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JOINT APPENDIX

2011-1195
(Serial No. 11/161,741)

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

JIE XIAO

Appellant

vs.

THE BOARD OF PATENT APPEALS AND
INTERFERENCES OF THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Appellee

Appeal from the United States Patent and Trademark Office,
Board of Patent Appeals and Interferences

JOINT APPENDIX

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In re Xiao, Appeal No. 2011-1195
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JIE XIAO

Appeal 2009-008575
Application 11/161,741
Technology Center 3600

Before: WILLIAM F. PATE III, STEFAN STAICOVICI, and KEN B.
BARRETT, *Administrative Patent Judges*.

PATE III, *Administrative Patent Judge*.

DECISION ON APPEAL¹

¹ The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the “MAIL DATE” (paper delivery mode) or the “NOTIFICATION DATE” (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

STATEMENT OF CASE

Appellant appeals under 35 U.S.C. § 134 from a rejection of claims 1, 2 and 4-18. App. Br 3. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

The claims are directed to a briefcase having a combination lock. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A briefcase comprising a combination lock, wherein the combination lock comprises:

a group of at least three tumbler rings, each tumbler ring operable to rotate and to settle at one of multiple predetermined positions and having multiple position-labels thereon each corresponding to one of the multiple predetermined positions, and wherein each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter, and the wild-card position-label is different from any one of the twenty-six English alphabetical-letters and is configured for representing any one of the twenty-six English alphabetical-letters.

REFERENCES

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Gray	US 2,261	Sep. 18, 1841
Remington	US 4,395,892	Aug. 2, 1983
Basche	US 6,621,405 B1	Sep. 16, 2003
Fiegner	US 2006/0169007 A1	Aug. 3, 2006

REJECTIONS

Claims 1, 2, 4-9, and 15-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Gray, Remington and Fiegner. Ans. 3.

Claims 10-12 and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Gray and Fiegenger. Ans. 6.

Claims 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Gray, Fiegenger, and Basche. Ans. 6.

ISSUES

Appellant argues claims 1, 2, 4-9 and 15-18 as a group. App. Br. 5-14. We select claim 1 as the representative claim, and claims 2, 4-9 and 15-18 will stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(vii). Appellant argues the patentability of claim 1 based upon the lock configuration. Specifically, the fact that each tumbler has “only one wild-card position-label and multiple alphabetical-letter position-labels.” No arguments are presented regarding the Examiner’s proposed combination with Remington’s briefcase or Basche’s algorithm. Although included under a separate subheading, Appellant argues the patentability of claims 10-14, which relate to the method for configuring the lock including “selecting one wild-card position-label and multiple alphabetical-letter position-labels for each tumbler ring,” for the same reasons argued with respect to claim 1. App. Br. 14-15. Thus, the sole issue for our consideration is whether the Examiner erred in concluding the claimed subject matter would have been obvious because the applied prior art would not have rendered obvious a lock having “one wild-card position-label and multiple alphabetical-letter position-labels” for each tumbler ring.

FINDINGS OF FACT

1. Gray discloses a combination lock having revolving rings 1-8. Il. 24-40. Each ring 1-8 has a space between the letters resulting in 52 divisions

which may form part of the line that must be attained in order to open the lock. Each end plate 9, 10 has twenty-two letters and twenty-two blank spaces which may form part of that line. ll. 49-83.

2. Gray discloses that the divisions may be designated by letters, figures, other marks or blank spaces. ll. 89-103.
3. Fiegener teaches that letters, numbers, ciphers, symbols, colors, patterns, textures or any combination thereof may be used as position indicia on a combination lock. P. 3, para. [0041].
4. Remington teaches that it is known to incorporate combination locks into briefcases. Fig. 1.
5. Basche discloses a combination lock wherein a method or algorithm is employed for selecting less than twenty-six letters for the positions on tumbler rings while maximizing the number of words in a given list that can be formed by those tumblers. Col. 4, ll. 3-8.

ANALYSIS

Gray discloses a combination lock having tumbler rings with multiple divisions, or “positions” and multiple labels thereon, including multiple English alphabetical letters. Fact 1. Gray also discloses that the divisions may be designated by indicia different from any English alphabetical letters. Fact 2. Gray does not disclose that there is only one position label different from any English alphabetical letter nor does Gray refer to those position labels that are different from English alphabetical letters as “wild-card” positions. Fiegener teaches that it was known in the art to use labels different from any English alphabetical letter as position indicia on a combination lock. Fact 3. Modifying Gray to include only one position label different from any English alphabetical letter involves merely the substitutions of

elements known to be interchangeable or an alteration in the size of Gray's device yielding a predictable result and would have been obvious to one having ordinary skill in the art. Terming such a position a "wild-card" position involves a distinction that is discernible only within the human mind and therefore does not patentably distinguish the claimed device over the prior art.

Appellant argues that the Examiner has failed to establish a prima facie case of obviousness for the claimed subject matter on the ground that Appellant's lock is a matter of design choice, because the Examiner has not provided any reasons to support this conclusion. This argument is not persuasive. Firstly, Appellant has not addressed the Examiner's position that a letter in Gray's lock could constitute a wild card and Feigener demonstrates that a letter is interchangeable with some other label that is not a letter. *See* Fact 3; Non-Final Rej. 3-4. Appellant argues the Examiner's statement on page 6 of the Non-Final Rejection (para. 15) is merely conclusory but this statement merely references the reasons already articulated thereinabove. Appellant's argument concerning *In re Dailey* is moot since it is clear from the Non-Final Rejection that the Examiner does not rely upon *In re Dailey* to support the rejections presently before us for review. Non-Final Rej. 7; App. Br. 6-8; Reply Br. 3.

Contrary to Appellant's assertion, even if true, the alleged lack of appreciation of the advantages of the invention by the Examiner would not provide any objective evidence of nonobviousness because the objective standard for determining obviousness is based upon a hypothetical person of ordinary skill in the art, not a particular Examiner. App. Br. 8-10.

Appellant relies upon *In re Wright* apparently for the proposition that secondary considerations or advantages from the Specification must be

evaluated in determining obviousness of the claimed invention. Appellant cites this general principal without pointing to any portion of the Specification the Examiner failed to afford weight to or consider in determining obviousness. App. Br. 10-11.

Appellant contends the Examiner is required to give patentable weight to the wild-card label. App. Br. 11-13; Reply Br 3-4. We note that although the Examiner argues the label is printed matter, and therefore not entitled to patentable weight, the Examiner makes this assertion only in the alternative. Ans. 4; Non-Final Rej. 3-4, 7. If no weight were afforded the symbol on the label there would have been no reason for the Examiner to rely upon Fiegener for specifically teaching a label different from any English alphabetical letter as discussed above. The Examiner has shown that it is known in the art to use this specific printed matter on locks. Thus, even if the printed matter, the label, is functionally related to the lock, and entitled to patentable weight, it is not related to the lock in any new and unobvious way, because the combination of Gray and Fiegener would have suggested it.

Appellant's argument that the "wild-card position label[s]" in this case are analogous to the "false label" in *In re Miller* is unpersuasive. App. Br. 11-13; Reply Br. 3. The distinction lies in the fact that any printed matter, letter, figure, number, other mark or blank space may serve as a "wild-card" without any alteration of how the lock functions since what symbol constitutes a "wild-card" is a distinction that is discernible only to the human mind. In contrast, changing the label of the measuring receptacle in *In re Miller* would result in measuring a different quantity. We cannot agree that the claimed invention solves a longstanding problem of selecting any desired word as a password because in the absence of a required letter

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an individual could designate one particular letter to represent another.

Contra App. Br. 12; Reply Br. 5.

Appellant cites Basche as evidence of long-felt need, failure of others and teaching away. App. Br. 13-14; Reply Br. 6-7. Appellant does not cite any particular portion of Basche in support of these allegations. Basche simply describes an alternative solution to a similar problem. Basche does not discourage or even discuss pursuing the path claimed by Appellant. The fact that Basche solves a similar problem in a different way does not establish long-felt need, failure of others or teaching away because it does not relate to Appellant's claimed subject matter.

CONCLUSIONS OF LAW

The Examiner did not err in concluding the claimed subject matter would have been obvious because the applied prior art would not have rendered obvious a lock having "one wild-card position-label and multiple alphabetical-letter position-labels" for each tumbler ring.

DECISION

For the above reasons, the Examiner's rejections of claims 1, 2 and 4-18 are affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2009).

AFFIRMED

mls

Appeal 2009-008575
Application 11/161,741

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Docket Sheet

Date	Document Title
08/15/2005	Specification, Drawings, Claims, Oath/Declaration, Abstract
08/15/2005	Nonpublication Request from Applicant
08/15/2005	Information Disclosure Statement
10/06/2005	Information Disclosure Statement
01/23/2006	Rescission of Previous Nonpublication Request
02/01/2006	Communication Regarding Rescission of Nonpublication Request and/or Notice of Foreign Filing
09/07/2006	Non-Final Rejection
09/25/2006	Amendment After Non-Final Rejection
12/06/2006	Final Rejection
01/18/2007	Notice of Publication of Application
04/10/2007	Amendment After Final
05/03/2007	Advisory Action
05/05/2007	Notice of Appeal
05/25/2007	Appeal Brief
06/26/2007	Notification of Non-Compliant Appeal Brief
07/08/2007	Corrected Appeal Brief
10/10/2007	Non-Final Rejection
12/10/2007	Notice of Appeal
01/18/2008	Second Appeal Brief
04/08/2008	Notification of Non-Compliant Appeal Brief
04/15/2008	Notification of Non-Compliant Appeal Brief (returned to USPTO as undelivered)
04/19/2008	Revocation of Power of Attorney
04/26/2008	Appeal Brief
04/26/2008	Change of Address
05/02/2008	Notice Regarding Change of Power of Attorney
05/02/2008	Notice of Acceptance of Power of Attorney
05/29/2008	Examiner's Answer to Appeal Brief
07/10/2008	Reply Brief
08/22/2008	Reply Brief Noted – BPAI
04/22/2009	Appeal Docketing Notice
10/26/2010	BPAI Decision – Examiner Affirmed
12/18/2010	Notice of Appeal to CAFC

[Para 19][0019] FIG. 1A and FIG.1B illustrate a combination lock 100 having four tumbler rings (20, 40, 60, and 80) that have wild-card position-labels (e.g., 45, 65, or 85). In the figures, each tumbler ring (20, 40, 60, or 80) can rotate around an axis. Each tumbler ring (20, 40, 60, or 80) can be settled at one of multiple predetermined positions. In one implementation, each tumbler ring can be settled at one of ten possible positions. On each tumbler ring, there are multiple position-labels. Each of the multiple position-labels indicates one of the multiple positions that a tumbler ring can settle at. For example, when a tumbler ring can be settled at one of ten predetermined positions, the tumbler ring can be marked with ten position-labels and each of the ten position-labels indicates one of the one of ten predetermined positions.

[Para 20][0020] In FIG. 1A and FIG.1B, each tumbler ring has a wild-card position-label (e.g., 45, 65, or 85) and multiple alphabetical-letter position-labels (e.g., 22, 42, 62, or 82). Each of the multiple alphabetical-letter position-labels is a single alphabetical-letter. The wild-card position-label can be a star "*", dollar sign "\$", a company log, or simply a blank. Other selections of the wild-card position-label are also possible.

[Para 21][0021] In one implementation, when each tumbler ring can be settled at one of ten possible positions, each tumbler ring can have one wild-card position-label and nine alphabetical-letter position-labels. The nine alphabetical-letter position-labels can be randomly selected from the twenty-six alphabetical-letters. The nine alphabetical-letter position-labels can be selected from the twenty-six alphabetical-letters based on certain design algorithm.

[Para 22][0022] As one particular example, FIG. 2 is an example of a table illustrating each of the four tumbler rings has ten positions in which each of nine positions is labeled with an alphabetical-letter and one position is labeled with a wild-card. In FIG.2, tumbler 1 has one wild-card position-label 25 in the form of a star "*" and nine alphabetical-letters 22

consisting of W, S, F, C, B, L, D, H, and P; the wild-card card "*" can represent any of the twenty-six alphabetical-letters that are not listed on Tumbler 1. Tumbler 2 has one wild-card position-label 45 in the form of a star "*" and nine alphabetical-letters 42 consisting of O, A, I, E, U, T, L, R, and H; the wild-card card "*" can represent any of the twenty-six alphabetical-letters that are not listed on Tumbler 2. Tumbler 3 has one wild-card position-label 65 in the form of a star "*" and nine alphabetical-letters 62 consisting of R, M, L, N, A, E, S, O, and I; the wild-card card "*" can represent any of the twenty-six alphabetical-letters that are not listed on Tumbler 3. Tumbler 4 has one wild-card position-label 85 in the form of a star "*" and nine alphabetical-letters 82 consisting of D, E, M, T, P, N, K, L, and H; the wild-card card "*" can represent any of the twenty-six alphabetical-letters that are not listed on Tumbler 4.

[Para 23] [0023] The result of selecting alphabetical-letter position-labels as show in a table 200 in FIG. 2 is obtained by modifying a result of selecting alphabetical-letter position-labels as shown in FIG. 3. The table 300 in FIG. 3 is related to a method as described in U.S. patent No. 6,621,405 (see, for example, Fig. 2 of U.S. patent No. 6,621,405). After replacing the tenth favorable alphabetical-letter for each tumbler ring with a wild-card position-label in the form of a star "*", one can convert table 300 in FIG. 3 into table 200 in FIG.2. More specifically, the tenth favorable alphabetical-letter for Tumbler 1, G, is replaces with a star "*"; the tenth favorable alphabetical-letter for Tumbler 2, N, is replaces with a star "*"; the tenth favorable alphabetical-letter for Tumbler 3, C, is replaces with a star "*"; and the tenth favorable alphabetical-letter for Tumbler 4, G, is replaces with a star "*".

[Para 24] [0024] The result as show in FIG. 2 has several advantages over the result as show in FIG. 3. First, some words that cannot be spelled with the result in FIG. 3 can now be spelled with the result in FIG. 2. As specific examples, using the result of FIG. 2, one can spell "BLUE" as "BL*E", spell "DOOR" as "DOO*", and "HERO" as "HER*"; in contrast, none of

these words (BLUE, DOOR, or HERO) can be spelled using the result in FIG. 3. Therefore, such feasibility of using a wild-card to represent letters that are not expressly listed on tumbler rings can be quite useful. Second, words with number of letters less than the number of tumbler rings can now be spelled. More specifically, three-letters words can be spelled even a lock has four tumbler rings. As an example, using the result of FIG. 2, one can spell "CAR" as "'CAR*", "SUN" as "SUN*", "TOP" as "*TOP"; such feasibility is particular useful when large number of tumbler rings (e.g., six tumbler rings) are used in a combination lock. In addition, the result of FIG. 2 can be used to spell large number of foreign words, and the result of FIG. 2 can also be used to spell some special words that are not listed in dictionaries but that have particular meanings to a user.

[Para 25] [0025] In one implementation, when each of the four tumbler rings has a wild-card position-label, any four-letter words can be theoretically spelled, because the wild-card can theoretically represent any of the twenty-six letters. In a trivial example, "B***" can represent any four-letter words starting with a first letter "B"; in practice, however, a user may want to use "BL*E" to represent "BLUE" rather than using "B***" to represent "BLUE."

[Para 26] [0026] In an implementation of combination lock as shown in FIG. 1A and FIG. 1B, four tumbler rings are used. In other implementations, three or five tumbler rings can be used. Still in other implementations, more than five tumbler rings can be used.

[Para 27] [0027] In some implementations, the multiple alphabetical-letter position-labels can be selected from the twenty-six alphabetical-letters based on a design algorithm that is somewhat related to the method as described in U.S. patent No. 6,621,405. In some other implementations, multiple alphabetical-letter position-labels can also be selected based on a design algorithm that is not so much related to the method as described in U.S. patent No. 6,621,405. Still in other implementations, the multiple alphabetical-letter position-labels can be randomly selected from the twenty-six alphabetical-letters.

[Para 28] [0028] In one implementation, when each of the four tumbler rings has ten possible positions, an example design algorithm can include two steps. In the first step, ten most favorable letters for each of the four tumbler rings can be selected using a method related the method as described in U.S. patent No. 6,621,405. In the second step, only the top nine most favorable letters are retained; the tenth most favorable letter is discarded and is replaced with a wild card, such as a star ("*"), a dollar sign ("\$"), a logo, or simply a blank.

[Para 29] [0029] In another implementation, when each of the four tumbler rings has ten possible positions, an example design algorithm can include two steps. In the first step, nine most favorable letters for each of the four tumbler rings can be selected using a method related the method as described in U.S. patent No. 6,621,405. In the second step, a wild card is used as the tenth most favorable letter to form a total of ten position-labels along with the other nine most favorable letters.

[Para 30] [0030] In another implementation, when each of the four tumbler rings has ten possible positions, an example design algorithm can include four independent steps. In the first independent step, the most frequently used letters that can be used as the first letter of a word are selected; these top nine most-frequently-used letters and a wild card are used for the ten position-labels for the first tumbler rings. In the second independent step, the most frequently used letters that can be used as the second letter of a word are selected; these top nine most-frequently-used letters and a wild card are used for the ten position-labels for the second tumbler rings. In the third independent step, the most frequently used letters that can be used as the third letter of a word are selected; these top nine most-frequently-used letters and a wild card are used for the ten position-labels for the third tumbler rings. In the fourth independent step, the most frequently used letters that can be used as the fourth letter of a word are selected; these top nine most-frequently-

used letters and a wild card are used for the ten position-labels for the fourth tumbler rings.

[Para 31][0031] In still another implementation, when each of the four tumbler rings has ten possible positions, an example design algorithm can include two independent steps. Both of the two independent steps depend on a study on what is the most frequently used letters in a group of words. Different studies based on different selections of the group of words (e.g., in Webster dictionary, in press, or in literature) may yield different lists of most frequently used letters. In one specific example, a study found that most frequently used letters follows the following list: "etaoinsrhldcumfpgwybvkxjqz." Based on this list of most frequently used letters, in the first independent step, the top fourteen most-frequently-used letters are selected and the five vowels are discarded; the resulted nine letters, "tnsrhldcm," are selected as the alphabetical-letter position-labels for the first tumbler ring. In the second independent step, the top nine most-frequently-used letters, "etaoinsrh," are selected as the alphabetical-letter position-labels for each of the second, third, and fourth tumbler rings. FIG. 4 shows a table 400 that lists the position-labels for each of the four tumbler rings based on the design algorithm as described above. In table 400 as shown in FIG.4, each of the four tumbler rings has ten positions in which each of nine positions is labeled with an alphabetical-letter and one position is labeled with a wild-card.

[Para 32][0032] Based on above teachings, people skilled in the art can use other design algorithms to select multiple alphabetical-letters, and subsequently, use a wild-card along with the selected multiple alphabetical-letters as the position-labels for each of the tumbler rings.

[Para 33][0033] FIG. 5 shows an example of a briefcase 500 that includes two combination locks 100A and 100B. Each of the two combination locks (100A, or 100B) includes four tumbler rings, 20, 40, 60, and 80. Each tumbler ring (20, 40, 60, or 80) can be settled at

one of multiple predetermined positions. On each tumbler ring, there are multiple position-labels. Each of the multiple position-labels indicates one of the multiple positions that a tumbler ring can settle at. Each tumbler ring has a wild-card position-label (e.g., 45) and multiple alphabetical-letter position-labels. Each of the multiple alphabetical-letter position-labels is a single alphabetical-letter. The wild-card position-label can be a star "*", dollar sign "\$", a company log, or simply a blank. Other selections of the wild-card position-label are also possible.

[Para 34] [0034] In FIG. 5, when each of the two combination locks (100A, or 100B) includes four tumbler rings, large number of eight-letters words can be spelled. For example, assume that the position-labels for the four tumbler rings on each combination lock (100A, or 100B) are selected based on table 400 on FIG. 4, then, "SUITCASE" can be spelled as "S*ITCASE"; where the wild-card "*" is used to represent letter "U" that can not be found on tumbler ring 40 in combination lock 100A.

[Para 35] [0035] In the implementation as shown in FIG.5, briefcase 500 includes two combination locks. In other implementations, briefcase 500 can include one combination lock. Still in other implementations, 500 can include more than two combination locks.

[Para 36] [0036] The present invention has been described in terms of a number of implementations. The invention, however, is not limited to the implementations depicted and described. Rather, the scope of the invention is defined by the appended claims.

FIG._1A

Amendments to the Specification:

Please replace paragraph [0020] with the following amended paragraph:

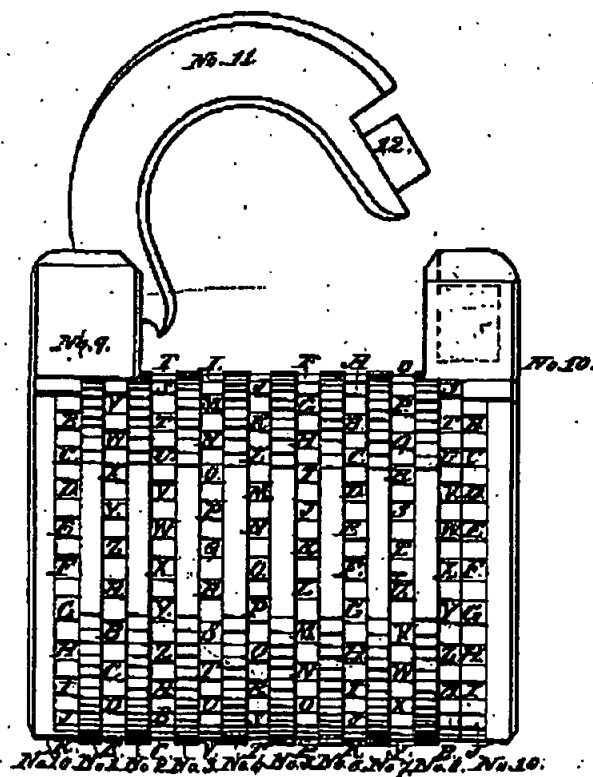
[0020] In FIG. 1A and FIG.1B, each tumbler ring has a wild-card position-label (e.g., 45, 65, or 85) and multiple alphabetical-letter position-labels (e.g., 22, 42, 62, or 82). Each of the multiple alphabetical-letter position-labels is a single alphabetical-letter. The wild-card position-label can be a star "*", dollar sign "\$", a company logo, or simply a blank. Other selections of the wild-card position-label are also possible.

Please replace paragraph [0023] with the following amended paragraph:

[0023] The result of selecting alphabetical-letter position-labels as show in a table 200 in FIG. 2 is obtained by modifying a result of selecting alphabetical-letter position-labels as shown in FIG. 3. The table 300 in FIG. 3 is related to a method as described in U.S. patent No. 6,621,405 (see, for example, Fig. 2 of U.S. patent No. 6,621,405). After replacing the tenth favorable alphabetical-letter for each tumbler ring with a wild-card position-label in the form of a star "*", one can convert table 300 in FIG. 3 into table 200 in FIG.2. More specifically, the tenth favorable alphabetical-letter for Tumbler 1, G, is replaced[[s]] with a star "*"; the tenth favorable alphabetical-letter for Tumbler 2, N, is replaced[[s]] with a star "*"; the tenth favorable alphabetical-letter for Tumbler 3, C, is replaced[[s]] with a star "*"; and the tenth favorable alphabetical-letter for Tumbler 4, G, is replaced[[s]] with a star "*".

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rotate around an axis and settle at one of multiple predetermined positions, each tumbler having multiple position labels thereon corresponding to one of the multiple predetermined positions (see lines 1-35), and wherein each tumbler ring has a wild-card position label and multiple alphabetical letter position labels each being a single letter and the wild card position is configured for representing any alphabetical letter. The Examiner would like to note that any of the twenty-six letters on each of the Gray tumblers is representing the "wild card". The wild card position label is purely a design choice and plays no critical role in the function of the lock. The wild card label can be a star, a dollar sign, a logo, blank, a number, Greek alphabet symbols, etc. The Gray device shows the labels as letters. See the Gray device below.



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the examiner agrees but the argument is not persuasive. The wild-card position label is not patentably distinct material. As shown by Fiegenger, it is well known for combination lock indicia to be any shape, symbol, letter, number or color. The examiner would like to point out that any letter on the Gray device could be labeled a wild card. For example, the "A" on each tumbler of the Gray device is the wild card. Each tumbler would therefore only have one wild card label. It would be obvious to make the label "A" any design, symbol or number. Regarding the argument that the "wild card position label" is critical, the examiner would like to point out that Gray is capable of making any "password" that the applicant's device is capable of making and more since Gray includes more letters than the applicant's invention. It is well known that any keypad on a telephone has wild card labels as numbers representing letters. For example, the number (wild card label) 3 on a telephone represents any of the letters D, E or F. It is well known to have 1 character represent several others for security purposes.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

such rejection. Nevertheless, Applicant submits that claims 10-14 are not anticipated by Basche for the following reasons.

Basche realized a problem associated with letter locks: when each tumbler ring has only ten tumbler positions (rather than twenty-six positions), not all English words can be used as a "password" for the lock. (Column 1, lines 34-44). Basche teaches a computational process for selecting letters on tumbler rings. Using such a computational process, any one of several thousand words (albeit not all words) can be used as a "password." (Column 2, lines 25-29).

Each of the claims 10-14 calls for "selecting one wild-card position-label and multiple alphabetical-letter position-labels for each tumbler ring of the combination lock." Basche failed to disclose "the one wild-card position-label [that] is different from any one of the twenty-six English alphabetical-letters and is selected for representing any one of the twenty-six English alphabetical-letters" as recited in each of the claims 10-14; therefore, claims 10-14 are not anticipated by Basche.

B. Claims 1-2, 4-9, and 15-18 are not rendered obvious under 35 U.S.C. 103(a) over Gray in view of Remington and further in view of Fiegener.

Gray teaches a combination lock on which each tumbler ring can be labeled with English alphabetical-letters. Remington shows that a combination lock can be used on a briefcase. Fiegener shows labels can be "letters, numbers, ciphers, symbols, colors, patterns, textures, any combination thereof." (Paragraph [0041])

Each of the claims 1-2, 4-9, and 15-18 calls for a combination lock on which each tumbler ring has thereon "only one wild-card position-label and multiple alphabetical-letter position-labels." Applicant submits that such combination lock is not obvious under 35 U.S.C. 103(a) for the following reasons.

1) The Examiner has failed to establish prima facie case of obviousness for claims 1-2, 4-9, and 15-18, because the Examiner failed to provide the reason "why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed."

..

In the final office action, at lines 2-3 on page 6, the Examiner argued that “it is well known for combination lock indicia to be any shape, symbol, letter, number or color.” At lines 3-7, the Examiner further stated that:

The examiner would like to point out that any letter on the Gray device could be labeled a wild card. For example, the “A” on each tumbler of the Gray device is the wild card. Each tumbler ring would therefore only have one wild card label. It would be obvious to make the label “A” any design, symbol or number.

Here, the Examiner is using Applicant’s claims as the “blueprint” for building a modified Gray device. Rather than arguing that, based on a “blueprint” as taught by Applicant, a Gray device can be modified to bring about Applicant’s lock, the Examiner needs to explain why a Gray device should be modified to bring about Applicant’s lock.

Nevertheless, **the Examiner did not provide any reason why only one wild-card position-label is needed on each tumbler ring along with multiple alphabetical-letter position-labels.** That is, the Examiner did not identify any reason “why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed” (emphasis added), as required by the PTO’s temporary examination guidelines after *KSR* (See the last paragraph in the Memorandum sent to Technology Center Directors on May 3, 2007, from Margaret A. Focarino, Deputy Commissioner for Patent Operations). Further more, in the first office action (lines 18-20, page 4) and in the final office action (line 8, page 4 and lines 7-13, page 6), the Examiner repetitively argued that the wild card position label plays no critical role, which only indicates that **the Examiner did not see any apparent reason why only one wild-card position-label is needed on each tumbler ring along with multiple alphabetical-letter position-labels.**

Absence of any reasons or design goals, people could put any number of non-English-letter symbols on each tumbler ring. When multiple different non-English-letter symbols are randomly used on one or more tumbler rings (e.g., one or more tumbler rings can have “*”, “#”, or other non-English-letter symbols), there can be essentially countless possible designs¹⁰. In the patent application, Applicant specifically claims a few designs, in which each tumbler ring has only one wild-card position-label and

¹⁰ As an example, for a combination lock with three tumbler rings each of which can settle on ten positions, when a single non-English-letter symbol is repetitively used on one or more tumbler rings (i.e., any tumbler ring can have one, two, three, or more of the same non-English-letter symbol), there will be one thousand possible designs (10 choices x 10 choices x 10 choices).

multiple alphabetical-letter position-labels. The Examiner did not provide any reason why a person of ordinary skill in the art would select this few designs from countless possible designs. That is, the Examiner failed to identify the reason “why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed” (emphasis added). Therefore, the Examiner has failed to establish prima facie case of obviousness for claims 1-2, 4-9, and 15-18.

2) The Examiner’s repetitive failure to appreciate (at least initially) the advantages in the Applicant’s invention provides objective evidence that the Applicant’s invention is not obvious.

Applicant specifically claims a few designs (in which each tumbler ring has only one wild-card position-label and multiple alphabetical-letter position-labels) from countless possible designs, for the reason that this few designs can solve a problem for which others (such as Basche) have failed to find the solution; the problem is that when each tumbler ring has only ten tumbler positions (rather than twenty-six positions), not all English words can be used as the “password” for the lock. The Examiner not only failed to provide the reason why other people would select these claimed designs but also failed to appreciate Applicant’s reason for selecting these claimed designs, at least initially, by repetitively arguing that the wild card position label plays no critical role (lines 18-20, page 4, the first office action; line 8, page 4, the final office action; lines 7-13, page 6, the final office action). When a wild card position label is used to represent any one of the twenty-six alphabetical letters, even for a lock with fewer than twenty-six positions, any desired word can still be selected as “password.” Therefore, the wild-card position-label improves the usability of the lock and the function of the lock.

In response to Applicant’s contention that “the wild card position label plays a very critical role in the usability of the lock and the function of the lock” (on page 10 of Applicant response to the first office action), the Examiner argued that “Gray is capable of making any ‘password’ that applicant’s device is capable of making and more since Gray includes more letters than applicant’s invention” (lines 8-10, page 6, the final office action). Yes, “Gray is capable of making any ‘password’ that applicant’s device is capable of,” but at the cost of including more letters than Applicant’s lock, making it mechanically clumsy. Even with the cost of including more letters than Applicant’s lock,

Gray's lock is not capable of making more "password" than applicant's lock, as mistakenly believed by the Examiner. Any "password" on Gray's lock can be a "password" on Applicant's lock as well. **The Examiner apparently failed to appreciate the advantage that Applicant's lock is not only mechanically simpler than but also as versatile as Gray's lock in terms of "password" selection.**

In addition, at lines 10-12 on page 6 of the final office action, the Examiner argued that "[i]t is well known that any keypad on a telephone has wild card labels as numbers representing letters." Mere establishing that a wild card can represent any letters is by itself insufficient to render Applicant's invention obvious. The Examiner still needs to provide the reason "why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed" (emphasis added), as required by the PTO's temporary examination guidelines after *KSR* (See the last paragraph in the Memorandum sent to Technology Center Directors on May 3, 2007 from Margaret A. Focarino, Deputy Commissioner for Patent Operations). Despite the Examiner's assertion that one element in the claims (i.e., a wild card) is well known, the Examiner still fails to appreciate the advantages of the lock on which, as in the manner claimed, "each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels." That is, the Examiner fails to see any reasons to design a lock as in the manner claimed.

3) The Examiner should have evaluated the advantages presented by Applicant, as required by *Graham*.

In the Advisory Action, at lines 9-12 on page 2, the Examiner finally acknowledged that Applicant's invention possesses some advantages and stated that:

In response to the argument that the examiner fails to appreciate the advantages of the invention, the examiner respectfully disagrees. The examiner appreciates applicant's presented advantage but applicant is reminded that only the claimed structural limitations of the device are patentable. The specification is not examined for novelty over the prior art, only the claim limitations.

Here, the Examiner refused to evaluate the advantages presented by Applicant, presumably based on the theory that these advantages, while in the specifications, are not in claim limitations and thus need not be examined. The Examiner's such theory is

contrary to the principle of *Graham v. John Deer Co.* and contrary to the precedent of the Federal Circuit. As stated by the Federal Circuit:

Factors including unexpected results, new features, solution of a different problem, novel properties, are all considerations in the determination of obviousness...When such factors are described in the specification they are weighted in determining ...whether the prior art presents the prima facie case of obviousness. (Emphasis added by Applicant).

In re Wright, 848 F.2d 1216, 1219, 6 USPQ 2d 1959, 1962 (Fed. Cir. 1988). Therefore, Applicant submits that the Examiner should have evaluated the advantages possessed by the lock as claimed.

4) The Examiner cannot rely on *In re Dailey*, because the shape change in *In re Dailey* plays no significant role, whereas the wild-card position-label in Applicant's lock plays critical role for improving the function of the lock.

On page 4 of the first office action and on page 4 of the final office action, the Examiner repetitively argued that "[t]he wild card position label is purely a design choice and plays no critical role in the function of the lock." On page 2 of the Advisory Action, despite the Examiner claims that "[t]he examiner appreciates applicant's presented advantages," the Examiner still insisted that "the wild card label" is a design choice and stated that:

The examiner pointed out that "the wild card label" is a design choice and is therefore an obvious modification and not patentably distinct. ... There is no rule necessary to illustrate design choice. It has been held that a change in shape (the label) of a prior art device is a design consideration within the skill of the art. *In re Dailey*. 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Here, the Examiner characterized Applicant's claim limitation -- "only one wild-card position-label and multiple alphabetical-letter position-labels" on each tumbler ring -- as mere change in shape and cited *In re Dailey* for the proposition that mere change in shape of a device is obvious design consideration. Applicant respectfully disagrees.

When citing *In re Dailey*, the Examiner made the same mistake that another examiner had made in *Ex Parte Moore*, 1996 WL 1796237 (Bd. Pat. App & Interf.) In *Ex Parte Moore*, an examiner cited *In re Dailey* and rejected a claim 1, which is directed to a chalk box and included "an arched neck," for the reason that "no patentable moment

is derived from the specified shape”. The Board of Patent Appeals and Interferences disagrees. The Board stated that “the shape of the neck recited in claim 1 cannot be badly dismissed as an obvious matter of design choice,” because “the shape of the neck recited in claim 1 is significant in that it solves a stated problem.”

Just like the neck on the chalk box in *Ex Parte Moore*, Applicant’s wild-card position-label on the lock “cannot be badly dismissed as an obvious matter of design choice,” because it plays critical role for improving the function of the lock. The “only one wild-card position-label and multiple alphabetical-letter position-labels” on each tumbler ring is significant in that it solves a stated problem (i.e., on a prior art combination lock, such as Basche’s lock, not all desired words can be chosen as the “password”).

Under MPEP 2144.04, “[i]f the applicant has demonstrated the criticality of a specific limitation, it would not be appropriate to rely solely on case law as the rationale to support an obviousness rejection” (See the last sentence in the first paragraph of MPEP 2144.04). More specifically, if there is evidence that the particular configuration of the claimed device was significant, the Examiner should not rely on the “design choice” rationale of *In re Dailey* to support an obvious rejection (See, MPEP 2144.04(IV) (B)). In claims 1-2, 4-9, and 15-18, the “only one wild-card position-label and multiple alphabetical-letter position-labels” on each tumbler ring plays a critical role and is significant; therefore, the Examiner’s obviousness rejection based on *In re Dailey* should be withdrawn.

5) Claims 1-2, 4-9, and 15-18 is not obvious for the additional reason that there is objective evidence of secondary consideration to support the invention is unobvious.

In the final office action, the Examiner did not evaluate on the record Applicant’s objective evidence submitted previously. In the Advisory Action, at line 13 on page 2, the Examiner merely made a conclusory statement that “after consideration of applicant’s arguments (previous and current), Gray still reads on the claimed limitations.”¹¹ Here, the Examiner merely stated that Applicant’s arguments (possibly also Applicant’s

¹¹ Perhaps, the Examiner intended to mean that “Applicant’s claims still read on Gray’s device.” But, such conclusion can not stand either, because Gray did not teach “only one wild-card position-label and multiple alphabetical-letter position-labels” on each tumbler ring as recited in the claims.

VIII CLAIMS APPENDIX

The claims involved in this Appeal are listed.

Listing of Claims:

1(previously amended). A briefcase comprising a combination lock, wherein the combination lock comprises:

a group of at least three tumbler rings, each tumbler ring operable to rotate and to settle at one of multiple predetermined positions and having multiple position-labels thereon each corresponding to one of the multiple predetermined positions, and wherein each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter, and the wild-card position-label is different from any one of the twenty-six English alphabetical-letters and is configured for representing any one of the twenty-six English alphabetical-letters.

2 (original). The briefcase of claim 1, wherein the group of at least three tumbler rings is configured to rotate around an axis.

3(cancelled).

4(original). The briefcase of claim 1 , wherein a wild-card position-label includes a star position-label ("*").

5(original). The briefcase of claim 1 , wherein a wild-card position-label includes a dollar sign position-label (“\$”).

6(original). The briefcase of claim 1 , wherein a wild-card position-label includes a blank position-label.

7(original). The briefcase of claim 1 , wherein a wild-card position-label includes a logo position-label.

8(original). The briefcase of claim 1 , wherein a group of at least three tumbler rings comprises:

a group of four tumbler rings.

9(original). The briefcase of claim 1 , wherein a group of at least three tumbler rings comprises:

a group of five tumbler rings.

10(previously amended). A method of configuring a combination lock that includes a plurality of tumbler rings each having a plurality of position-labels, each position-label on a given tumbler ring on the at least one combination lock indicating one of the multiple predetermined positions that the given tumbler ring is configured to settle at, the method comprises:

selecting one wild-card position-label and multiple alphabetical-letter position-labels for each tumbler ring of the combination, each of the multiple alphabetical-letter position-labels being a single English alphabetical-letter, wherein the one wild-card position-label is different from any one of the twenty-six English alphabetical-letters and is selected for representing any one of the twenty-six English alphabetical-letters.

11(previously amended). The method of claim 10, comprises:

selecting any one of a star (“*”), a dollar sign (“\$”), a blank, and a logo as a wild-card position-label for each tumbler ring of the combination lock.

12(previously amended). The method of claim 10, comprises:

selecting randomly a subset of English alphabetical-letters from the twenty-six English alphabetical-letters as the multiple alphabetical-letter position-labels for each tumbler ring of the combination lock.

13(previously amended). The method of claim 10, comprises:

selecting a subset of English alphabetical-letters from the twenty-six English alphabetical-letters based on a design algorithm as the multiple alphabetical-letter position-labels for each tumbler ring of the combination lock.

14(previously amended). The method of claim 13, wherein the design algorithm comprises:

finding a list of most frequently used letters regardless where a letter is used in a word based on a selection of a group of words; and

selecting a subset of English alphabetical-letters from the list of most frequently used letters.

15(previously amended). A briefcase comprising a combination lock, wherein the combination lock comprises:

a group of at least three tumbler rings configured to rotate around an axis, each tumbler ring having multiple position-labels thereon and operable to be set at a settled position selected from multiple predetermined positions, each one of the multiple position-labels corresponding to one of the multiple predetermined positions, and wherein the multiple position-labels comprises only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter, and the wild-card position-label is different from any one of the twenty-six English alphabetical-letters and is configured for representing any one of the twenty-six English alphabetical-letters.

16(previously amended). The briefcase of claim 15, wherein the multiple position-labels consists of a wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter.

17(previously amended). The briefcase of claim 15, comprising two combination locks wherein each of the two combination locks comprises:

a group of at least three tumbler rings configured to rotate around an axis, each tumbler ring having multiple position-labels thereon and operable to be set at a settled position selected from multiple predetermined positions, each one of the multiple position-labels corresponding to one of the multiple predetermined positions, and wherein the multiple position-labels comprises only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter, and the wild-card position-label is different from any one of the twenty-six English alphabetical-letters and is configured for representing any one of the twenty-six English alphabetical-letters.

18(previously added). A combination lock comprises:

a group of at least three tumbler rings, each tumbler ring operable to rotate and to settle at one of multiple predetermined positions and having multiple position-labels thereon each corresponding to one of the multiple predetermined positions, and wherein each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter, and the wild-card position-label is different from any one of the twenty-six English alphabetical-letters and is configured for representing any one of the twenty-six English alphabetical-letters.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. **Claims 1-2, 4-9 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray (US 2,261) in view of Remington (US 4,395,892) and further in view of Fiegner (US 2006/0169007).**

4. Regarding claims 1 and 15-16, Gray shows a combination lock comprising a group of a group of at least three tumbler rings (1-8), each tumbler ring operable to rotate and to settle at one of multiple predetermined positions and having multiple position-labels thereon each corresponding to one of the multiple predetermined positions (lines 50-51), and wherein each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter. The Examiner would like to note that any of the twenty-six letters on each of the Gray tumblers could represent the "wild card position label". The wild card position label is considered printed matter (see response to arguments below concerning printed matter). Gray fails to show the device being used in combination with a briefcase. Remington shows that a combination lock in combination with a briefcase is old in the combination lock art. It would have been obvious to one of ordinary skill in the art to combine the Gray combination lock, with a briefcase as shown by Remington in

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11. Regarding claims 10-12, the method as claimed is rejected by Gray in view of Fiegenger as applied claims 1-2 and 4-7 above. Gray in view of Feigenger disclose applicant's claimed device and therefor disclose the method claimed in claims 10-12.

12. Regarding claim 18, gray in view of Feigenger teaches the combination lock as applied to claim 1 above.

13. **Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray and Fiegenger and further in view of Basche (US 6621405).** Gray and Fiegenger teach applicant's inventive concept and therefore the claimed method of claim 10 but fail to teach selecting letters based on a design algorithm and list. Basche teaches that it is well known in the combination lock art to use a design algorithm and generated lists to create passwords for combination locks (see columns 3-4; lines 60-66, 1-10 and steps following line 10). It would have been obvious to one of ordinary skill in the art to computer generate the selection of password using design algorithms in order to provide a lock with numerous password options (see column 3, lines 20-22).

Response to Arguments

14. Applicant's arguments regarding the U.S.C. rejection with Basche are moot in view of the new rejection above.

15. Regarding the argument that the examiner failed to establish a prima facie case of obviousness, the examiner respectfully disagrees and brings attention to the rejection above where the examiner shows that one would change the letter of Gray as a matter of design choice and that one would add a lock to a briefcase to deter unwanted access to the device.

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16. Regarding the argument that the examiner fails to appreciate applicant's invention, the examiner disagrees and reminds applicant that although the examiner may appreciate and understand applicants claimed invention, only claimed subject matter is examined. The examiner would like to note that the Gray device is fully capable of performing any function of applicant's **claimed** device and draws attention to the last sentence of page 7 in applicant's arguments where applicant admits "Gray is capable of making any password applicant's device is capable of".

2. Regarding the argument that the examiner failed to evaluate the advantages of applicant's invention, the examiner respectfully disagrees and reminds applicant that although the claims are interpreted in light of the specification, limitations, and advantages, from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

3. The arguments regarding *In re Dailey* are moot.

4. Regarding the arguments that the wild-card position label plays a critical role, the examiner respectfully disagrees. The wild-card position **label** is printed matter. Printed matter does not distinguish the invention from the prior art in terms of patentability. Printed matter is only given patentable weight when a functional relationship exists between the printed matter and the substrate to which it is attached. In this case, as the examiner understands it, the **label** is not the patentably distinct matter, the function and alignment of the tumbler wheels appears to be what applicant believes patentably distinct. The examiner suggests adding limitations directed at the substrate, the tumbler wheels, and their alignment in the various positions of the combination lock.

B. Claims 10-12 stand rejected under 35 U.S.C. 103(a) as being obvious over Gray in view of Fiegenger. Claims 13-14 stand rejected under 35 U.S.C. 103(a) as being obvious over Gray in view of Fiegenger and further in view of U.S. Patent No. 6,621,405 (“Basche”).

VII ARGUMENT

A. Claims 1-2, 4-9, and 15-18 are not rendered obvious under 35 U.S.C. 103(a) over Gray in view of Remington and further in view of Fiegenger.

Gray teaches a combination lock on which each tumbler ring can be labeled with English alphabetical-letters (See the figure of Gray). Remington shows that a combination lock can be used on a briefcase (See FIG. 1 of Remington). Fiegenger shows labels can be “letters, numbers, ciphers, symbols, colors, patterns, textures, any combination thereof” (See paragraph [0041] of Fiegenger).

Claims 1-2, 4-9, and 15-18 solved a problem for which Basche failed to provide a solution. Basche realized a problem associated with letter locks: when each tumbler ring has only ten tumbler positions (rather than twenty-six positions), not all English words can be used as a “password” for the lock. (Column 1, lines 34-44). Basche teaches a computational process for selecting letters on tumbler rings. Using such a computational process, any one of several thousand words (albeit not all words) can be used as a “password.” (Column 2, lines 25-29).

Each of the claims 1-2, 4-9, and 15-18 calls for a combination lock on which each tumbler ring has thereon “only one wild-card position-label and multiple alphabetical-letter position-labels.” Applicant submits that such combination lock is not obvious under 35 U.S.C. 103(a) for the following reasons.

1) The Examiner has failed to establish prima facie case of obviousness for claims 1-2, 4-9, and 15-18 on the ground that Applicant’s lock is “a matter of design choice.”

In Reopened Office Action, the Examiner insisted that “one would change the letter of Gray as a matter of design choice,” without providing reasons to support the Examiner’s conclusory statement (See lines 20-21 on page 6 of Reopened Office Action).

Previously, the Examiner had provided two reasons to support the Examiner's "design choice" argument.

As to the first reason, the Examiner repetitively argued that "[t]he wild card position-label is purely a design choice and plays no critical role in the function of the lock"(See page 4 of the first office action and page 4 of the final office action). Such argument only indicates that the Examiner did not see any apparent reason **why one would change each and every tumbler ring in such away that only one wild-card position-label is combined with multiple alphabetical-letter position-labels.**

In response, Applicant argued, in the previous appeal brief, that "[a]bsence of any reasons or design goals, people could put any number of non-English-letter symbols on each tumbler ring." When multiple different non-English-letter symbols are randomly used on one or more tumbler rings (e.g., one or more tumbler rings can have "*", "#", or other non-English-letter symbols), there can be essentially countless possible designs¹⁰. In the patent application, Applicant specifically claims a few designs, in which each tumbler ring has only one wild-card position-label and multiple alphabetical-letter position-labels. The Examiner did not see any apparent reason why a person of ordinary skill in the art would select this few designs from countless possible designs (See page 6-7 of previous appeal brief on July 8, 2007).

As to the second reason, the Examiner cited *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) and argued that "a change in shape (the label) of a prior art device is a design consideration within the skill of the art" (See line 8 on page 2 of the Advisory Action).

In response, Applicant argued that **the Examiner cannot rely on *In re Dailey*, because the shape change in *In re Dailey* plays no significant role, whereas the wild-card position-label in Applicant's lock plays critical role for improving the function of the lock. (See page 10 of previous appeal brief on July 8, 2007)**

¹⁰ As an example, for a combination lock with three tumbler rings each of which can settle on ten positions, when a single non-English-letter symbol is repetitively used on one or more tumbler rings (i.e., any tumbler ring can have one, two, three, or more of the same non-English-letter symbol), there will be one thousand possible designs (10 choices x 10 choices x 10 choices).

The Examiner responded that “[Applicant’s] arguments regarding *in re Dailey* are moot” (See line 13 on page 7 of Reopened Office Action). Applicant respectfully disagrees and resubmits the same arguments for the Board’s review.

Applicant’s argument in previous appeal brief filed on July 8, 2007

On page 4 of the first office action and on page 4 of the final office action, the Examiner repetitively argued that “[t]he wild card position label is purely a design choice and plays no critical role in the function of the lock.” On page 2 of the Advisory Action, despite the Examiner claims that “[t]he examiner appreciates applicant’s presented advantages,” the Examiner still insisted that “the wild card label” is a design choice and stated that:

The examiner pointed out that “the wild card label” is a design choice and is therefore an obvious modification and not patentably distinct. ... There is no rule necessary to illustrate design choice. It has been held that a change in shape (the label) of a prior art device is a design consideration within the skill of the art. *In re Dailey*. 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Here, the Examiner characterized Applicant’s claim limitation -- “only one wild-card position-label and multiple alphabetical-letter position-labels” on each tumbler ring -- as mere change in shape and cited *In re Dailey* for the proposition that mere change in shape of a device is obvious design consideration. Applicant respectfully disagrees.

When citing *In re Dailey*, the Examiner made the same mistake that another examiner had made in *Ex Parte Moore*, 1996 WL 1796237 (Bd. Pat. App & Interf.) In *Ex Parte Moore*, an examiner cited *In re Dailey* and rejected a claim 1, which is directed to a chalk box and included “an arched neck,” for the reason that “no patentable moment is derived from the specified shape”. The Board of Patent Appeals and Interferences disagrees. The Board stated that “the shape of the neck recited in claim 1 cannot be badly dismissed as an obvious matter of design choice,” because “the shape of the neck recited in claim 1 is significant in that it solves a stated problem.”

Just like the neck on the chalk box in *Ex Parte Moore*, Applicant’s wild-card position-label on the lock “cannot be badly dismissed as an obvious matter of design choice,” because it plays critical role for improving the function of the lock. The “only one wild-card position-label and multiple alphabetical-letter position-labels” on each

tumbler ring is significant in that it solves a stated problem (i.e., on a prior art combination lock, such as Basche's lock, not all desired words can be chosen as the "password").

Under MPPEP 2144.04, "[i]f the applicant has demonstrated the criticality of a specific limitation, it would not be appropriate to rely solely on case law as the rationale to support an obviousness rejection" (See the last sentence in the first paragraph of MPPEP 2144.04). More specifically, if there is evidence that the particular configuration of the claimed device was significant, the Examiner should not rely on the "design choice" rationale of *In re Dailey* to support an obvious rejection (See, MPPEP 2144.04(IV) (B)). In claims 1-2, 4-9, and 15-18, the "only one wild-card position-label and multiple alphabetical-letter position-labels" on each tumbler ring plays a critical role and is significant; therefore, the Examiner's obviousness rejection based on *In re Dailey* should be withdrawn.

2) The Examiner's repetitive failure to appreciate (at least initially) the advantages in the Applicant's invention provides objective evidence that the Applicant's invention is not obvious.

In Reopened Office Action, despite the Examiner's pronouncement that that "the Examiner may appreciate and understand applicants claimed inventions" (See line 3 on page 7 of Reopened Office Action), other statements in Reopened Office Action strongly indicate that the Examiner still fails to appreciate the advantages of the lock as claimed.

If the Examiner indeed recognized that the Applicant's lock has solved a long standing problem, why would the Examiner take Applicant's statement out of context by arguing that Applicant admitted that "Gray is capable of making any password applicant device is capable of" (See lines 6-7 on page 7 of Reopened Office Action)? The Examiner apparently failed to understand that, as emphasized in the remaining part of the same sentence, Gray is capable of doing so "at the cost of including more letters than Applicant's lock, making it mechanically clumsy" (See page 7 of previous appeal brief on July 8, 2007). Furthermore, if Gray's lock has fewer than twenty-six positions on each tumbler ring, Gray is NOT capable of making any password.

Since it appears that the Examiner still fails to appreciate the advantages in the Applicant's invention, Applicant resubmits Applicant's argument in the previous appeal brief for the Board's review.

Applicant's argument in previous appeal brief filed on July 8, 2007

Applicant specifically claims a few designs (in which each tumbler ring has only one wild-card position-label and multiple alphabetical-letter position-labels) from countless possible designs, for the reason that this few designs can solve a problem for which others (such as Basche) have failed to find the solution; the problem is that when each tumbler ring has only ten tumbler positions (rather than twenty-six positions), not all English words can be used as the "password" for the lock. The Examiner not only failed to provide the reason why other people would select these claimed designs but also failed to appreciate Applicant's reason for selecting these claimed designs, at least initially, by repetitively arguing that the wild card position label plays no critical role (lines 18-20, page 4, the first office action; line 8, page 4, the final office action; lines 7-13, page 6, the final office action). When a wild card position label is used to represent any one of the twenty-six alphabetical letters, even for a lock with fewer than twenty-six positions, any desired word can still be selected as "password." Therefore, the wild-card position-label improves the usability of the lock and the function of the lock.

In response to Applicant's contention that "the wild card position label plays a very critical role in the usability of the lock and the function of the lock" (on page 10 of Applicant response to the first office action), the Examiner argued that "Gray is capable of making any 'password' that applicant's device is capable of making and more since Gray includes more letters than applicant's invention" (lines 8-10, page 6, the final office action). Yes, "Gray is capable of making any 'password' that applicant's device is capable of," but at the cost of including more letters than Applicant's lock, making it mechanically clumsy. Even with the cost of including more letters than Applicant's lock, Gray's lock is not capable of making more "password" than applicant's lock, as mistakenly believed by the Examiner. Any "password" on Gray's lock can be a "password" on Applicant's lock as well. **The Examiner apparently failed to appreciate**

the advantage that Applicant's lock is not only mechanically simpler than but also as versatile as Gray's lock in terms of "password" selection.

In addition, at lines 10-12 on page 6 of the final office action, the Examiner argued that "[i]t is well known that any keypad on a telephone has wild card labels as numbers representing letters." Mere establishing that a wild card can represent any letters is by itself insufficient to render Applicant's invention obvious. The Examiner still needs to provide the reason "why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed" (emphasis added), as required by the PTO's temporary examination guidelines after *KSR* (See the last paragraph in the Memorandum sent to Technology Center Directors on May 3, 2007 from Margaret A. Focarino, Deputy Commissioner for Patent Operations). Despite the Examiner's assertion that one element in the claims (i.e., a wild card) is well known, the Examiner still fails to appreciate the advantages of the lock on which, as in the manner claimed, "each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels." That is, the Examiner fails to see any reasons to design a lock as in the manner claimed.

3) The Examiner should have evaluated the advantages presented by Applicant, as required by *Graham*.

In the Advisory Action, at lines 9-12 on page 2, the Examiner finally acknowledged that Applicant's invention possesses some advantages and stated that:

In response to the argument that the examiner fails to appreciate the advantages of the invention, the examiner respectfully disagrees. The examiner appreciates applicant's presented advantage but applicant is reminded that only the claimed structural limitations of the device are patentable. The specification is not examined for novelty over the prior art, only the claim limitations.

Here, the Examiner refused to evaluate the advantages presented by Applicant. The Examiner repeated such refusal in Reopened Office Action.

To justify the Examiner's refusal to evaluate the advantages presented, the Examiner cited *In re Van Geuns* for the proposition that "advantages, from specification are not read into the claims" (See lines 11-12 on page 7 of Reopened Office Action). It appears that the Examiner believed that the advantages not expressly cited in the claims

(i.e., “advantages ...not read into the claims”) need not be evaluated. Applicant respectfully submits that the Examiner made at least two mistakes.

First, *In re Van Geuns* merely stands for the proposition that “limitations are not to be read into claims from specification.” *In re Van Geuns*, 988 F.2d 1181, 1184, 26 USPQ 1057 (Fed. Cir. 1993). The Examiner **should not mischaracterize** *In re Van Geuns* as standing for “advantages, from specification are not read into the claims.”

Second, the examiner failed to distinguish between “advantages possessed by limitations that are not cited in claims” and “advantages possessed by limitations that are already cited in claims.” With respect to limitations that are already cited in the claims, if certain advantages have already been possessed by these limitations cited in the claims, Applicant is not aware of any authority that justifies Examiner’s refusal to evaluate these advantages even if these advantages themselves are not expressly cited in the claims. On the contrary, in compliance with the principle of *Graham v. John Deer Co.* and the precedent of the Federal Circuit, the Examiner must evaluate these advantages. As stated by the Federal Circuit:

Factors including unexpected results, new features, solution of a different problem, novel properties, are all considerations in the determination of obviousness...When such factors are described in the specification they are weighted in determining ...whether the prior art presents the prima facie case of obviousness. (Emphasis added by Applicant).

In re Wright, 848 F.2d 1216, 1219, 6 USPQ 2d 1959, 1962 (Fed. Cir. 1988). Therefore, Applicant submits that the Examiner should have evaluated the advantages possessed by the lock as claimed, which are advantages possessed by the limitations that are already cited in the claims.

4) The Examiner is required to give “patentable weight” to “the wild card position-label” as cited in the claims.

In Reopened Office Action, at lines 15-16 on page 7, the Examiner argued that “The wild-card position label is printed matter. Printed matter does not distinguish the invention from the prior art in terms of patentability.” The Examiner further argued that “the label is not the patentably distinct matter” (See line 19 on page 7 of Reopened Office Action). Applicant respectfully submits that the claims in the instant case are not directed

merely to “the wild-card position label”. Rather, the claims are directed to a combination of “the wild-card position-label” with additional elements, such as, the tumbler rings and multiple alphabetical-letter position-labels. To quote what Judge Rich said in a very similar case:

[the Examiner’s] characterization of printed matter as ‘unpatentable’ is beside the point; no attempt is here being made to patent printed matter as such. The fact that printed matter by itself is not patentable subject matter, because non-statutory, is no reason for ignoring it when the claim is directed to a combination.

Application of Paul J. Miller, 57 C.C.P.A. 809, 418 F.2d 1392, 1396, 164 U.S.P.Q. 46.

In the instant case, the Examiner made similar mistakes as another examiner had made in *Paul J. Miller*. In that case, the examiner rejected the inventor’s claim directed to a measuring receptacle having volumetric labels by improperly focusing on the patentability of the volumetric labels. In that case, the examiner argued that the only difference between the inventor’s measuring receptacle and an “ordinary measuring vessel” is the volumetric labels. Judge Rich held that the inventor’s measuring receptacle is not obvious under §103. *Paul J. Miller*, at 1396. The patent application in *Paul J. Miller* was issued as U.S. patent No. 3,530,722.

Just like the measuring receptacle in *Paul J. Miller*, the combination lock in the instant case should also be deemed as unobvious under §103. In *Paul J. Miller*, the inventor’s volumetric labels, “if taken literally and by themselves, are false.” *Paul J. Miller*, at 1394. That is, the volumetric label is literally a “false label”. In the instant application, the inventor’s “the wild-card position-label” is also literally a “false label,” because when the “*” is chosen as a wild card position-label, literally it means a star, but in the instant application it represents any one of the twenty-six English alphabetical-letters (e.g., letter “Y”). In *Paul J. Miller*, the measuring receptacle is unobvious, because “[t]he disclosed invention has for its purpose the solving of the domestic culinary problem of measuring the ingredients from a cookbook recipe in something other than the full recipe.” *Paul J. Miller*, at 1393. In the instant application, the combination lock is unobvious, because the disclosed invention has for its purpose the solving of a **long-standing problem of selecting any desired word as the “password” for the lock when each tumbler ring has less than twenty six positions.**

If Judge Rich, who is considered by many as one of the most respected judge for patent related issues, has held that the measuring receptacle in *Paul J. Miller* is unobvious and can be protected in an issued U.S. patent, the combination lock in the instant case should also be unobvious.

5) Claims 1-2, 4-9, and 15-18 are not obvious for the additional reason that there is objective evidence of secondary consideration to support the invention is unobvious.

In previous response to office actions, Applicant listed some objective evidence of secondary considerations and provided some arguments related to secondary considerations.

In Reopened Office Action, at line 2 on Page 8, the Examiner refused to evaluate Applicant's evidence of secondary considerations. The Examiner justified such refusal by arguing that "there is no 'evidence' on the record." Applicant respectfully disagrees.

First, U.S. Patent No. 6,621,405 ("Basche") provides objective evidence for at least three *Graham* factors, such as, "Long-felt need," "Failure by others," and "Teach-away by others," as related to locks having tumbler rings with less than twenty-six positions. At least, Basche demonstrates there is a long-felt need for a combination lock on which large number of words need be used as the "password." Basche failed to provide a combination lock on which any desired word can be used as the "password." Basche also teaches away Applicant's solution.

Second, the Examiner's own statement during prosecution provided the objective evidence that Applicant's lock possesses "unrecognized or unappreciated advantages."

In the following, Applicant resubmits the arguments and evidence related to secondary considerations which has already been presented in the previous appeal brief.

Applicant's argument in previous appeal brief filed on July 8, 2007

To facilitate the Board's review, Applicant lists some arguments and objective evidence of secondary considerations in the following:

(a) Long-felt need

VIII CLAIMS APPENDIX

The claims involved in this Appeal are listed.

Listing of Claims:

1(previously amended). A briefcase comprising a combination lock, wherein the combination lock comprises:

a group of at least three tumbler rings, each tumbler ring operable to rotate and to settle at one of multiple predetermined positions and having multiple position-labels thereon each corresponding to one of the multiple predetermined positions, and wherein each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter, and the wild-card position-label is different from any one of the twenty-six English alphabetical-letters and is configured for representing any one of the twenty-six English alphabetical-letters.

2 (original). The briefcase of claim 1, wherein the group of at least three tumbler rings is configured to rotate around an axis.

3(cancelled).

4(original). The briefcase of claim 1, wherein a wild-card position-label includes a star position-label (“*”).

Claim 18 is rejected as obvious over Gray and Fiegenger without the use of the Remington reference.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

0,002,261	Gray	9-1841
4395892	Remington	8-1983
2006/0169007	Fiegenger	8-2006
6621405	Basche	9-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

- Claims 1-2, 4-9 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray (US 2,261) in view of Remington (US 4,395,892) and further in view of Fiegenger (US 2006/0169007).**
- Regarding claims 1 and 15-16, Gray shows a combination lock comprising a group of a group of at least three tumbler rings (1-8), each tumbler ring operable to rotate and to settle at one of multiple predetermined positions and having multiple position-labels thereon each corresponding to one of the multiple predetermined positions (lines 50-51), and wherein each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter. The Examiner would like to note that any of the twenty-six letters on

Art Unit: 3673

each of the Gray tumblers could represent the "wild card position label". The wild card position label is considered printed matter. Printed matter does not distinguish the invention from the prior art in terms of patentability. Printed matter is only given patentable weight when a functional relationship exists between the printed matter and the substrate to which it is attached. In this case, as the examiner understands it, the label is not the patentably distinct matter, the function and alignment of the tumbler wheels appears to be what applicant believes patentably distinct. The examiner suggests adding limitations directed at the substrate, the tumbler wheels, and their alignment in the various positions of the combination lock.

3. Gray fails to show the device being used in combination with a briefcase. Remington shows that a combination lock in combination with a briefcase is old in the combination lock art. It would have been obvious to one of ordinary skill in the art to combine the Gray combination lock, with a briefcase as shown by Remington in order to increase security against unwanted access to the inside of the case. Gray fails to show a wild-card position label different from any one for the twenty-six English alphabetical letters. Fiegenger shows that it is well known in the art that a "label" can be any symbol, letter, number or color that is distinguishable from another (see paragraph [0041]) and considered a mere design choice. See the Gray and Remington devices below.

algorithm and generated lists to create passwords for combination locks (see columns 3-4; lines 60-66, 1-10 and steps following line 10). It would have been obvious to one of ordinary skill in the art to computer generate the selection of password using design algorithms in order to provide a lock with numerous password options (see column 3, lines 20-22).

(10) Response to Argument

1. Applicant argues the examiner has failed to establish a prima facie case of obviousness for claims 1-2, 4-9 and 15-18 on the ground that Applicant's lock is a matter of design choice. The examiner would like to note that the rejection states that the "wild-card label" is a matter of design choice, not the lock. The examiner provides support from Fiegenger (paragraph [0041]), showing that it is well known in the art that a "label" can be any symbol, letter, number or color that is distinguishable from another. The label can be changed to any design (symbol, letter, number, color, etc) and will not affect the function of the device since the label is considered printed matter.
2. Applicant argues the wild-card position label plays a critical role for improving the function of the lock. The examiner contends that the claims merely require each tumbler ring to have a wild card position label and do not include any limitations directed at the function of the wild card position label in relation to the alignment of the tumbler wheels or function of the combination lock. The wild card position label is considered printed matter. Printed matter does not distinguish the invention from the prior art in terms of patentability. Printed matter is only given patentable weight when a functional relationship exists between the printed matter and the substrate to which it is attached.

Art Unit: 3673

In this case, no functional relationship is claimed between the printed matter (wild card label) and the substrate or element (tumbler wheels or lock) to which it is attached.

MPEP 2112.01 (III)

3. Applicant argues "the examiner fails to appreciate (at least initially) the advantages of Applicant's invention". Applicant emphasizes this argument by stating the Gray device is capable of making the passwords made by applicant's device but would do so at "the cost of including more letter than Applicant's lock, making it mechanically clumsy". The examiner again would like to point out that the prior art teaches Applicant's CLAIMED limitations. Statements arguing cost and mechanical soundness of Gray versus Applicant's invention are considered mere opinion statements since there is no evidence on record to support such statements. Since the prior art includes the claimed structure, it reads on the claims regardless of cost.

4. Applicant argues that the advantages of Applicant's invention are not considered and are possessed by the limitations cited in the claims. The advantages that Applicant is referring to are unclear. If Applicant intended to argue the cost advantage, the examiner would again like to emphasize that the cost is not claimed, nor is cost advantage a considerable argument without evidence to support such arguments. If Applicant intended to argue that each tumbler ring only has 10 tumbler positions rather than 26 positions, the examiner points out that the claims use open language, including "comprising". Therefor a combination lock comprising multiple alphabetical-letter-position-labels can include any number of position labels.

This advantage has hitherto not been evaluated by the Examiner under *Graham*.

IV. ARGUMENTS IN RESPONSE TO EXAMINER'S ANSWER

A. The Examiner did not establish prima facie case of obvious regarding Appellant's claims.

1) The Examiner erred in arguing that Appellant's "wild card position-label" label is a matter of design choice.

The Examiner insisted that the "wild-card label" is a matter of design choice (see Examiner's Answer, at line 10 on page 7). Under *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966), Appellant's wild-card position-label is not a matter of design choice, because the wild-card position-label in Appellant's lock plays critical role for improving the function of the lock. Here, Examiner made the same mistake that another examiner had made in *Ex Parte Moore*, 1996 WL 1796237 (Bd. Pat. App & Interf.).

Appellant's more detailed argument can be found on pages 5-8 of Appeal Brief.

2) Just like the measuring receptacle in *Paul J. Miller*, the combination lock in the instant case should also be deemed unobvious under §103.

On page 11 of Appeal Brief, Appellant requested the Examiner to give "patentable weight" to "the wild card position-label" by citing *application of Paul J. Miller*, a precedent of the Federal Circuit regarding "printed matter." Appellant respectively submits that, unless Appellant's lock in the instant case can be distinguished from the measuring receptacle in *Paul J. Miller* for the purpose of determining unobviousness, Appellant's lock should be deemed unobvious.

Appellant's more detailed argument can be found on pages 11-13 of Appeal Brief.

3) The Examiner is required to give "patentable weight" to the "the wild card position-label" as cited in the claims.

In justifying the Examiner refusal to give “patentable weight” to the “the wild card position-label” as cited in the claims, the Examiner cited MPEP 2112.01 (III) and insisted that “no functional relationship is claimed between the printed matter (wild card label) and the substrate or element (tumbler wheel or lock) to which it is attached” (see Examiner’s Answer, at lines 1-2 on page 8). Appellant respectfully disagrees, because the Examiner’s such argument is contrary to the holding of *In re Gulack*, 703 F.2d 1381 (Fed. Cir. 1983), a precedent of the Federal Circuit which is mentioned in MPEP 2112.01 (III).

In *Gulack*, the claim of the invention is directed to a circular band having thereon printed digits. In that case, the PTO has refused to give the printed matter patentable weight for the reason that there is no functional relationship between the printed matter and the substrate. See *id.* at 1384. The court disagrees and finds that “the digits of Gulack’s invention are functionally related to the band.” *Id.* at 1385. In another “printed matter” related case, *In re Ngai*, 367 F.3d 1336 (Fed. Cir. 2004), the court also reasoned that in *Gulack* “the printed matter [printed digits] and the circularity of the band were interrelated, so as to produce a new product useful for ‘educational and recreational mathematical’ purposes.” *Id.* at 1339. “The printed matter would not achieve its educational purposes without the band, and the band without the printed matter would similarly be unable to produce the desired result.” *Id.* at 1339.

In the instant case, Appellant’s lock includes tumbler rings each has thereon only one “wild-card position-label.” The printed matter (“wild-card position-label”) of Appellant’s lock is also functionally related to the tumbler ring, so as to produce a new product useful for at least the purpose of solving a long standing problem. The printed matter would not achieve its “problem-solving” purposes without “the tumbler ring”, and “the tumbler ring” without the printed matter would similarly be unable to produce the desired result.

Therefore, if the Examiner is unable to distinguish between the device in *Gulack* and the combination lock in the instant case, the Examiner would be required to give “patentable weight” to the “wild-card position-label” as cited in the claims.

4) The Examiner erred in arguing that “the prior art teaches Appellant’s claimed limitations.”

The Examiner insisted that the prior art teaches Appellant’s claimed limitations (see Examiner’s Answer, at lines 8-9 on page 8, and at lines 5-6 page 9). Appellant respectively disagrees.

The Examiner insisted that that “Gray shows ... each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels each being a single English alphabetical-letter” (see Examiner’s Answer, at lines 16-22 on page 3). That is incorrect. In Gray’s invention of more than 160 years ago, Gray did not explicitly teach or implicitly suggest the concept of “wild-card”, not to mention that “each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels”.

Gray’s lock was invented in the year of 1841. Gray had never expressly used the word “wild-card.” Grey also had never implicitly suggested the concept of “wild-card.” In Gray, each letter is used for its literal meaning (i.e., for example, letter “A” means “A”, letter “B” means “B”, etc.). The Examiner contended that “any of the twenty-six letters on each of the Gray tumblers could represent the ‘wild card position label’” (see Examiner’s Answer, at line 22 on page 3 and at line 1 on page 4). The Examiner’s contention is based on hindsight reasoning, because Gray did not provide any motivation to use any letter to represent other letters. Absent such motivation, Gray has not implicitly suggested “wild-card position-label.” Absent such motivation, Grey could not have possibly suggested “each tumble ring has thereon only one wild-card position-label and multiple alphabetical-letter position labels.”

Further more, none of the references cited by the Examiner, either alone or in combination with other references, has taught or suggested “each tumbler ring has thereon only one wild-card position-label and multiple alphabetical-letter position-labels.” None of the references provided the reason **why one would change each and every tumbler ring in such a way that only one wild-card position-label is combined with multiple alphabetical-letter position-labels**. As argued by Appellant previously, “absence of any reasons or design goals, people could put any number of non-English-letter symbols on each tumbler ring.”

The references cited by the Examiner has not taught or suggested “each tumble ring has thereon only one wild-card position-label and multiple alphabetical-letter position labels each being a single English alphabetical-letter” as cited in the claims².

Appellant’s more detailed argument can be found on pages 5-6 and page 10 of Appeal Brief.

B. Appellant’s claims are not obvious for the additional reason that there is objective evidence of secondary consideration to support the invention is unobvious

Appellant would like to point out that the Examiner has not yet established prima facie case of obviousness, and the burden has not even shifted to Appellant to present objective evidence of secondary consideration. Nonetheless, Appellant submits that, in the event that the Examiner is able to establish prima facie case of obviousness, there is still objective evidence of secondary consideration to support that the invention is unobvious. Appellant’s more detailed argument can be found on pages 13-14 of Appeal Brief.

In Examiner’s Answer, the Examiner disagrees with Appellant that Basche essentially teaches away Appellant’s invention. The Examiner believed that “Basche is used properly to teach the use of design algorithms to create passwords for combination locks” (see Examiner’s Answer, at lines 17-18 on page 9). Appellant respectfully disagrees.

In *Basche*, mathematical algorithms are applied to a supplied word list to select letters for using on a combination lock. Basche’s combination lock can then be set by the user into any of the hundreds or thousands of words contained in the supplied word list (albeit not all desired words) (see “Basche”, column 3, lines 16-21).

Basche essentially teaches away Appellant’s invention, because upon reading *Basche*, people may be encouraged to use other mathematical algorithms method to select

² The Examiner still needs to provide the reason “why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed”, as required by the PTO’s temporary examination guidelines after *KSR* (see Appeal Brief, at lines 6-9 on page 10).

letters for using on a combination lock. With Appellant's method, once a "wild-card position-label" is selected for each tumbler ring, the remaining multiple alphabetical-letters on each tumbler ring can be selected randomly (i.e., without using any mathematical algorithms) or with certain design algorithm. In addition, upon reading *Basche*, people may be encouraged to find words contained in a supplied word list. With Appellant's method, the multiple alphabetical-letters on each tumbler ring can be selected either with or without the aid of a supplied word list.

C. The Examiner's should not make unwarranted interpretation of the procedure requirement under *Graham*.

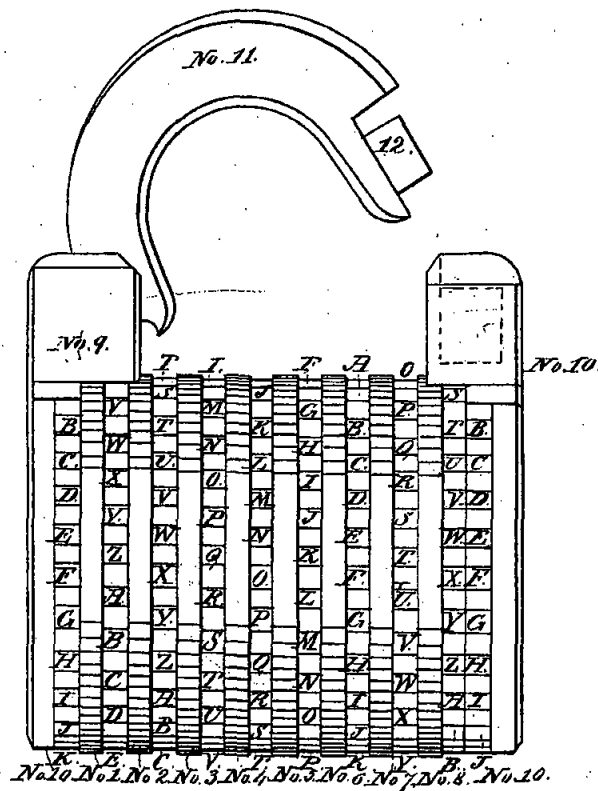
The Examiner repetitively refused to evaluate advantages as presented by Appellant. In Advisory Action of May 3, 2007, at lines 11-12 on page 2, for justifying the Examiner's refusal to evaluate the advantages as presented by Appellant, the Examiner asserted that "the specification is not examined for novelty over the prior art, only the claim limitations." In Reopened Office Action of October 10, 2007 (hereafter "Reopened Office Action"), at lines 11-12 on page 7, the Examiner mischaracterized *In re Van Geuns* as standing for the proposition that "advantages, from specification are not read into the claims." Appellant respectively submits that the Examiner's such interpretation of the procedure requirement is unwarranted. Appellant's detailed argument can be found on pages 10-11 of Appeal Brief.

The Examiner repetitively contended that "[t]here is no affidavit, declaration, or other objective evidence on record to consider" (see Examiner's Answer, at lines 9-10 on page 9, and Reopened Office Action, at lines 1-5 on page 8). The Examiner refuses to treat *Basche* as objective evidence on record despite Appellant previously submitted that U. S. Patent No. 6,621,405 ("*Basche*") provided objective evidence of secondary consideration (see Appeal Brief, page 13). Appellant respectively submits that, under 37 CFR 10.150(c), "[o]fficial documents, records, and papers of the Office are admissible without extrinsic evidence of authenticity." Therefore, Appellant's admissible evidence should include at least *Basche*.

J. B. Gray,

Permutation Padlock.

No. 2,261. Patented Sep. 18, 1841.



UNITED STATES PATENT OFFICE.

J. B. GRAY, OF FREDERICKSBURG, VIRGINIA.

PERMUTATION OR COMBINATION LOCK.

Specification of Letters Patent No. 2,261, dated September 18, 1841.

To all whom it may concern:

Be it known that I, J. B. GRAY, of Fredericksburg, in the county of Spottsylvania and State of Virginia, have made an improvement in the combination or permutation lock, which is opened and closed by the revolving of a series of rings that are connected together, so as to constitute a cylindrical body, and upon each of which there are numbers, or letters, by the arrangement of which in a determined order the opening is effected without the use of a key.

Locks of this description are too well known to render a particular description of them necessary, and in my improvement upon them I have not made any change in their internal structure; but I have so arranged the letters, or figures, and spaces upon the exterior of said lock as to increase the security against its being opened, without the necessity of rendering it more complex by increasing the number of parts of which it consists.

In the accompanying drawing, I have given a representation of such a lock, consisting of two circular end plates, and of eight revolving rings embraced between said plates. The number of revolving rings may be varied to any extent that may be deemed convenient; and the number of letters and of spaces upon each ring will also admit of a like variation; but the general principle will be best understood by a specific example, with which view I have chosen that which I am about to describe. No. 9, in the drawing is the circular end plate which has the shackle No. 11, attached to it; and No. 10, that which receives the locking stud 12, of the hasp, when the lock is closed; the revolving rings are numbered from 1 to 8. In locks of this kind as heretofore made, there is a mark, or notch, upon each disk, which are made the starting and terminating points in arranging the numbers, or letters, upon the revolving rings; in my lock, I divide the periphery of each of these end plates into a number of spaces, or divisions, corresponding in size with those on the revolving rings; and in the example shown each of these revolving rings has an alphabet of twenty-six letters upon it, and a space, or division, between each letter equal to that occupied by the letter, and there are, of course, fifty-two such divisions, the letters occupying each alternate division. On the peripheries of

the end plates, in the example shown, there are twenty two letters, and twenty-two blank spaces, making forty four divisions; the portion of the circle occupied by the shackle, and by the projection to receive it on the opposite end plate, taking the place of eight divisions. Either of the letters, or spaces upon the end piece No. 9 may be made a starting point at pleasure, and the corresponding letter, or space, on No. 10, the terminus; and a person attempting to open the lock would have, therefore, forty three chances to one against him in the very first step taken by him.

In the revolving rings, each has fifty-two divisions in the example given; and in constructing the rings I make the blank spaces on one portion of them to coincide with the notches on their interior; and the letters on the other portion to coincide with said notches; and as the places of these rings may be changed at pleasure, and as there is not anything on their exterior to indicate whether a letter or a blank space is to constitute a part of the line of direction which must be attained in order to open the lock, the difficulty of doing so is enhanced to an almost inconceivable extent.

Having thus fully described the nature of my improvement in the within described combination, or permutation lock, what I claim therein as new and desire to secure by Letters Patent, is—

1. The dividing of the end plates of said lock on their peripheries, into a considerable number of equal parts, coinciding in size with the divisions on the revolving rings, either of which divisions, whether designated by letters, figures, or blank spaces, may be made the starting point in setting the revolving rings.

2. And I likewise claim, in combination with the foregoing, the so constructing the revolving rings as that one portion of them shall require to be set by the spaces intermediate between the letters, figures, or other marks thereon, so as greatly to enhance the difficulty of opening the lock, from the manner of constructing it, substantially as set forth.

J. B. GRAY.

Witnesses:

THOS. P. JONES,
G. W. BASSETT.

[54] **HARDWARE ASSEMBLY FOR LUGGAGE AND THE LIKE**

[75] Inventor: **Richard C. Remington**, Pompton Plains, N.J.

[73] Assignee: **Presto Lock, Inc.**, Garfield, N.J.

[21] Appl. No.: **224,036**

[22] Filed: **Jan. 12, 1981**

[51] Int. Cl.³ **E05B 37/02; E05B 65/52; A45C 13/10**

[52] U.S. Cl. **70/312; 70/69; 70/319; 292/38; 292/141; 292/171; 190/28**

[58] Field of Search **70/312, 298, 327, 69, 70/70, 71, 304, 67, 315, 316, 317, 319; 292/38, 141, 169, 171; 190/28; 150/1.6**

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[57] **ABSTRACT**

A hardware assembly, which is readily adaptable to luggage cases of widely varying constructions, dimensions and configurations, includes a housing which may be positioned within cut-outs in adjacent edges of the side walls of the luggage case, and be mounted on the exterior of one side wall. The housing contains slideable latches for engaging associated hasps mounted on the exterior of the other side wall, and a flexible member connecting the latches to a slideable actuator mounted on the housing for opening the case. The coupling between the latches and the flexible member allows the latches to move to unlatching position independently of the actuator to facilitate closing and latching of the case when the parts are brought together. The actuator is U-shaped and supported for transverse movement on the housing by a rocker located within the housing. A combination lock, which may have its combination changed by a push button projecting through the top of the housing, may be included for preventing movement of the actuator necessary to open the case.

48 Claims, 12 Drawing Figures

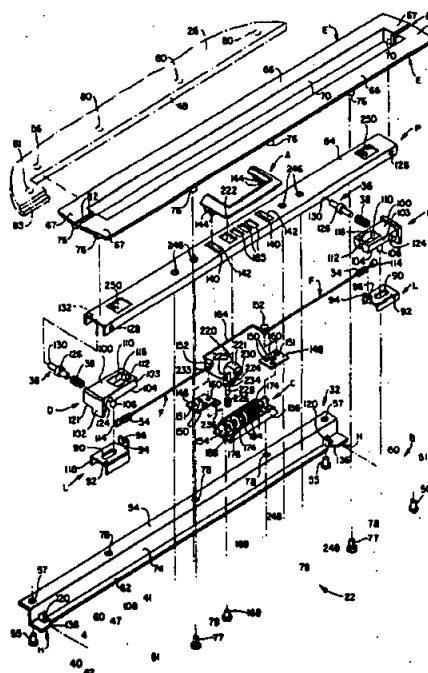


FIG. 1.

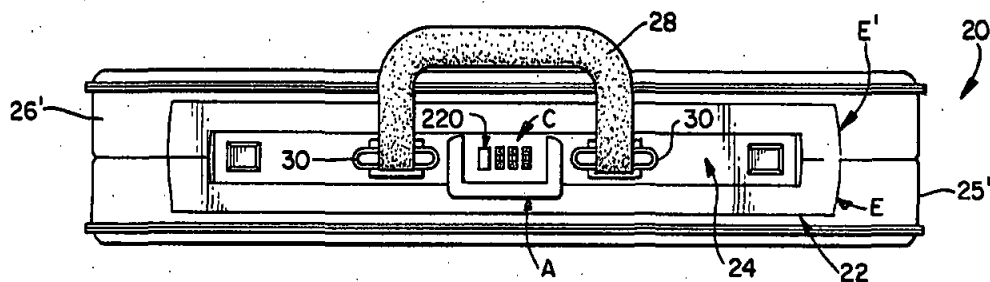


FIG. 3.

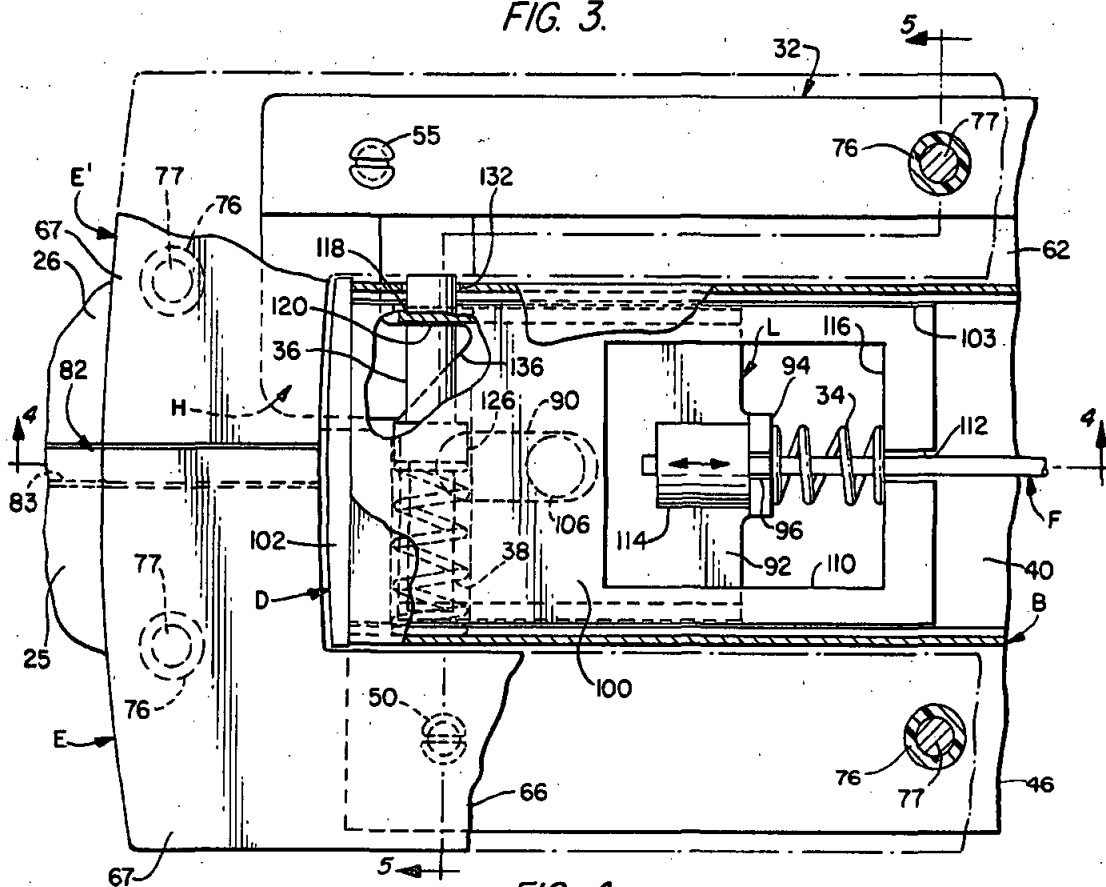
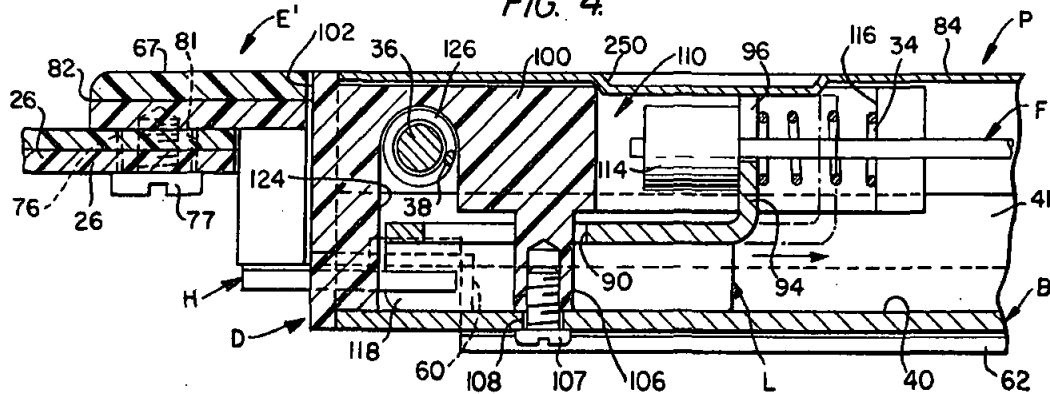


FIG. 4.



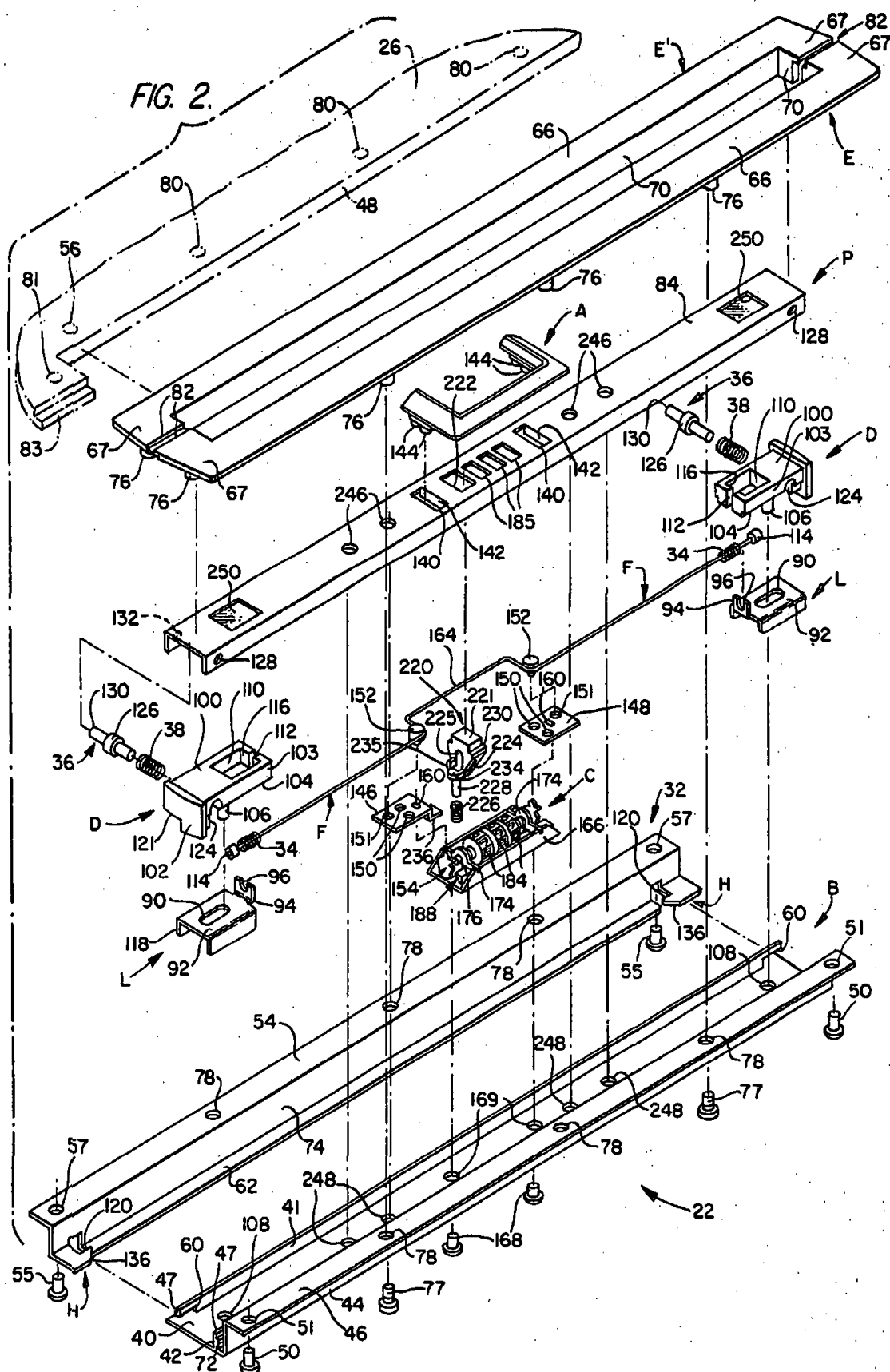


FIG. 5.

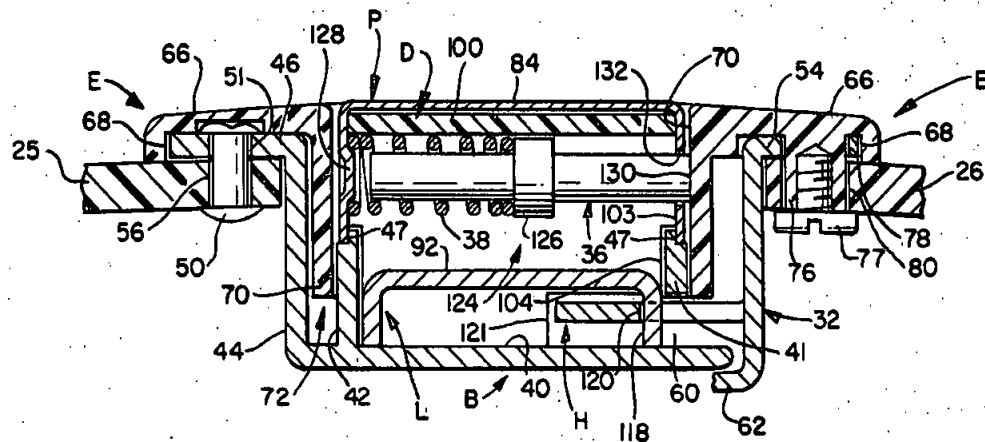


FIG. 6.

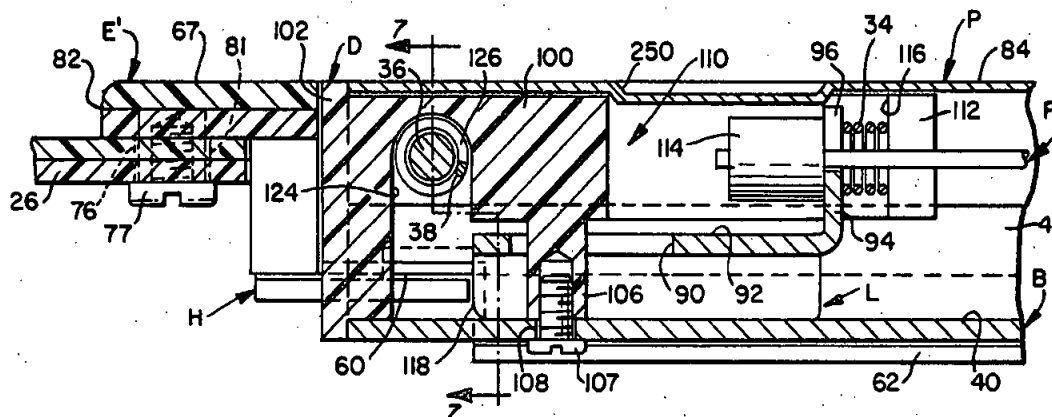


FIG. 7.

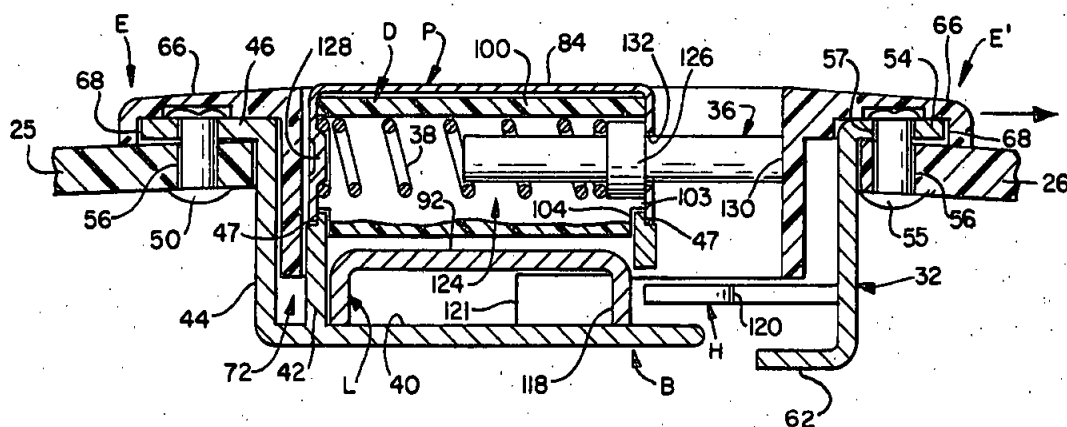


FIG. 8.

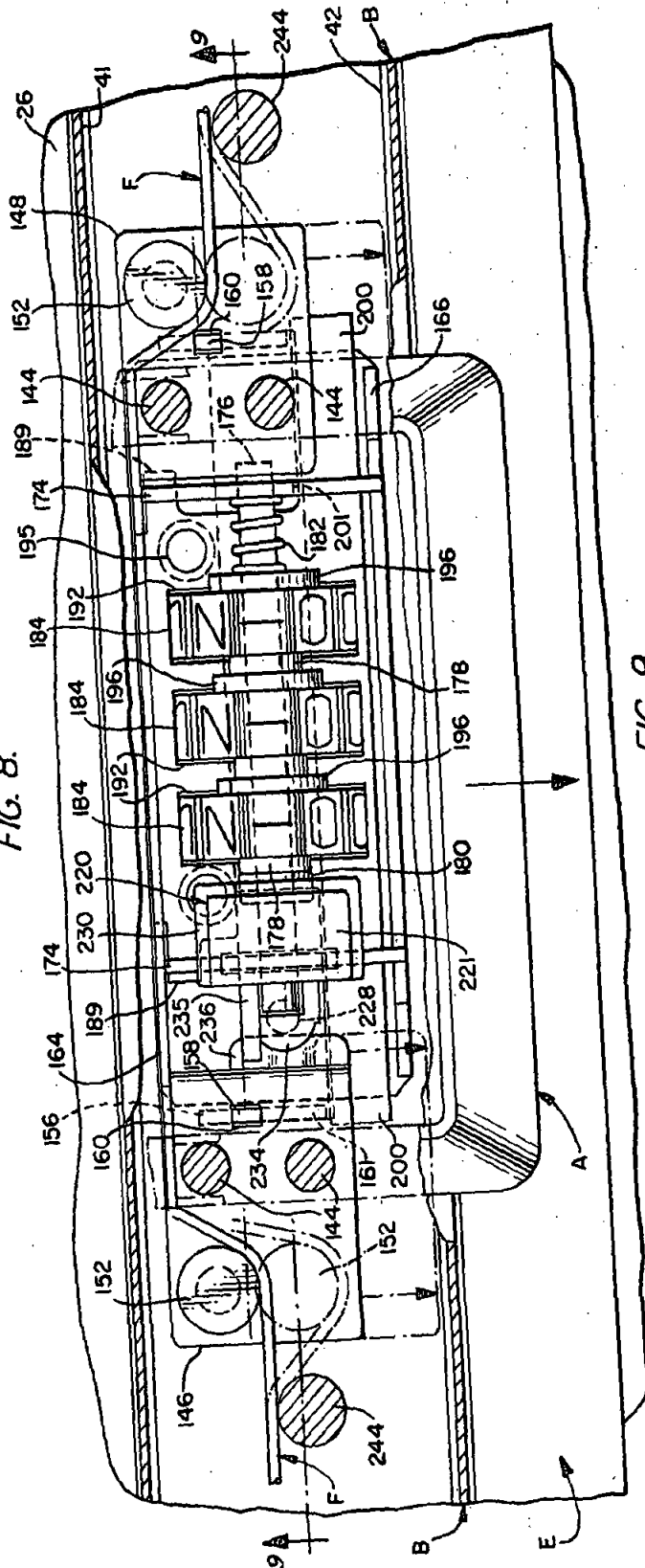


FIG. 9.

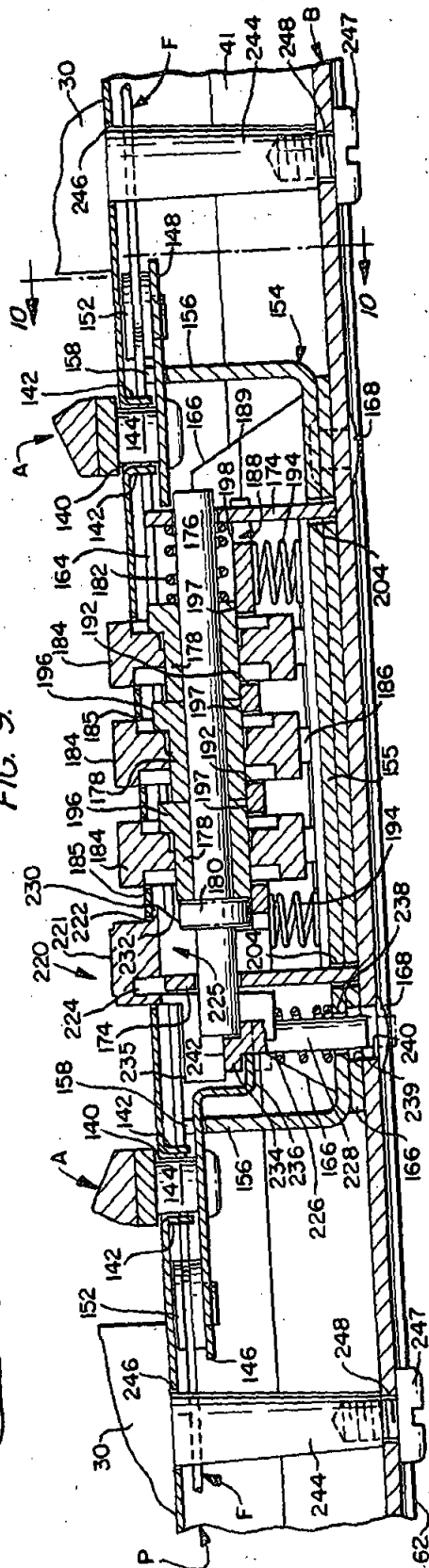


FIG. 10.

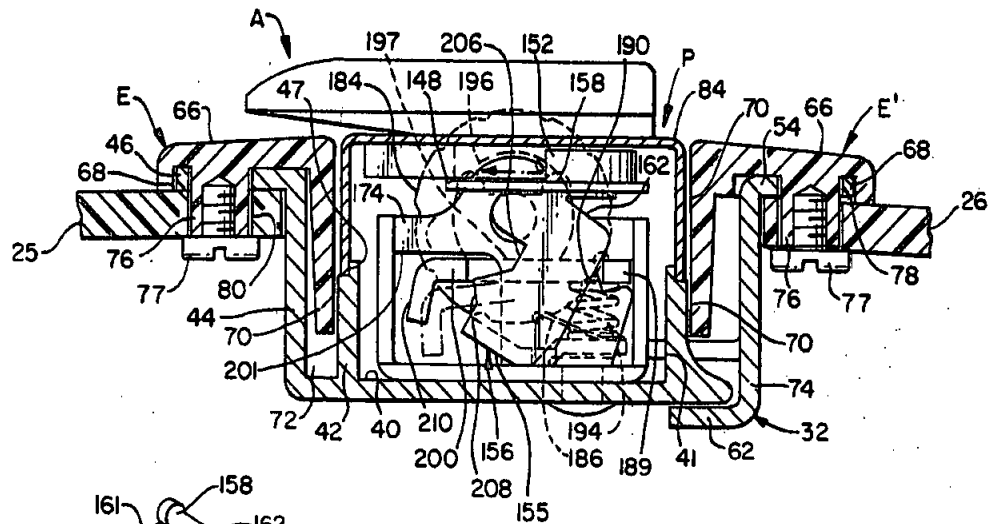


FIG. 11.

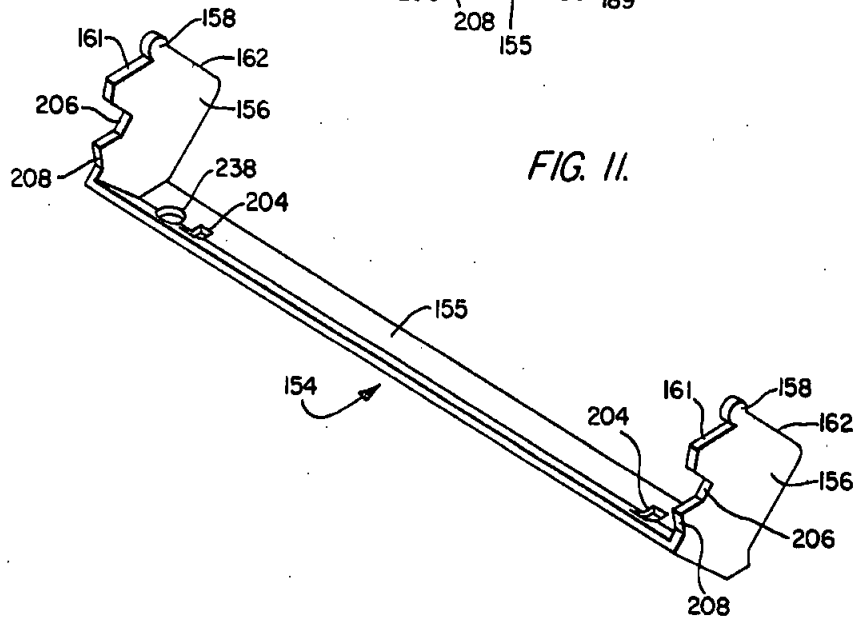
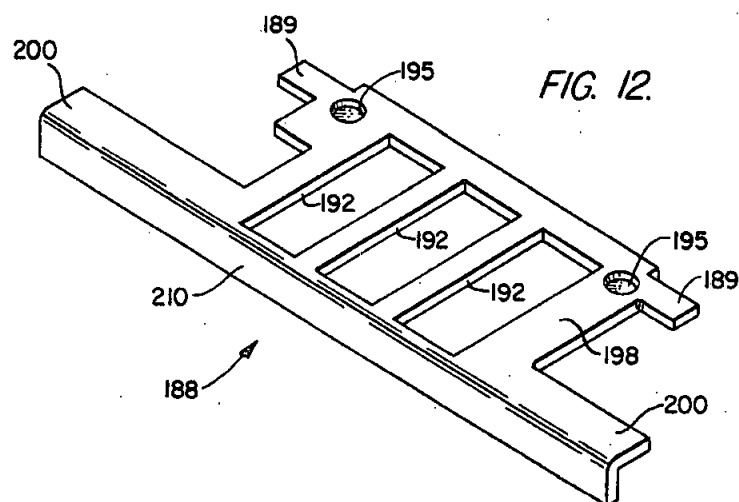


FIG. 12.



HARDWARE ASSEMBLY FOR LUGGAGE AND THE LIKE

BACKGROUND OF THE INVENTION

This invention relates generally to hardware assemblies for luggage and the like such as consoles having spaced latches operated by one or more actuators which may be controlled by a combination lock.

Because of the large variety of luggage case constructions, manufacturers of luggage hardware have faced continual problems in providing hardware which can be used readily on a number of different types of cases. These problems are particularly acute with respect to hardware assemblies such as consoles in which spaced latches are operatively interconnected by a control mechanism to an actuator and/or to a combination lock. Such assemblies generally require that rather close tolerances be maintained between the various elements of the assembly in order to ensure proper operation. Since the actuator and combination lock are usually mounted on the exterior surface of a luggage case, whereas the control mechanism and latches are mounted on the interior of the case, such consoles generally must be specifically tailored to the particular type of case on which they are used, and are not readily adaptable to different types of luggage cases. Even the normal dimensional variations in side wall thickness between individual cases of a particular type can lead to mounting difficulties or contribute to poor or improper operation. Previous attempts to avoid such problems by providing the hardware assembly as part of a valance member which is attached to an edge of the case have been only partially successful in overcoming the problem of adaptability, since the problem is merely transferred to the valance designer.

In addition to considering side wall thickness, other factors which must be considered in designing a hardware assembly which is adaptable to different types of luggage cases include case configurations or shapes and valance constructions. For example, many hardware assemblies employ rigid control members for connecting the latches to an actuator and/or to a combination lock. If the hardware assembly is mounted on a case having a curved side wall, there may be a tendency for the control members to bind. Valance construction must be considered insofar as it affects case thickness, placement of the hardware assembly, and the dimensions of the hasps on the lid of the case which must cooperate with the latches to hold the case closed.

SUMMARY OF THE INVENTION

The invention provides improved hardware assemblies which overcome the above-mentioned and many other disadvantages of known hardware assemblies. The hardware assemblies of the invention are readily adaptable to luggage cases of widely varying constructions, dimensions, and configurations. For example, side wall thickness of the case may vary from as little as one-eighth inch, as for a molded plastic shell or a metal case, to as much as one-half inch or more, as for a wooden case. The hardware assemblies of the invention are easily adaptable to cases of different lengths, to cases having flat or curved side walls and to valanced or non-valanced cases. The hardware assemblies have a relatively simple construction, employ only a few parts, and are easily assembled.

Briefly, in accordance with one aspect a hardware assembly in accordance with the invention includes an elongated housing which is adapted to be mounted on the exterior of a side wall of a first part of the luggage case and to be positioned within an elongated cut-out in the edge of the first part, the housing having a portion which projects beyond the edge toward a second part of the case and which is adapted to be received in another elongated cut-out in an adjacent edge of the second part when the parts are brought together to close the case. Movable latch means is mounted within the housing and is cooperable with associated hasp means mounted on the exterior side wall of the second part of the case along the adjacent edge for holding the case closed when the parts are brought together. Actuator means is mounted on the housing for controlling the movement of the latch means.

In accordance with another aspect, a hardware assembly in accordance with the invention comprises a pair of sliding latches adapted to be mounted on a first part of a luggage case adjacent to an edge of the case for sliding movement parallel to the edge. The latches are cooperable with associated hasps on a second part of the case for holding the case closed when the parts are brought together. Also included are means for biasing the latches to latching position and a slideable actuator adapted to be mounted on the first part of the case, the actuator being slideable between a rest position and an open position in a plane parallel to a plane containing the latches and in a direction transverse to the direction of movement of the latches. Connecting means extend between the latches and the actuator for moving the latches to unlatching position when the actuator moves to open position. The connecting means is coupled to the latches in such a manner that the latches can move to unlatching position independently of the movement of the actuator to open position when the parts are brought together to close the case.

In accordance with yet another aspect of the invention, an end cap is provided for closing an open end of an elongated housing of a hardware assembly, the housing being adapted to be mounted on a first part of a luggage case and to be positioned within an elongated cut-out in the edge of the first part, a portion of the housing projecting beyond the edge toward a second part of the case and adapted to be received in another elongated cut-out in the edge of the second part when the parts are brought together, the housing including a latch cooperable with a hasp on the second part to hold the parts together when the case is closed. The end cap comprises a first portion shaped to fit within the open end of the housing and a curved portion projecting slightly beyond the open end which is shaped to cooperate with the elongated cut-out in the edge of the second part to cam the parts into alignment when they are brought together to close the case.

In accordance with still a further aspect, the invention provides a combination lock adapted for use in a hardware assembly. The lock comprises a frame, a longitudinally extending shaft supported on the frame, a plurality of sleeves rotatably supported on the shaft, each sleeve being coupled to an associated dial for rotation therewith, bolt means pivotally supported on the frame for rotation between locked and unlocked positions, the bolt means being cooperable with the sleeves and capable of moving to unlocked position only when the sleeves have a predetermined orientation, a rocker supported on the frame for rotation between first and

second positions, and an actuator coupled to the rocker. The actuator is movable between a rest position and an open position and the rocker is movable with the actuator such that when the actuator is in the rest position the rocker is in the first position and when the actuator is in the open position, the rocker is in the second position. The bolt means and the roller have cooperable blocking means for preventing movement of the rocker from the first position except when the bolt means is in the unlocked position.

In accordance with another aspect, the invention provides a combination lock adapted for use in a hardware assembly. The combination lock comprises a frame, a longitudinally extending shaft supported on the frame, a plurality of sleeves rotatably supported on the shaft, each sleeve being releasably coupled to an associated dial for rotation therewith, a movable actuator, and combination changing means for moving the sleeves relative to the dials to uncouple the sleeves and the dials to enable the combination to be changed. The actuator includes means for preventing operation of the combination changing means except when the actuator is moved from a rest position to an open position.

In accordance with still another aspect, a hardware assembly in accordance with the invention comprises a latching assembly which is adapted to be mounted on a first part of a luggage case within an elongated cut-out in an edge of the first part with a portion of the latching assembly projecting beyond the edge toward a second part of the case. The projecting portion is adapted to be received in another elongated cut-out in an adjacent edge of the second part when the parts are brought together to close the case. A hasp assembly is adapted to be mounted on the second part of the case within the other cut-out, the latching assembly and the hasp assembly having cooperable means for holding the parts of the case together when the case is closed. First and second escutcheon means adapted to be mounted on the first and second parts of the case, respectively, are also provided for surrounding the latching assembly when the case is closed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of a luggage case employing a hardware assembly in accordance with the invention.

FIG. 2 is an exploded perspective view of a hardware assembly in accordance with the invention.

FIG. 3 is a top view partially broken away illustrating a portion of the hardware assembly of FIG. 2.

FIG. 4 is a longitudinal sectional view taken approximately along the line 4—4 of FIG. 3, this view illustrating a latch employed in the hardware assembly in latching position.

FIG. 5 is a transverse sectional view taken approximately along the line 5—5 of FIG. 3.

FIG. 6 is a longitudinal sectional view similar to FIG. 4 showing the latch in unlatching position.

FIG. 7 is a transverse sectional view similar to FIG. 5 taken approximately along line 7—7 of FIG. 6 which illustrates the operation of an ejector device for moving the parts of the luggage case apart when the latch is moved to unlatching position.

FIG. 8 is a plan view partially broken away of a portion of the hardware assembly of FIG. 2 illustrating a combination lock in accordance with the invention which may be employed in the hardware assembly.

FIG. 9 is a longitudinal sectional view taken approximately along the line 9—9 of FIG. 8.

FIG. 10 is a transverse sectional view taken approximately along the line 10—10 of FIG. 9.

FIG. 11 is an enlarged perspective view of a rocker which may be employed in the combination lock of FIGS. 8-10.

FIG. 12 is an enlarged perspective view of a bolt which may be employed in the combination lock of FIGS. 8-10.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The hardware assembly of the invention is primarily intended for use with luggage cases and similar articles and will be described in that environment, although, as will become apparent from the following description, it has a wider applicability.

FIG. 1 is a top view of a luggage case 20, such as an attache case, employing a hardware assembly 22 in accordance with the invention centrally located thereon. As shown, and as will be described in detail hereinafter, the hardware assembly generally comprises a console housing 24 adapted to be mounted to a first part 25' of a luggage case, the housing including a pair of spaced latches for engaging associated hasps mounted on a second part 26' of the luggage case for holding the case closed (the latches and the hasps are not shown in FIG. 1). The latches are operated by a movable actuator A mounted on the housing, and a combination lock C may be included for controlling the movement of the actuator A. A handle 28 may also be mounted on the housing by handle studs 30 in a well-known manner. Although the hardware assembly of the invention is shown applied to a non-valanced luggage case having straight, i.e., flat, side walls, it will become apparent from the following description that the hardware assembly may also be used on valanced cases and cases having curved or contoured side walls. Furthermore, although shown applied to an attache case, it will become apparent that the hardware assembly may be easily adapted to larger cases.

FIG. 2 illustrates the hardware assembly 22 of the invention in greater detail. As shown, and as will be described in greater detail hereinafter, the hardware assembly may include a generally U-shaped elongated channel or base B, and an inverted generally U-shaped elongated cover plate P adapted to be mounted on the channel to form an elongated tubular housing having a generally rectangular cross section. The ends of the housing may be closed by end caps D. A pair of sliding latches L may be located within the housing for engaging associated hasps H formed on an elongated hasp member 32 for holding the case closed. The latches may be connected to the actuator A by a flexible member or cable F, preferably formed of stranded stainless steel. Coil springs 34 coaxial with cable F may bias the latches outwardly to latching position, at which they engage the hasps. Actuator A may be slidably mounted on cover plate P for transverse movement (with respect to the direction of movement of the latches) between a rest position and an open position. When the actuator is moved to open position, the latches are moved inwardly to unlatching position, at which they disengage from the hasps. As previously mentioned, a combination lock C may be included for preventing movement of actuator A to open position except when the combination lock is on combination. However, as will be explained, the construction of the hardware assembly is such that the latches may be moved to unlatching position by the

hasps independently of the movement of the actuator to open position when the parts of the case are brought together. This is convenient for enabling the case to be closed (and locked) when the combination lock is off combination. Ejector pins 36, biased by springs 38, may also be included within the housing for urging the parts of the case apart when the latches are moved to unlatching position, thus causing the case to "pop" open when the actuator is moved to open position. The hardware assembly may also include escutcheon plates E, E' for imparting a finished appearance to the assembly.

In greater detail now, channel B, which may be an extruded aluminum member, comprises a bottom portion 40 having longitudinal sides 41 and 42 extending upwardly therefrom, as illustrated in FIG. 2. Also extending outwardly and upwardly from bottom portion 40 adjacent to side 42 is an angled portion 44 which is coextensive with the length of the channel and which provides a flange 46 for mounting the channel on a luggage case. As best illustrated in FIGS. 5, 7, and 10, the longitudinal edges of the sides 41 and 42 are preferably stepped, as shown at 47, to provide a support for cover plate P. As previously mentioned, and as illustrated in the drawings, when the cover plate and the channel are assembled, they form an elongated tubular housing having a generally rectangular cross section, the open ends of which are closed by ends caps D. The cover plate is preferably formed of steel. Its main function is to cover the channel to form the housing and to support the actuator. In addition, being of steel, it also serves to strengthen and stiffen the hardware assembly. The housing encloses the various operating elements of the hardware assembly, such as the latches L, the combination lock C and the control mechanism, including cable F, which connects the latches to the actuator. Accordingly, the entire operating mechanism of the hardware assembly of the invention is enclosed within the housing, and the housing may be mounted as a unitary assembly on the luggage case.

Channel B may be mounted on the luggage case by positioning the channel within an elongated cut-out (not shown) in the edge of the case side wall 25 (similar to cut-out 48 in side wall 26 illustrated in phantom lines in FIG. 2 for hasp member 32) and by positioning flange 46 of angled portion 44 on the exterior surface of the side wall, as shown in FIGS. 5, 7 and 10. As shown, the channel may be fastened to the side wall by rivets 50 which extend through holes 56 in the side wall and holes 51 located in flange 46 adjacent to its opposite ends. Preferably, the depth of the cut-out in the edge of side wall 25 is approximately one-half of the width of the channel, so that half the width of the channel projects beyond the edge of the side wall (see FIG. 3). Cut-out 48 in side wall 26 is sized to receive the projecting half of the channel (as well as hasp member 32 and escutcheon plate E', as will be explained) so that the case may be closed.

Hasps H and hasp member 32 are preferably formed as a unitary assembly of stamped steel with a shape best illustrated in FIG. 2. As shown, the hasp member may be angled and may also have a flange 54 similar to flange 46 of the channel. The hasp member may be mounted within cut-out 48 of side wall 26 by positioning flange 54 on the exterior surface of the side wall, and by fastening the hasp member to the side wall with rivets 55 which pass through holes 56 in the side wall and holes 57 in the ends of flange 54. When the parts of the case are brought together, the portion of channel B

which projects beyond the edge of side wall 25 is received within the recess formed by cut-out 48 in side wall 26, allowing the edges of the side walls to come together in abutting relationship to close the case. If desired, the side wall edges may be cooperatively notched for interfitting engagement as shown at 83 (see FIG. 2 which illustrates the notched edge of side wall 26). Notches or cut-outs 60 may be formed in side 41 of the channel to allow the hasps H to enter the housing and to be engaged by the latches. As shown in FIGS. 2, 4, 6, 9, and 10, the hasp member may have a projecting lip 62 adapted to be located beneath the bottom portion 40 of the channel to assist in positioning the hasps H properly within cut-outs 60 and to provide support to the portion of the channel adjacent to the hasp member when the case is closed.

Preferably, as mentioned, the hardware assembly also includes a pair of escutcheon plates E, E' which are preferably identical injection molded plastic members, shaped as best illustrated in FIG. 2. As shown, each escutcheon plate is preferably a shallow U-shaped member (as viewed from the top) having a longitudinal flange portion 66 and end flange portions 67. The escutcheon plates are adapted to be mounted on the side walls 25 and 26 of the luggage case and to cover flange portions 46 and 54 of channel B and hasp member 32, respectively, to impart a finished appearance to the hardware assembly, as best shown in FIG. 1. As shown, the escutcheon plates have a length sufficient to accommodate housing 24, i.e., channel B and cover plate P, and hasp member 32 between their end flange portions 67, and the end flange portions are preferably sized to extend to the edges of the side walls of the case. As shown in FIGS. 5, 7, and 10, the underside of the flange portion 66 of each escutcheon plate preferably has a recess 68 sized to accommodate flanges 46 and 54 of the channel and the hasp member, and the rivets which connect these parts to their respective side walls, to enable flange portions 66 to fit flush with the exterior surface of the side walls.

As also shown in the figures, the escutcheon plates have side walls 70 which depend from flange portions 66 and 67 at approximately a right angle. Side wall 70 of escutcheon plate E (which covers flange 46 of the channel) is positioned within a recess 72 formed between angle portion 44 and side 42 of the channel. Side wall 70 of escutcheon plate E' extends generally parallel to and covers the portion 74 of the hasp member which connects the hasps H and lip 62 with flange 54. Also formed on the undersides of the flange portions 66 and 67 of the escutcheon plates is a plurality of mounting studs 76 which may be threaded to receive threaded fasteners 77 for fastening the escutcheon plates to the case side walls. The mounting studs which depend from the undersides of the longitudinal flange portions 66 of the escutcheon plates pass through aligned holes 78 in flanges 46 and 54 and through aligned holes 80 in the case side walls (see FIGS. 5, 7, and 10, for example) where they receive the threaded fasteners 77. Mounting studs 76 depending from the undersides of flanged portions 67 of the escutcheon plates are spaced beyond the ends of channel B and hasp member 32, as shown, for example, in FIGS. 3, 4, and 6. These mounting studs may similarly be received in holes 81 in the case side walls and may also receive threaded fasteners 77 for connecting these portions to the side walls.

The abutting edges 82 of the end flange portions 67 of the escutcheon plates may be cooperatively notched for

overlapping, interfitting engagement, as shown in FIGS. 2 and 3, so that there is no opening between the side walls of the case when it is closed. Preferably, the angled portion 44 of the channel and the escutcheon plates are sized so that when they are assembled, the top surfaces of the flange portions of the escutcheon plates are flush with the top surface 84 of the cover plate, as shown in FIGS. 4-7 and 10. It should be noted, that since the entire operating mechanism of the hardware assembly is associated with the housing, and the housing is mounted as a unitary assembly with respect to the exterior surface of case side wall 25, the relative positions between the top surfaces of the flange portions of the escutcheon plate and the cover plate, and the cooperation between the operating parts of the hardware assembly are unaffected by variations in side wall thickness. Accordingly, the hardware assembly may be readily adapted to luggage cases having widely varying side wall thicknesses. Moreover, the hardware assembly may be readily adapted to valanced cases by merely providing a recess in the underside of the end flange portions 67 of the escutcheon plates, similar to recess 68 for flanges 46 and 54, to enable the escutcheon to cover the valance and to mount flush on the exterior surface of the side walls. These are significant advantages of the invention over prior hardware assemblies.

The foregoing has presented a description of the overall construction of the hardware assembly of the invention and its mounting on a luggage case. The following will describe the various operating mechanisms, including the latching mechanism and the locking mechanism, employed in the hardware assembly.

As previously mentioned, and as shown in FIG. 2, the hardware assembly includes a pair of spaced latches L which engage the hasps H for holding the case closed (as will be described shortly) when the parts are brought together. The latches are preferably identical U-shaped slide members formed of stamped steel with a shape best illustrated in FIG. 2. As shown in FIGS. 2-7, the latches are disposed in an inverted-U position on the bottom 40 of the channel adjacent to cut-outs 60 in side 41 for the hasps and to the end caps D. The latches are sized with respect to the channel so that channel walls 41 and 42 confine the latches for sliding movement along the channel, i.e., longitudinally. As shown, each latch has a slot 90 in a central portion 92 of the latch and an up-turned projection 94 at one end of the central portion, the projection having a notch 96 therein through which cable F passes for coupling the latch to the cable (in a manner which also will be described shortly).

End caps D cooperate with the latches L and with other parts of the hardware assembly in several unique ways. As shown in FIGS. 2-7, the end caps, which are preferably formed from plastic, each have a generally rectangular first portion 100 sized to fit into an end of the housing, and another portion 102 which projects slightly beyond the end of the housing. As shown, the dimensions of projecting portion 102 are such that the portion abuts the ends of the channel and the cover plate when the end cap is inserted into the housing. The longitudinal sides 103 of portion 100 are inwardly notched at 104 so that when the end cap is inserted into the housing, portion 100 is supported on the tops of the stepped edges 47 of channel walls 41 and 42 adjacent to cover plate P. A mounting stud 106 depends from the underside of portion 100 to the bottom 40 of the channel B and may receive a threaded fastener 107 through a

hole 108 in the bottom of the channel for fastening the end cap on the housing.

As shown in FIGS. 3-7, each latch L is positioned beneath portion 100 of an end cap with mounting stud 106 extending through slot 90 in the latch, and with projection 94 of the latch received in a recess or cut-out 110 in portion 100. Slot 90 is sized to permit sufficient movement of the latch to engage and disengage from its associated hasp H. A slot or opening 112 extends between recess 110 and the end of portion 100 of the end cap which faces the center of the assembly, the slot being sized to pass cable F. The cable also passes through notch 96 in projection 94 of the latch as previously mentioned, and the end of the cable has a stop 114 thereon which abuts projection 94, as best illustrated in FIGS. 3, 4, and 6, for coupling the latch to the cable. As is also shown in these figures, recess 110 in portion 100 of the end cap is sized to also accommodate stop 114 and latch spring 34, and to permit sufficient movement of the latch to engage and disengage from the hasp H. Spring 34, which engages surface 116 of recess 110 and projection 94 of the latch biases the projection into engagement with stop 114, and urges the latch to latching position (to the left in FIGS. 3, 4, and 6). In latching position, the end of one leg 118 of the latch is positioned adjacent to cut-out 60 (as shown in FIGS. 3 and 4) where it engages a hook portion 120 of hasp H received in cut-out 60, in the manner shown in FIGS. 3-5. The end cap may have a cut-out 121 adjacent to cut-out 60 to enable the hasp to be received within the housing. When actuator A is operated, the ends of cable F are pulled together toward the center of the hardware assembly (in a manner which will be explained shortly) which, in turn, causes the latches to move together toward the center of the hardware assembly by virtue of the engagement between stops 114 and projections 94 of the latches. As shown in FIG. 6, when the latches move towards the center of the hardware assembly, the end of leg 118 of each latch disengages from its associated hasp H so that the case can be opened. This is the unlatching position of the latches. As is also shown in FIG. 6, when the latches move to unlatching position, coil springs 34 are compressed between projections 94 and surface 116 of recesses 110, so that when the actuator is released, the coil springs move the latches back to latching position. Accordingly, the latches are constantly urged to latching position by the coil springs.

As previously mentioned, to facilitate opening of the case when the latches are moved to unlatching position, the hardware assembly may also include ejector pins 36 biased by springs 38 for moving the parts of the case apart when the latches move to unlatching position. Preferably, an ejector pin 36 and coil spring 38 are positioned within a transverse recess 124 in each of the end caps D. As shown in FIGS. 2-7, each ejector pin may comprise a cylindrical shaft having an enlargement 126 centrally positioned thereon, to provide an abutment for coil spring 38. The coil spring is coaxial with the shaft on one side of the enlargement. To support the ejector pin within the housing, the opposite end of the coil spring from the end which engages enlargement 126 may be located on a boss 128 formed as an inward depression in the side of the cover plate adjacent to case side wall 25 and escutcheon plate E, and the other end 130 of the shaft may be located in a hole 132 in the other side of the cover plate which faces side wall 26 and escutcheon plate E' (see FIGS. 2, 5 and 7). Coil spring 38 urges end 130 of the ejector pin out of the housing so

that the ejector pin tends to assume the position shown in FIG. 7 whereby enlargement 126 abuts the side of the cover plate adjacent to hole 132. When the case is closed by bringing the parts together, the engagement between end 130 of the ejector pin and escutcheon plate E' on side wall 26 of the case forces the pin into the housing to the position shown in FIG. 5, compressing coil spring 38. The ejector is held in this position by virtue of the engagement between the latches and the hasp. Subsequently, when the actuator is operated to move the latches to unlatching position and they disengage from the hasps, coil spring 38 forces the ejector pin out of the housing, causing the parts of the case to be forced apart and moving the hasps out of cut-outs 60 to positions where they cannot be engaged by the latches (see FIG. 7). Thus, the action of the two ejector pins causes the case to pop open when the actuator is operated.

Closing of the case and engagement of the latches with the hasps to hold the case closed are facilitated by the previously described manner of coupling the cable F to the latches, since the latches may be moved relative to the cable and to stops 114 to unlatching position independently of the movement of the cable ends and independently of the operation of the actuator. This is accomplished in the following manner. As shown in FIGS. 2 and 3, each hasp H is formed with a sloping cam surface 136 adjacent to hook portion 120. When the parts of the case are brought together to close the case and the hasps enter cut-outs 60, cam surfaces 136 engage the ends of legs 118 of the latches, causing the latches to be moved relative to the cable (as shown in phantom lines in FIG. 4) to unlatching position. This compresses each coil spring 34 against surface 116 of its recess so that once the hasps have fully entered the housing, the coil springs force the latches back to latching position and into engagement with the hasps. Accordingly, the case may be closed and latched by simply moving the parts of the case together to closed position, without requiring manipulation or movement of the actuator. This is also a significant advantage of the invention, since, as mentioned previously and as will be described shortly, the hardware assembly preferably includes a combination lock for preventing movement of the actuator from rest position except when the combination lock is on combination. Thus, the case may be closed (and locked) when the combination lock is off combination. Also, portions 102 of the end caps cooperate with the walls 70 of escutcheon plate E' to assist in closing the case. As best shown in FIG. 3, portions 102 and end flange portions 67 of the escutcheon plate are curved slightly, portions 102 being tapered toward the sides of the cover plate. Thus, when the parts of the case are brought together, portions 102 and walls 70 of the escutcheon plate adjacent to end flange portions 67 cooperate to cam the parts together into proper alignment, thus facilitating closing of the case.

The spaced latches of the hardware assembly of the invention are operated simultaneously by the movement of the actuator A from a rest position to an open position. As shown in FIG. 2, actuator A, which is preferably a generally U-shaped die-cast member, may be mounted on the top surface 84 of cover plate P for sliding movement in transverse slots 140 formed in the cover plate. Cover plate P is preferably formed from stamped steel, and slots 140 are preferably formed by piercing the metal of the cover plate and bending it inwardly to form transverse tabs 142 (best illustrated in

FIG. 9) on opposite sides of each slot. The tabs form a guide channel in each slot for a pair of bosses 144 formed on each leg of the actuator which project through the slots into the housing. Within the housing, the bosses connect each leg of the actuator to a bracket 146 and 148. The bosses extend through holes 150 in each bracket and have their ends swedged over (as shown in FIG. 9) to connect the brackets to the actuator. Mounted on each bracket by means of another hole 151 is a roller 152 over which cable F passes. The purpose of this arrangement will be described shortly.

Within the housing, brackets 146 and 148 are coupled to and supported on a rocker 154, which is best illustrated in FIG. 11. As shown, the rocker has an elongated angled base member 155 with a generally planar flange member 156 connected to each end thereof. The rocker, which is preferably part of the combination lock C as will be described hereinafter, is disposed longitudinally within the housing so that it may pivot or rock on base 155 about a longitudinal axis through the base. Each flange member 156 has an arcuate projection 158, which may be semi-circular as shown, which is adapted to be received in a slot 160 in each of brackets 146 and 148, and each flange member has a flat surface 161 adjacent to projection 158 which abuts the underside of the brackets when the rocker is in the position shown in FIGS. 10 and 11. In this position, which corresponds to the rest position of the actuator, the rocker supports the brackets and, in turn, the actuator. When the actuator is pulled to open position (down in FIG. 8 as indicated by the arrow and to the left in FIG. 10) the actuator and the brackets slide transversely with respect to the housing and the rocker pivots about base 155. Slots 160 in the brackets are sized with respect to projections 158 to allow the projections to pivot in the slots. When the actuator is in the open position, another surface 162 of each flange member abuts the underside of each bracket. The rocker supports the actuator during its movement and prevents the actuator from cocking or binding in its guide slots 140, which, because of the poor length to width relation of the U-shaped actuator, could otherwise occur. With the rocker, the actuator is able to move freely and smoothly between its rest position and its open position.

The length of cable F which extends between latches L is adjusted so that the cable is taut when the latches are in latching position and the actuator is in rest position. The portion 164 of the cable between rollers 152 is held fixed against the side of the housing adjacent to side 41 of channel B to prevent transverse movement of portion 164 when the actuator is moved to open position. As shown in FIGS. 2 and 8, this may be accomplished by positioning portion 164 of the cable behind frame 166 of combination lock C, which is attached to the bottom of the channel by rivets 168 which extend through aligned holes 169 in the bottom of the channel and the frame. When the actuator is moved to open position, brackets 146 and 148 undergo a transverse movement, as previously described. Since portion 164 of the cable is held fixed, when the brackets undergo such movement, the cable slides past rollers 152 and is pulled to the phantom line position illustrated in FIG. 8. This causes the length of the cable between each latch and the actuator to be shortened, and the engagement of stops 114 with projections 94 of the latches causes the latches to move together. The amount of movement of the actuator to open position, which is determined by the length of slots 140, is selected to shorten the cable

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between each latch and the actuator sufficiently to move the latches to unlatching position, thereby releasing the hasps and opening the case. When the actuator is released, coil springs 34, which were compressed by projections 94 when the latches moved to unlatching position, force the latches back to latching position, which in turn moves the actuator back to rest position. Because the latches are located beneath portions 100 of end caps D and confined by channel sides 41 and 42, the latches are prevented from cocking or binding during their movements.

The use of a flexible member, such as a cable, as a control element connecting the latches and the actuator has certain advantages. For example, the hardware assembly of the invention may be readily adapted to luggage cases having curved, i.e., convex, side walls, since the cable is not subject to binding, as a rigid control member would be, when it passes over a curved surface. To adapt the hardware assembly to a luggage case having a curved side wall, it is merely necessary to conform the shapes of channel B, cover plate P, hasp member 32 and escutcheon plates E, E' to the shape of the side walls. Moreover, the length of the hardware assembly may be readily adjusted to accommodate different size luggage cases by merely adjusting the lengths of these elements and the length of cable F.

As previously mentioned, the hardware assembly of the invention may include a combination lock C for locking the case. Preferably, the combination lock prevents movements of the actuator from the rest position except when the combination lock is on combination, thereby preventing operation of the actuator necessary to move the latches to unlatching position. To accomplish this, the combination lock may be used to block the movement of rocker 154, as will be described. Preferably, combination lock C is a pivoted bolt combination lock, which, except as will be described hereinafter, may be generally similar to well-known combination locks of this type.

As shown in FIGS. 8-10, combination lock C may include a frame 166 having brackets 174 thereon for supporting a longitudinally extending shaft 176 which rotatably supports a plurality of sleeves 178. The sleeves are held in end-to-end abutting relationship against an enlargement 180 near one end of the shaft by a spring 182 on the opposite end of the shaft which engages an adjacent sleeve and bracket 174. Each sleeve may be releasably coupled to an associated combination dial 184 for rotation therewith, and the dials may project through slots 185 in cover plate P, which serves as a faceplate, to display successive indicia spaced about the periphery of the dials. A dial spring 186 may be included for holding each dial in successive rotational positions.

A bolt 188, shown in greater detail in FIG. 12, may be pivotally supported on the frame for rotation about an axis parallel to the axis of shaft 176 by locating tabs 189 of the bolt in corresponding cut-outs 190 (see FIG. 10) in brackets 174. The bolt may have a plurality of transverse slots 192 through which the dials pass and may be biased into engagement with the sleeves by bolt springs 194 located between the frame and bosses 195 in the bolt adjacent to tabs 189. As is well known, the sleeves may have a circular flange portion 196 and a flat portion 197 which engage the planar surface 198 of the bolt adjacent to slots 192. When the dials are rotated to position the flat portions 197 of all of the sleeves adjacent to the surface 198 of the bolt, bolt springs 194 pivot the bolt

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about tabs 189 to a horizontal position, as illustrated in FIGS. 9 and 10. This is the unlocked position of the combination lock. When any dial is turned off combination, the circular flange portion of its associated sleeve engages the surface of the bolt, causing the bolt to pivot downwardly to locked position (shown in phantom lines in FIG. 10).

As is also shown in FIG. 12, the side of the bolt opposite to tabs 189 may have extensions 200 which project beyond brackets 174 through cut-outs 201 in the brackets (see FIG. 10). The extensions 200, which constitute blocking elements, cooperate with flange members 156 of the rocker to prevent movement of the rocker from the position corresponding to the rest position of the actuator except when the combination lock is on combination. Rocker 154 is preferably formed as part of the combination lock with base 155 of the rocker supported on the bottom of frame 166. As shown in FIGS. 2 and 8-10, rocker flange members 156 are positioned beyond brackets 174 of the combination lock. The brackets 174 may have cut-outs for base 155 (not shown) and may have projecting tabs (also not shown) which are received in notches 204 in base 155 of the rocker, for locating the rocker on the frame. When assembled with the combination lock, flanges 156 of the rocker are positioned adjacent to the ends of extensions 200 of the bolt (see FIGS. 2, 8, and 10). As best illustrated in FIG. 11, the edge of each flange member 156 adjacent to extensions 200 may be formed with a cut-out 206 into which an extension 200 of the bolt is received when the bolt is in unlocked position, i.e., in the horizontal position illustrated in solid lines in FIG. 10, and the actuator is moved to open position. When the bolt is moved to locked position (phantom line position illustrated in FIG. 10) a blocking surface 208 of flange members 156 is positioned adjacent to an extension of the bolt, which blocks movement of the rocker necessary for the actuator to move to open position. Accordingly, when the combination lock is off combination, the actuator is prevented from moving to open position, necessary to move the latches to unlatching position. As shown in FIG. 12, side 210 of the bolt adjacent to extensions 200 may be angled to impart greater strength to the extensions and to increase their resistance to bending due to the forces exerted on them by the rocker.

The combination lock C also incorporates a novel combination changing mechanism which permits the combination of the lock to be changed from the faceplate of the lock, i.e., from the same side of the lock on which the combination dials are accessible. The combination changing mechanism comprises a shifter 220 (FIGS. 2, 8 and 9) which includes a push button portion 221 projecting through a slot 222 in cover plate P adjacent to dial slots 185. The shifter is located on the left-hand (in the figures) bracket 174 of the combination lock frame by means of a transverse vertical slot 224 and on the shaft 176 adjacent to enlargement 180 by means of a longitudinal vertical slot 225 which receives the shaft (see FIG. 9). A coil spring 226 located on a depending projection 228 of the shifter biases the push button portion of the shifter away from the cover plate (upwardly in FIG. 9) so that a lip 230 at the base of the push button portion engages the underside of the cover plate. As shown in FIG. 9, the portion of the shifter adjacent to enlargement 180 on the shaft is formed with an angled cam surface 232, and the opposite side of the shifter adjacent to the end of the shaft is formed with a ledge 234 and a vertical tab 235 on one side of the upper

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surface thereof. As is also shown in FIG. 9, bracket 146 (attached to the left-hand leg of the actuator) has a generally L-shaped tab portion 236 which is positioned beneath ledge 234 of the shifter. Depending projection 228 of the shifter extends through an opening 238 in the rocker (see FIG. 11 also) and into aligned holes 239 and 240 in frame 166 and channel B, respectively.

In order to change the combination, the lock must be first set on combination and the actuator A moved to and held in open position, in order to enable shifter 220 to be depressed. As shown in FIGS. 8 and 9, when the actuator is in rest position, tab 236 of bracket 146 is located beneath ledge 234 of the shifter, which prevents the shifter from being depressed. When the actuator is moved to open position (downwardly in FIG. 8 in the direction of the arrow) tab 236 is moved out from beneath ledge 234 to the phantom line position illustrated, where it is out of blocking alignment with the shifter. The shifter may then be depressed against the bias of spring 226 to move it to its combination changing position. As the shifter is depressed, cam surface 232 engages enlargement 180 on the shaft to move the shaft and the sleeves 178 to the right in FIGS. 8 and 9 against the bias of spring 182. As is well known, each sleeve may have teeth received in recesses in its associated dial (the teeth and the recesses are not shown in the drawings) for keying the dials and the sleeves together. Movement of the sleeves to the right in the figures by depressing shifter 220, disengages the teeth of the sleeves from the dials so that the dials may be rotated independently of the sleeves to the new combination.

To facilitate changing of the combination, tab 236 and ledge 234 on the shifter cooperate to hold the shifter in the combination changing position. Upon moving the actuator to open position and depressing the shifter, if the shifter is held depressed and the actuator is released, latch springs 34 will move the actuator back toward rest position, as previously described, causing tab 236 to be positioned adjacent to the upper surface 242 of ledge 234. Engagement between tab 236 and the upper surface 242 of ledge 234 prevents spring 226 from returning the shifter to its combination fixing position (illustrated in FIG. 9) and holds the shifter in the combination changing position, thereby freeing the user's hands and facilitating changing of the combination. Engagement between vertical tab 235 on the shifter and tab 236 on the bracket prevents the actuator from moving completely to its rest position when it is released, and contributes to slightly smoother operation of the mechanism. When the new combination has been set, moving the actuator to open position releases the shifter and enables spring 226 to return the shifter to the combination fixing position. At the same time, spring 182 returns the shaft and the sleeves to their normal positions illustrated in FIGS. 8 and 9 where the sleeves recouple to the dial, thereby setting the new combination into the lock. As the shaft moves back to its normal position, the engagement between enlargement 180 on the shaft and cam surface 232 of the shifter also forces the shifter upwardly (in FIG. 9) and assists spring 226 in returning the shifter to the combination fixing position.

Preferably, combination lock C and actuator A are located centrally in the cover plate of the housing between handle studs 30, as shown in FIG. 1. To connect handle 28 to the hardware assembly, handle studs 30 may have mounting posts 244 (see FIG. 9) which extend through holes 246 in the cover plate and receive threaded fasteners 247 through aligned holes 248 in the

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channel. Accordingly, when the luggage case is being carried, the entire weight of the case is on the channel rather than on the cover plate. Mounting posts 244 also may cooperate with rollers 152, in the manner indicated in FIGS. 8 and 9, to shorten cable F when the actuator moves to open position. Cover plate P may also be formed with depressions 250 (FIG. 2) which are adjacent to and are sized to fit within recesses 110 of end caps D, as shown in FIGS. 4 and 6, and which assist in positioning the end caps within the housing.

From the foregoing, it may be appreciated that the hardware assembly of the invention has significant advantages over comparable prior hardware assemblies. For example, as previously described, the invention provides a hardware assembly as an integral unit which may be readily adapted for use on luggage cases of different sizes, shapes, and configurations. Moreover, the hardware assembly of the invention has a relatively simple construction and employs a relatively small number of parts which may be quickly and readily assembled.

While a preferred embodiment of the invention has been shown and described, it will be apparent to those skilled in the art that changes can be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims.

The invention claimed is:

1. A hardware assembly for luggage and the like comprising an elongated housing adapted to be mounted on the exterior of a side wall of a first part of the luggage case and to be positioned within a elongated cut-out in the edge of the first part, the housing having a portion projecting beyond said edge toward a second part of the case which is adapted to be received in another elongated cut-out in an adjacent edge of the second part when the parts are brought together to close the case, a pair of sliding latches mounted within the housing, the latches being movable longitudinally within the housing between latching and unlatching positions and being engageable, when in latching position, with associated hasp means mounted on the exterior of the side wall of the second part of the case along said adjacent edge for holding the case closed when the parts are brought together, an actuator mounted on the housing for transverse movement with respect to the direction of movement of the latches for controlling the movement of the latches, means for connecting the latches to the actuator, a rocker pivotally supported within the housing, and means for coupling the rocker to the actuator for movement therewith.

2. The assembly of claim 1, wherein the connecting means comprises means for enabling movement of the latches to unlatching position independently of the movement of the actuator to an open position when the parts of the case are brought together.

3. The assembly of claim 2, wherein the connecting means comprises a flexible member extending between the latches and slideably coupled to the actuator.

4. The assembly of claim 1, further comprising a combination lock within the housing, the combination lock having means for preventing movement of the actuator to an open position except when the combination lock is on combination.

5. The assembly of claim 4, wherein the preventing means comprises means engageable with the rocker for impeding movement of the rocker.

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6. The assembly of claim 1, further comprising escutcheon means adapted to be mounted on the exterior of the side wall of the first part of the case, the escutcheon means being formed to extend parallel to the housing and to a portion of each end of the housing, and to cover a portion of the housing mounted on the exterior side wall.

7. The assembly of claim 6, further comprising another escutcheon means adapted to be mounted on the exterior of the side wall of the second part of the case along said adjacent edge, said other escutcheon means being shaped to extend parallel to the housing and to cover another portion of the housing.

8. The assembly of claim 7, wherein said other escutcheon means and the ends of the housing are cooperatively shaped to cam the first and second parts of the case into proper alignment when the parts are brought together.

9. The assembly of claim 1, wherein the housing comprises an elongated channel member having a flange portion along a longitudinal side thereof, the channel member being attached to the exterior of the side wall of the first part of the case by said flange portion, and a cover member mounted on the channel member to form a generally tubular structure having open ends.

10. The assembly of claim 9, further comprising end caps closing the ends of said tubular structure, each end cap having a curved portion which projects slightly beyond a corresponding end of the tubular structure and which cooperates with means associated with said other cut-out to cam the parts of the case into alignment when the parts are brought together.

11. The assembly of claim 1, further comprising spring biased ejector means within the housing for urging the parts of the case apart when the actuator is moved to an open position.

12. The assembly of claim 1, further comprising a carrying handle mounted on the housing.

13. A hardware assembly for luggage and the like comprising a pair of sliding latches adapted to be mounted on a first part of a luggage case adjacent to an edge thereof for sliding movement parallel to said edge, the latches being movable between latching and unlatching positions and being cooperable with associated hasps on a second part of the case for holding the case closed when the parts are brought together, means for biasing the latches to latching position, a slideable actuator adapted to be mounted on the first part of the case, the actuator being slideable between a rest position and an open position in a plane parallel to a plane containing the latches and in a direction transverse to the direction of movement of the latches, connecting means extending between the latches and the actuator for moving the latches to unlatching position when the actuator moves to open position, and means for coupling the connecting means to the latches to enable the latches to move with respect to the connecting means such that the latches can move to unlatching position independently of the movement of the actuator to open position when the parts are brought together to close the case.

14. The assembly of claim 13, wherein the connecting means comprises a flexible member extending between the latches and slideably coupled to the actuator.

15. Assembly of the claim 14, wherein the actuator comprises a generally U-shaped member having a pair of legs and having roller means adjacent to the end of each leg, the flexible member passing over the roller means and being held in a fixed position between the

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roller means such that movement of the actuator to open position is effective to shorten the length of the flexible member between the latches to move the latches together to unlatching position.

16. The assembly of claim 15, wherein the U-shaped member has a bracket attached to each leg adjacent to the end of the leg, and the roller means comprises a roller mounted on each bracket.

17. The assembly of claim 14, wherein the flexible member comprises a cable and the coupling means comprises stop means on each end of the cable and a projection on each latch with an opening therethrough for the cable, and wherein the biasing means comprises spring means for biasing each projection into engagement with an associated stop means.

18. The assembly of claim 17, wherein the spring means comprises coil springs coaxial with the cable which urge the latches apart to latching position.

19. The assembly of claim 18, wherein the hasps and the latches have cooperable cam means for moving the latches to unlatching position against the bias of the coil springs when the parts of the case are brought together, and have engageable surfaces for holding the parts together when the case is closed.

20. The assembly of claim 13, further comprising an elongated housing, the latches being disposed within the housing and the actuator being mounted thereon, and the housing adapted to be mounted on the exterior of a side wall of the first part of the luggage case and to be positioned within an elongated cut-out in the edge of the first part.

21. The assembly of claim 20, wherein the housing comprises an elongated channel having a flange portion for mounting the channel on the exterior of said side wall, a cover mounted on the channel to form a generally tubular structure having open ends, and end caps closing the ends of such structure.

22. The assembly of claim 21, wherein each end cap includes a portion shaped to fit within an end of the tubular structure and to be positioned between the cover and one of the latches, the portion having a recess therein for receiving a projection from such latch and an opening connecting the recess with an interior end of the portion for passing the connecting means, the connecting means being coupled to the projection within the recess and the biasing means being located within the recess between the projection and a surface of the recess adjacent to said opening.

23. The assembly of claim 22, wherein the end cap has another recess located between said first-mentioned recess and another end of the end cap, and wherein the assembly further comprises spring biased ejector means located within the later-mentioned recess for urging the parts of the case apart when the latches are moved to unlatching position.

24. The assembly of claim 13, wherein the hasps are part of an elongated flanged member adapted to be mounted on the exterior of a side wall of the second part of the case.

25. The assembly of claim 13, further comprising a rocker supported on the first part of the case for pivotal movement between first and second positions about an axis parallel to the direction of movement of the latches, the rocker having means for supporting the actuator and for constraining the rocker and the actuator for concerted movement, the rocker being in the first position when the actuator is in the rest position and being

in the second position when the actuator is in the open position.

26. The assembly of claim 25, further comprising a combination lock for controlling the movement of the rocker.

27. The assembly of claim 26, wherein the combination lock and the rocker have cooperable blocking means for preventing movement of the rocker from the first position except when the combination lock is on combination.

28. The assembly of claim 13, further comprising a combination lock for preventing movement of the actuator to the open position except when the combination lock is on combination.

29. The assembly of claim 28, wherein the combination lock comprises a frame, a shaft supported on the frame, a plurality of sleeves rotatably supported on the shaft, each sleeve being releasably coupled to an associated dial for rotation therewith, and combination changing means for moving the sleeves relative to the dials to uncouple the sleeves and the dials to enable the combination to be changed, the actuator having means for preventing the operation of the combination changing means except when the actuator is in the open position.

30. A hardware assembly for luggage and the like comprising a housing with an open end, the housing adapted to be mounted on a first part of a luggage case and to project beyond an edge of the first part toward a second part of the case and to be received in a cut-out in an edge of the second part when the parts are brought together to close the case, and an end cap for closing the open end of the housing, the end cap comprising a member having a first portion shaped to fit within the open end of the housing, and a curved portion projecting slightly beyond said open end, the curved portion being shaped to cooperate with means associated with said cut-out to cam the parts into alignment when the parts are brought together to close the case.

31. The assembly of claim 30, wherein the housing encloses a latch cooperable with a hasp on the second part of the case to hold the parts together when the case is closed, and wherein said first portion has a recess therein for receiving a projection from the latch and an opening therethrough connecting the recess with an end of the first portion, said recess being sized to receive biasing means for biasing the latch to latching position, and the opening being sized to pass control means for connecting the latch to an actuator.

32. The assembly of claim 31, wherein the first portion has another recess for receiving spring biased ejector means for urging the parts of the case apart when the latch is moved to unlatching position.

33. A combination lock adapted for use in a hardware assembly for luggage and the like comprising a frame, a longitudinally extending shaft supported on the frame, a plurality of sleeves rotatably supported on the shaft, each sleeve being coupled to an associated dial for rotation therewith, bolt means pivotally supported on the frame for movement between locked and unlocked positions, the bolt means being cooperable with the sleeves and capable of moving to unlocked position only when the sleeves have a predetermined orientation, a rocker supported on the frame for movement between first and second positions, and an actuator coupled to the rocker, the actuator being movable between a rest position and an open position, the rocker being movable with the actuator and being in the first

position when the actuator is in the rest position and being in the second position when the actuator is in the open position, the bolt means being pivotally supported about an axis parallel to the axis of the shaft and the rocker being pivotally supported about another axis parallel to the axis of the shaft, and the bolt means and the rocker having cooperable blocking means for preventing movement of the rocker from the first position except when the bolt means is in the unlocked position.

34. The combination lock of claim 33, wherein the actuator is mounted for sliding movement in a transverse direction to the longitudinal axis of the shaft.

35. The combination lock of claim 33, wherein the rocker comprises a base for supporting the rocker on the frame and a pair of members extending from opposite ends of the base, each member having a projection which is received in a slot in bracket means attached to the actuator and having a portion adjacent to the projection for supporting the bracket means, the slots in the bracket means being sized with respect to the projections to enable the projections to rotate in said slots when the rocker moves between its first and second positions and the actuator moves between its rest and open positions.

36. The combination lock of claim 35, wherein the cooperable blocking means comprises extended portions of the bolt means which abut sides of corresponding members when the bolt means is in locked position.

37. The combination lock of claim 36, wherein the members have cut-outs in their sides which receive an extended portion of the bolt means when the bolt means is in unlocked position and the rocker is in the second position.

38. The combination lock of claim 33, further comprising combination changing means accessible from a faceplate of the combination lock through which the dials project for uncoupling the sleeves from the dials to enable the combination to be changed, the actuator having means engageable with the combination changing means for preventing operation of the combination changing means except when the actuator is in open position.

39. A combination lock adapted for use in a hardware assembly for luggage and the like comprising a frame, a longitudinally extending shaft supported on the frame, a plurality of sleeves rotatably supported on the shaft, each sleeve being releasably coupled to an associated dial for rotation therewith, an actuator movable between a rest position and an open position, the actuator being movable from the rest position only when the sleeves have a predetermined orientation, and combination changing means for moving the sleeves relative to the dials to uncouple the sleeves and the dials to enable the combination to be changed, the actuator having means for preventing operation of the combination changing means except when the actuator is in the open position.

40. The combination lock of claim 39, wherein the combination changing means comprises a member movable between a combination fixing position and a combination changing position, and wherein the preventing means comprises means attached to the actuator for engaging the movable member when the actuator is in the rest position to prevent movement of the movable member to the combination changing position.

41. The combination lock of claim 40, wherein the movable member has a portion cooperable with the engaging means for holding the movable member in the

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combination changing position upon the actuator being moved toward rest position while the movable member is in the combination changing position.

42. The combination lock of claim 40, wherein the movable member comprises a push button accessible from the same side of the combination lock as the dials, and spring means for biasing the push button to the combination fixing position, the push button being depressable against the bias of the spring means when the push button is moved to the combination changing position.

43. The combination lock of claim 42, wherein the push button has a projection, and the preventing means comprises a bracket attached to the actuator which is positioned adjacent to the projection, one side of the projection being engageable with the bracket to prevent movement of the push button to the combination changing position, and the other side of the projection being engageable with the bracket to prevent movement of the push button to the combination fixing position.

44. The combination lock of claim 42, wherein the push button has cam means for moving the sleeves longitudinally with respect to the axis of the shaft to uncouple the sleeves from the dials when the push button is moved to the combination changing position.

45. The combination lock of claim 39, further comprising a rocker supported on the frame for rotation

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between first and second positions, the rocker being coupled to the actuator for concerted movement therewith such that when the actuator is in its rest position the rocker is in its first position and such that when the actuator is in its open position the rocker is in its second position, and blocking means cooperable with the sleeves for preventing movement of the rocker from its first position except when the sleeves have said predetermined orientation.

46. The combination lock of claim 33 or 39, wherein the combination lock is mounted in a hardware assembly for luggage and the like, the hardware assembly comprising a housing adapted to be mounted on a first part of the luggage case, a pair of sliding latches within the housing cooperable with associated hasps on a second part of the luggage case for holding the case closed when the parts are brought together, and means connecting the latches to the actuator for moving the latches to unlatching position when the actuator moves to open position.

47. The combination lock of claim 46, wherein the combination lock and the hardware assembly are mounted on a luggage case.

48. The hardware assembly of claim 1 or 13, wherein the hardware assembly is mounted on a luggage case.

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(54) **CUSTOMIZABLE COMBINATION LOCKING SYSTEM USING TEXTUAL COMBINATIONS**

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5,522,243 A	6/1996	Kusmiss
6,021,653 A *	2/2000	Pimpo 70/26
6,125,568 A *	10/2000	Granaroli 42/70.11

* cited by examiner

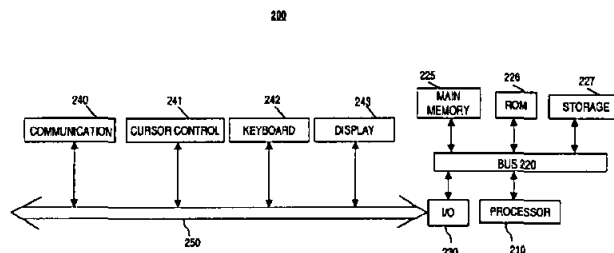
Primary Examiner—Nina Tong

(74) *Attorney, Agent, or Firm*—Blakely Sokoloff Taylor & Zafman LLP

(57) **ABSTRACT**

A customizable combination locking system using textual combinations. The principle object of the present invention is to provide a method to create a lock that is capable of being set in any desired set of letters that spells words that are easy for the user to remember. These words are supplied as a list and the tumbler positions are created from that list. The resultant lock would be commercially viable, as it will use existing, standard lock mechanisms comprised of tumbler rings with ten positions (0-9) and two, three, or four tumblers. The letters that appear in each of the ten positions have been selected through the described process. Having been selected, each lock is capable of being set to one of several thousand actual word combinations.

25 Claims, 5 Drawing Sheets



	Tumbler 1	Tumbler 2	Tumbler 3	Tumbler 4
Position 1	W	O	R	E
Position 2	S	I	M	E
Position 3	F	L	N	E
Position 4	C	A	A	E
Position 5	B	E	S	O
Position 6	L	E	O	I
Position 7	D	E	S	O
Position 8	H	E	S	O
Position 9	P	E	S	O
Position 10	G	N	E	C

With two letters per position the locks could spell OVER 6000 four letter words:

	Tumbler 1	Tumbler 2	Tumbler 3	Tumbler 4
Position 1	BA	ND	WA	SH
Position 2	WA	ND	WA	SH
Position 3	FI	EL	FA	CA
Position 4	DI	NE	PU	NE
Position 5	MA	SH	MA	SH
Position 6	CA	NE	HA	VE
Position 7	CO	NE	DO	DI
Position 8	LA	ST	DI	NE
Position 9	BU	ST	LU	NE
Position 10	WI	LT	FI	NE

200

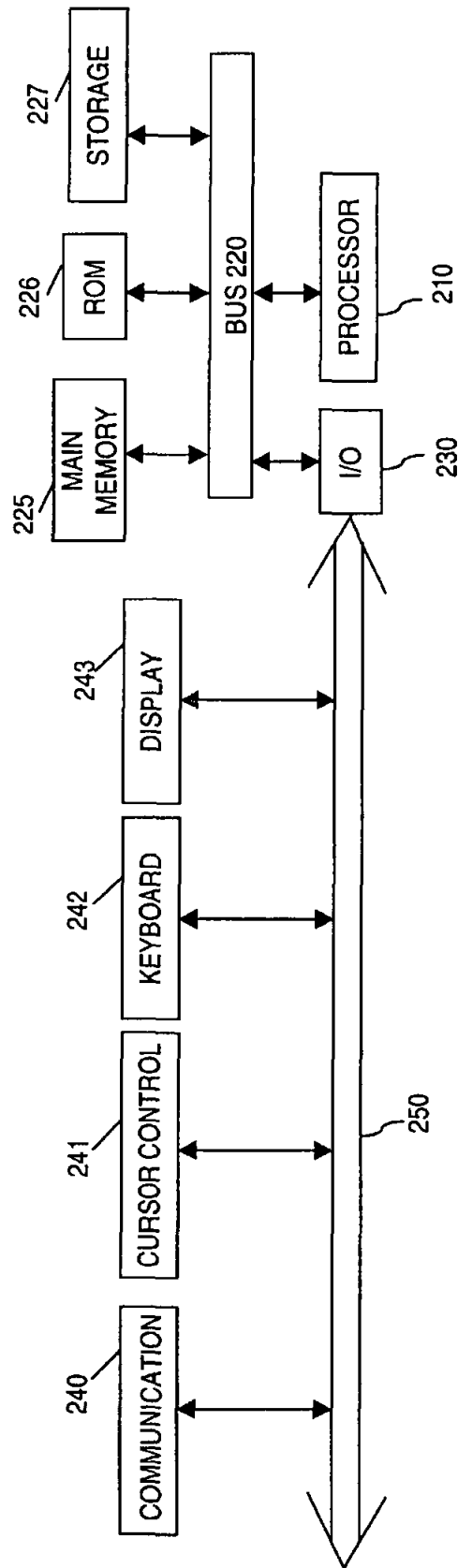


FIG. 1

Fig. 2

	Tumbler 1	Tumbler 2	Tumbler 3	Tumbler 4
Position 1	W	O	R	D
Position 2	S	A	M	E
Position 3	F	I	L	M
Position 4	C	E	N	T
Position 5	B	U	A	P
Position 6	L	T	E	N
Position 7	D	L	S	K
Position 8	H	R	O	L
Position 9	P	H	I	H
Position 10	G	N	C	G

Fig. 3

With two letters per position the locks could spell OVER 6000 four letter words:

	Tumbler 1	Tumbler 2	Tumbler 3	Tumbler 4
Position 1	BA	LL	WA	SH
Position 2	WA	ND	WI	CK
Position 3	FI	IL	FA	LL
Position 4	DI	NK	PU	NK
Position 5	MA	SH	MA	IL
Position 6	CA	KE	HA	IE
Position 7	CO	CK	DO	ST
Position 8	LA	ST	DI	NG
Position 9	BU	NE	LU	LT
Position 10	WI	LT	FI	NT

Fig. 4A

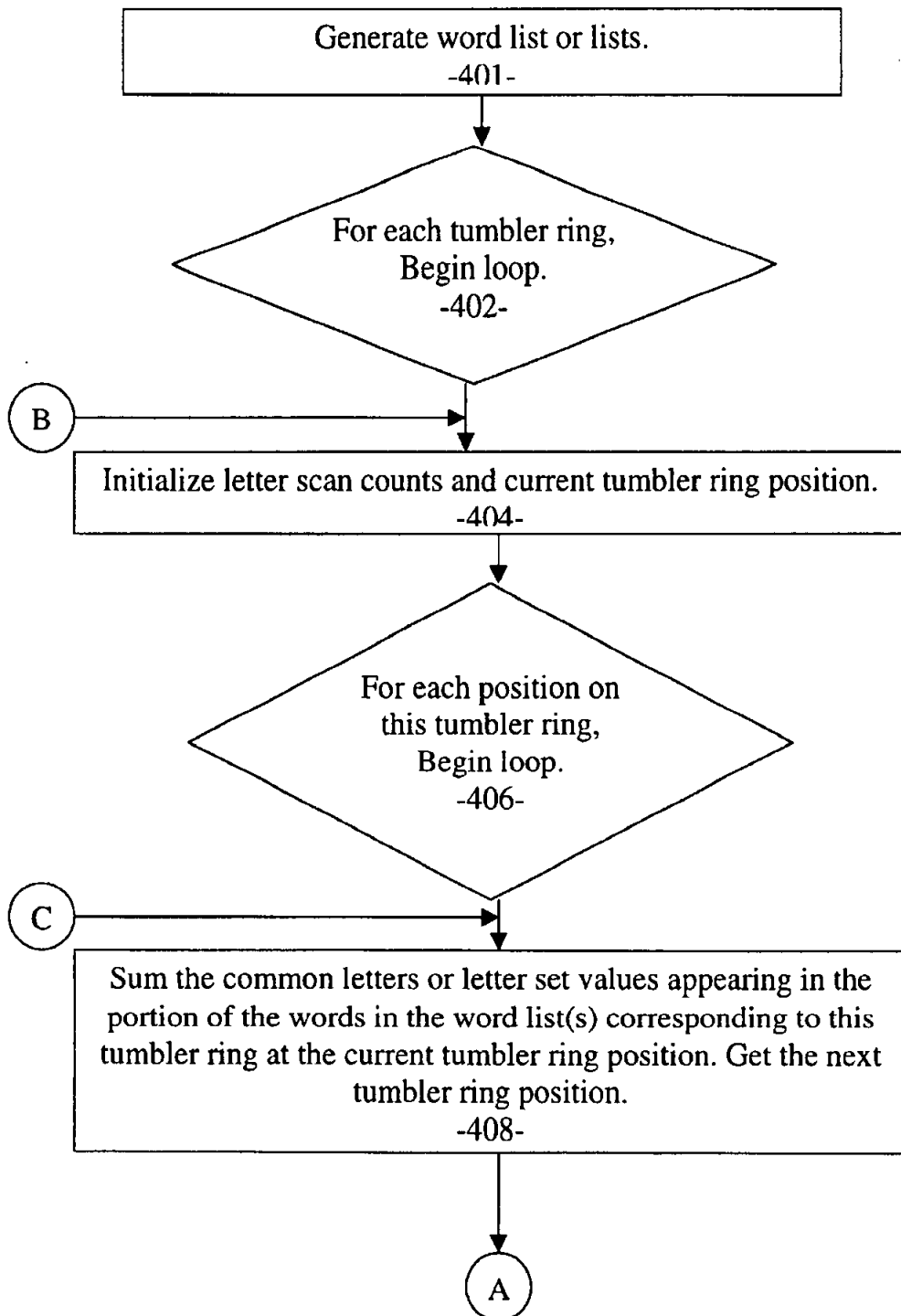
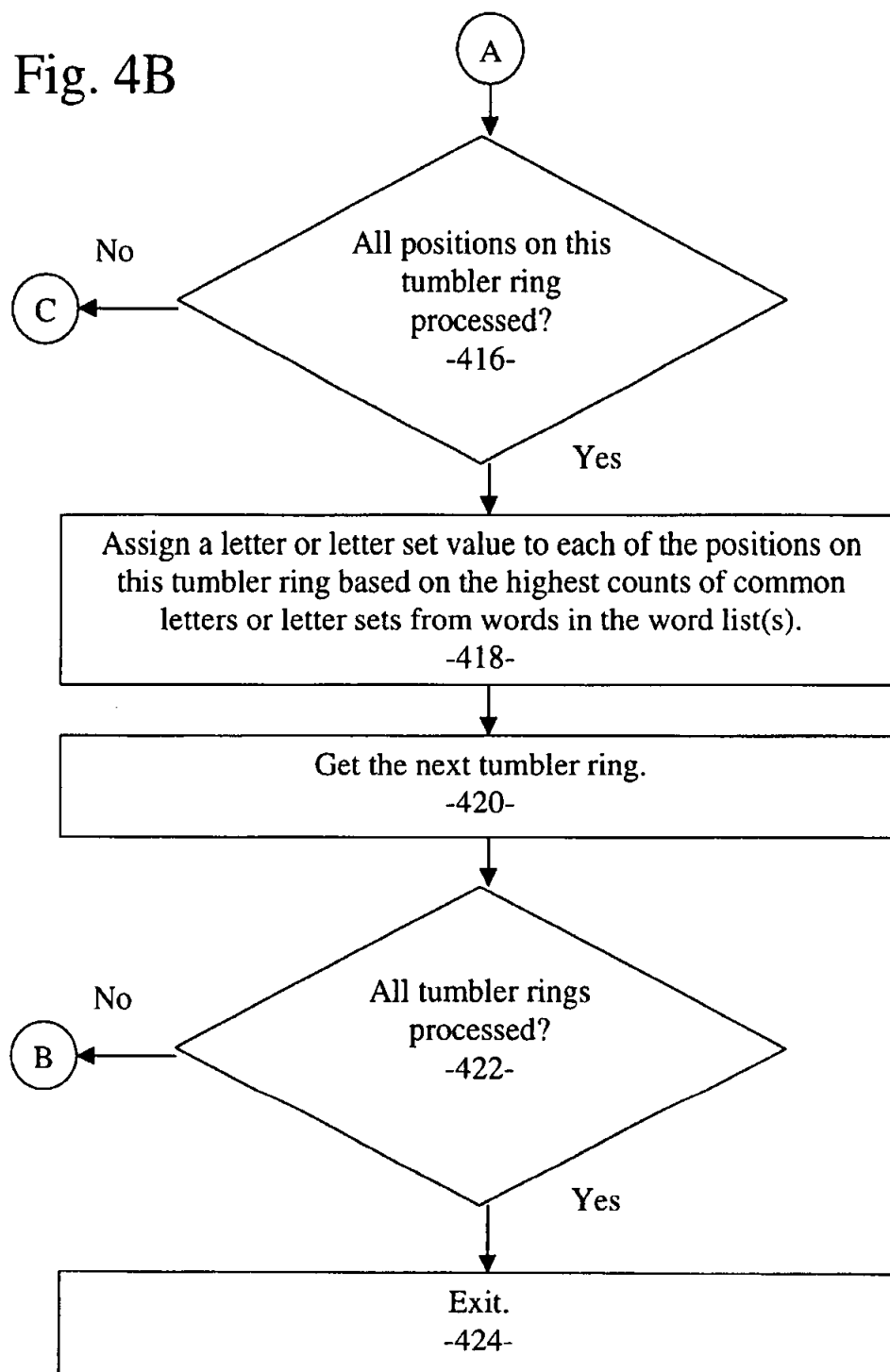


Fig. 4B



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CUSTOMIZABLE COMBINATION LOCKING SYSTEM USING TEXTUAL COMBINATIONS

FIELD OF THE INVENTION

The present invention relates to all combination locks in which the combination can be freely set or changed to any other combination by the user.

BACKGROUND OF THE INVENTION

Problem with Existing Numeric Combination Locks

Combination locks have existed for many years. The most common combination lock uses a fixed set of numbers that the user may choose from to select the desired combination. All existing commercially viable combination locks have used 10 tumbler positions and two, three, or four sets of these tumblers to make up the lock. The more tumbler positions there are, the larger the number of possible numeric combinations to choose from. However, all these numeric locks have the same problem. The user must remember a numeric code made up of two (00-99), three (000-999), or four (0000-9999) digits. These numbers have no meaning and are often difficult for the user to remember. Children and the elderly often forget the number they entered and stop using the lock.

Many people are dyslexic or have memory and cognitive limitations, and remembering 4 numerical digits would be very difficult. Recognizing that numbers are difficult to remember, U.S. Pat. No. 5,522,243 created a lock for which colors and symbols might be used for combinations in place of numbers.

Words are more Natural for People

For most people, especially children and the elderly, words are much easier to remember than numbers. Words are the natural way in which humans communicate with each other. However, creating a lock comprised of words has required lock mechanisms to have 26 tumbler positions (A-Z) (See U.S. Pat. No. 4,621,589). This would require a much more expensive lock hardware mechanism with 26 rather than 10 tumbler positions. Additionally these patents describe locks with one letter per tumbler position and would require many more sets of tumblers to contain enough letters to spell out words. The combination locks commercially available today all use ten tumbler positions (0-9) and no more than 4 tumblers (0000-9999) and has precluded the production of commercially viable locks using letters, to spell words.

No Ability to Customize

With existing lock mechanisms the user purchases the lock with the set of tumblers and numbers as supplied by the lock manufacturer. While the user can set or change the combination (U.S. Pat. No. 4,445,348, and others), they can only set or change it using the numbers supplied by the lock manufacturer. The numbers are fixed on a set of rings (denoted *tumbler rings herein*) which, in some locks can be adjusted to set a desired unlocking combination. A combination lock, once purchased is only able to be set to the digits between 0000 and 9999, in the case of a four-tumbler combination lock. Furthermore, there is no method of differentiating one combination lock from another, as they all contain the same 0000 to 9999.

DESCRIPTION OF THE RELATED ART

Many combination locks have been patented that allow the user to set and change the combination of numbers (see

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U.S. Pat. Nos. 4,445,348 and 5,109,684 and 4,615,191 etc.). These all describe combination locks with numbers. There have also been locks that allow the user to create words (see U.S. Pat. No. 4,621,589). These all describe combination locks that require 26 tumbler positions to create meaningful words. They also describe locks that would use one letter per tumbler position and would require many more than 4 tumblers to create meaningful words.

One lock describes the use of colors in an attempt to create a lock with combination that are easier to remember than numbers (U.S. Pat. No. 5,522,243)

SUMMARY OF THE INVENTION

The present invention is a customizable combination locking system using textual combinations. The principle object of the present invention is to provide a method to create a lock that is capable of being set in any desired set of letters that spells words that are easy for the user to remember. These words are supplied as a list and the tumbler positions are created from that list. The resultant lock would be commercially viable, as it will use existing standard lock mechanisms comprised of tumblers with ten positions (0-9) and two, three, or four tumblers.

The letters that appear in each of the ten positions have been selected through the described process. Having been selected, each lock is capable of being set to one of several thousand actual word combinations.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings, in which

FIG. 1 illustrates the prior art architecture of a conventional computer system used in the preferred embodiment to perform the process of the present invention.

FIG. 2 is an example of a table illustrating ten positions of the four tumbler rings with one letter per position.

FIG. 3 is an example of a table illustrating ten positions of the four tumbler rings with two letters per position.

FIGS. 4A and 4B are flowcharts illustrating the processing flow used in the preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is a customizable combination locking system using textual combinations. In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one of ordinary skill in the art that these specific details need not be used to practice the present invention. In other circumstances, well-known structures, materials, circuits, processes and interfaces have not been shown or described in detail in order not to unnecessarily obscure the present invention.

The Process of the Preferred Embodiment

By using the inventive process described herein, we can create a lock that uses tumbler rings having the standard ten position lock mechanisms, yet uses letters to spell out words. It will be apparent to those of ordinary skill in the art that the present invention works just as well with tumblers having a different number of positions.

The resultant locks can be used to produce, for example: Bike locks

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Locker locks

Briefcases with these locks built in

Lunch boxes with these locks built in

Backpack locks

A lock manufacturer, a third party, any individual, or any electronic means creates a list of desired words. This list of words can be, for example:

Random words

Sports teams names (basketball, baseball, football, etc.)

Movie characters (star wars, etc.)

Beanie baby names

Pokemon characters

Themes (computer words, fishing words, poetry, art terms, animals, psychology terms etc)

Different languages (Spanish, German, French, etc.)

The list of words is processed by the described method, and it creates the tumbler positions for the lock such that the lock now has the desired letters to be able to spell out the words contained in the supplied list. The resultant lock can then be set by the user into any of the hundreds or thousands of words contained in that specific list.

The method is also flexible enough to be able to produce tumbler rings with any quantity of letters in each position. For example, a lock with four tumblers, with one letter per tumbler ring could spell: C A T S (CATS), using one letter per position. If there are two letters per position the same lock could spell: CA TS RU LE (CATS RULE), still using only four tumblers. With three letters per position, the same lock could spell out: CAT SAR EGR EAT (CATS ARE GREAT), and still only use four tumblers.

Additionally, the method can produce entries for four tumbler locks comprised of one four letter word, one six letter word, two four letter words, or one eight letter word.

An example with one letter per position and four tumbler rings (as shown in FIG. 2), the lock can spell over 700 four-letter words:

WORD

SAME

FILM

CENT

FACE

LOCK

Etc.

The present invention also includes a method by which locks can be fully customized by the users. There are currently tens of millions of combination locks that are produced with plastic tumbler rings with the number positions engraved on them (e.g. See U.S. Pat. No. 4,445,348 or U.S. Pat. No. 5,109,684). These tumbler rings are removable as a way for the user to set and change the numerical combination. We describe a method whereby the tumbler rings can be produced with the different letters on them, thereby forming words in the various themes as described above. These tumbler rings can be sold to the owners of the existing locks to enable them to customize the existing locks from a numerical lock into a word lock with the theme of their choice.

Furthermore, the users could supply a list of their own words (random words, names of children on a sports team, names of children at a birthday party, etc) to a company, or web site. The company could then, using the described method, produce the resultant plastic tumbler rings that would create a lock that spelled the words supplied by the end user. This would allow for a fully customized/ personalized lock for that specific user.

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Description of the Method to Create the Tumbler Positions from the Supplied List or Lists

The goal of this process is to generate four tumbler rings, each containing ten positions, with each position containing a quantity of letters (1-N). The tumbler rings are optimized in such a way as to be able to spell the largest number of possible words from a supplied word list. This process can be used to produce tumbler rings that spell out:

A) 1 Four letter word (1 letter per position)

B) 2 Four letter words (2 letters per position), as shown in FIG. 3.

C) 3 Four letter words (3 letters per position)

D) 1 Six letter word (2 letters per position)

E) 2 Six letter words (3 letters per position)

F) 1 Eight letter word (2 letters per position)

G) 1 Twelve letter word (3 letters per position)

H) etc.

When the supplied list is a list of four (4) letter words, and the desired outcome is for one letter per position the process is as follows. The corresponding processing flow is also shown in FIGS. 4A and 4B.

Step 1. Generation of the Word List

A file is generated by some means, which contains a list of words, which are exactly four letters in length. This list is created by the user or by the manufacturer. For the desired theme (sports, movies, beanie babies, etc.), see above.

Step 2. Generation of Tumbler 1

The first tumbler will be used to spell the first letter of the word. The process to create the tumbler is as follows:

Step 2a. Generation of a Position

A position entry consists of one letter ranging from A to Z, which allows for a total of 26 position entries.

Step 2b. Frequency Counts Established

For each position entry, the entire word list is scanned to determine how many individual words start with the letter represented by the current position entry.

Step 2c. Highest 10 Frequencies Collected

A set of 10 position entries comprising the 10 highest frequency counts in descending order are selected for the positions 1 through 10 of this tumbler, respectively.

Step 3. Generation of Tumbler 2

The second tumbler will be used to spell the second letter of the word. The process to create the tumbler is as follows:

Step 3a. Generation of a Position

A position entry consists of one letter ranging from A to Z, which allows for a total of 26 position entries.

Step 3b. Frequency Counts Established

For each position entry, the entire word list is scanned to determine how many individual words have their second letter represented by the current position entry.

Step 3c. Highest 10 Frequencies Collected

A set of 10 position entries comprising the 10 highest frequency counts in descending order are selected for the positions 1 through 10 of this tumbler, respectively.

Step 4. Generation of Tumbler 3

The third tumbler will be used to spell the third letter of the word. The process to create the tumbler is as follows:

Step 4a. Generation of a Position

A position entry consists of one letter ranging from A to Z, which allows for a total of 26 position entries.

Step 4b. Frequency Counts Established

For each position entry, the entire word list is scanned to determine how many individual words have their third letter represented by the current position entry.

Step 4c. Highest 10 Frequencies Collected

A set of 10 position entries comprising the 10 highest frequency counts in descending order are selected for the positions 1 through 10 of this tumbler, respectively.

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Step 5. Generation of Tumbler 4

The fourth tumbler will be used to spell the fourth letter of the word. The process to create the tumbler is as follows:

Step 5a. Generation of a Position

A position entry consists of one letter ranging from A to Z, which allows for a total of 26 position entries.

Step 5b. Frequency Counts Established

For each position entry, the entire word list is scanned to determine how many individual words have their fourth letter represented by the current position entry.

Step 5c. Highest 10 frequencies Collected

A set of 10 position entries comprising the 10 highest frequency counts in descending order are selected for the positions 1 through 10 of this tumbler, respectively.

For the case where the desired outcome is to produce tumbler rings with two letters per position the process is as follows:

- I) The goal of this process is to generate 4 tumbler rings, each containing 10 positions, with each position containing a number of letters (1-N), in this example 2. The tumbler rings are optimized in such a way as to be able to spell the largest number of possible words or phrases from a supplied list of words or phrases.

Step 1. Generation of the Word List

A file is generated by some means, which contains a list of words, which are exactly 8 letters in length. This list is created by the lock manufacturer, a third party, any individual, or any electronic means. For the desired theme (sports, movies, beanie babies, etc, see above)

Step 2. Generation of Tumbler 1

The first tumbler will be used to spell the first two letters of the word or phrases. The process to create the tumbler is as follows:

Step 2a. Generation of a Tumbler Entries

A tumbler entry consists of a two-letter combination ranging from AA to ZZ, which allows for a total of 676 tumbler entries. All possible 676 tumbler entries are generated.

Step 2b. Frequency Counts Established

For each tumbler entry, the entire phrase list is scanned to determine how many individual words or phrases start with the two letters represented by the current tumbler entry.

Step 2c. Highest 10 Frequencies Collected

A set of 10 tumbler entries comprising the 10 highest frequency counts in descending order are selected for the positions 1 through 10 of this tumbler, respectively.

Step 3. Generation of the 2nd Tumbler

The second tumbler will be used to spell the third and fourth letters of the word or phrase. The process to create the tumbler is as follows:

Step 3a. Generation of a Tumbler Entries

A tumbler entry consists of a two-letter combination ranging from AA to ZZ, which allows for a total of 676 tumbler entries. All possible 676 tumbler entries are generated.

Step 3b. Frequency Counts Established

For each tumbler entry, the entire phrase list is scanned to determine how many individual phrases have third and fourth letters that match the two letters represented by the current tumbler entry.

Step 3c. Highest 10 Frequencies Collected

A set of 10 tumbler entries comprising the 10 highest frequency counts in descending order are selected for the positions 1 through 10 of this tumbler, respectively.

Step 4. Generation of the 3rd tumbler

The third tumbler will be used to spell the fifth and sixth letters of the phrases. The process to create the tumbler is as follows:

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Step 4a. Generation of a Tumbler Entries

A tumbler entry consists of a two-letter combination ranging from AA to ZZ, which allows for a total of 676 tumbler entries. All possible 676 tumbler entries are generated.

Step 4b. Frequency Counts Established

For each tumbler entry, the entire phrase list is scanned to determine how many individual phrases have fifth and sixth letters that match the two letters represented by the current tumbler entry.

Step 4c. Highest 10 Frequencies Collected

A set of 10 tumbler entries comprising the 10 highest frequency counts in descending order are selected for the positions 1 through 10 of this tumbler, respectively.

Step 5. Generation of the 4th Tumbler

The fourth tumbler will be used to spell the seventh and eighth letters of the phrases. The process to create the tumbler is as follows:

Step 5a. Generation of a Tumbler Entries

A tumbler entry consists of a two-letter combination ranging from AA to ZZ, which allows for a total of 676 tumbler entries. All possible 676 tumbler entries are generated.

Step 5b. Frequency Counts Established

For each tumbler entry, the entire phrase list is scanned to determine how many individual phrases have seventh and eighth letters that match the two letters represented by the current tumbler entry.

Step 5c. Highest 10 Frequencies Collected

A set of 10 tumbler entries comprising the 10 highest frequency counts in descending order are selected for the positions 1 through 10 of this tumbler, respectively.

Referring now to FIG. 1, a diagram illustrates an example of a computer system 200 illustrating an exemplary client or server computer system in which the features of the present invention may be implemented. Computer system 200 is comprised of a bus or other communications means 220 for communicating information, and a processing means such as processor 210 coupled with bus 220 for processing information. Computer system 200 further comprises a random access memory (RAM) or other dynamic storage device 225 (commonly referred to as main memory), coupled to bus 220 for storing information and instructions to be executed by processor 210. Main memory 225 also may be used for storing temporary variables or other intermediate information during execution of instructions by processor 210. Computer system 200 also comprises a read only memory (ROM) and/or other static storage device 226 coupled to bus 220 for storing static information and instructions for processor 210.

An optional data storage device 227 such as a magnetic disk or optical disk and its corresponding drive may also be coupled to computer system 200 for storing information and instructions. Computer system 200 can also be coupled via bus 250 to a display device 243, such as a cathode ray tube (CRT) or a liquid crystal display (LCD), for displaying information to a computer user. For example, textual or graphical depictions of lock tumblers or locking combinations and/or other types of graphical or textual information may be presented to the user on display device 243. Typically, an alphanumeric input device 242, including alphanumeric and other keys is coupled to bus 250 for communicating information and/or command selections to processor 210. Another type of user input device is cursor control device 241, such as a conventional mouse, trackball, or other type of cursor direction keys for communicating direction information and command selection to processor 210 and for controlling cursor movement on display 243.

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A communication device 240 is also typically coupled to bus 250 for accessing remote computers or servers, such as a World Wide Web (WWW) server, or other servers via the Internet, for example. The communication device 240 may include a modem, a network interface card, or other well known interface devices, such as those used for interfacing with Ethernet, Token-ring, or other types of networks. In any event, in this manner, the computer system 200 may be coupled to a server via a conventional network infrastructure such as the Internet.

The system of the present invention may include software, information processing hardware, and various processing steps, described above. The features and process steps of the present invention may be embodied in machine or computer executable instructions. The instructions can be used to cause a general purpose or special purpose processor, which is programmed with the instructions to perform the steps of the present invention. Alternatively, the features or steps of the present invention may be performed by specific hardware components that contain hard-wired logic for performing the steps, or by any combination of programmed computer components and custom hardware components. While embodiments of the present invention are described with reference to the exemplary conventional computer system described herein, the inventive method and apparatus described herein is equally applicable to other data processing or communications systems. Further, the present invention may be implemented manually without the aid of a computer or processor.

Thus, a customizable combination locking system using textual combinations is disclosed. Although the present invention is described herein with reference to a specific preferred embodiment, many modifications and variations therein will readily occur to those with ordinary skill in the art. Accordingly, all such variations and modifications are included within the intended scope of the present invention as defined by the following claims.

We claim:

1. A customizable combination locking method using textual combinations, said method comprising:

- a. defining a set of words in a first word list;
- b. determining the quantity of words from the first word list having common letters at each of a plurality of tumbler positions;
- c. assigning at least one letter to each of the plurality of tumbler positions on a tumbler ring based on the quantity of words from the first word list having corresponding common letters;
- d. repeating steps b and c for each of a plurality of tumblers, thereby producing a plurality of tumbler rings each having the plurality of assigned letters at each of the plurality of tumbler positions, said plurality of tumbler rings when appropriately aligned spelling out at least one word from the first word list, said at least one word representing an unlocking combination.

2. The method as claimed in claim 1 wherein each tumbler ring position is assigned a plurality of letters.

3. The method as claimed in claim 1 wherein each tumbler ring position is assigned a word from the first word list.

4. The method as claimed in claim 1 wherein each tumbler ring is replaceable.

5. The method as claimed in claim 1 wherein each word in the first word list is related to a common theme.

6. The method as claimed in claim 1 wherein each word in the first word list is obtained via the Internet.

7. The method as claimed in claim 1 further including:

- e. defining a set of words in a second word list, said first word list being used to assign at least one letter to a first

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set of at least one tumbler ring, the second word list being used to assign at least one letter to a second set of at least one tumbler ring.

8. A customizable combination locking method using textual combinations, said method comprising:

- a. defining a set of words in a first word list;
- b. defining a set of words in a second word list, said first word list being used to assign at least one letter to a first set of at least one tumbler ring, the second word list being used to assign at least one letter to a second set of at least one tumbler ring;
- c. determining a first quantity of words from the first word list having common letters at each of a plurality of tumbler positions for the first set of at least one tumbler ring;
- d. determining a second quantity of words from the second word list having common letters at each of a plurality of tumbler positions for the second set of at least one tumbler ring;
- e. assigning at least one letter to each of the plurality of tumbler positions on the first set of at least one tumbler ring based on the first quantity of words;
- f. assigning at least one letter to each of the plurality of tumbler positions on the second set of at least one tumbler ring based on the second quantity of words;
- g. repeating steps c, d, e, and f for each of a plurality of tumblers, thereby producing a plurality of tumbler rings each having the plurality of assigned letters at each of the plurality of tumbler positions, said plurality of tumbler rings when appropriately aligned spelling out at least one word from the first and second word lists, said at least one word representing an unlocking combination.

9. The method as claimed in claim 8 wherein each tumbler ring position is assigned a plurality of letters.

10. The method as claimed in claim 8 wherein each tumbler ring is replaceable.

11. The method as claimed in claim 8 wherein each word in the first word list is related to a first common theme and each word in the second word list is related to a second common theme.

12. The method as claimed in claim 8 wherein each word in the first and the second word list is obtained via the Internet.

13. A customizable combination locking system using textual combinations, said system having program logic for execution in a computer system, said program logic comprising:

- a. program logic configured to define a set of words in a first word list from which at least one unlocking combination is created;
- b. program logic configured to determine the quantity of words from the first word list having common letters at each of a plurality of tumbler positions;
- c. program logic configured to assign at least one letter to each of the plurality of tumbler positions on a tumbler ring based on the quantity of words from the first word list having corresponding common letters;
- d. program logic configured to repeat program logic b and c for each of a plurality of tumblers, thereby producing a plurality of tumbler rings each having the plurality of assigned letters at each of the plurality of tumbler positions, said plurality of tumbler rings when appropriately aligned spelling out at least one word from the first word list, said at least one word representing an unlocking combination.

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14. A machine-readable medium having instructions to cause a machine to perform a method, said method comprising:

- a. defining a set of words in a first word list;
- b. determining the quantity of words from the first word list having common letters at each of a plurality of tumbler positions;
- c. assigning at least one letter to each of the plurality of tumbler positions on a tumbler ring based on the quantity of words from the first word list having corresponding common letters;
- d. repeating steps b and c for each of a plurality of tumblers, thereby producing the plurality of tumbler rings each having the plurality of assigned letters at each of the plurality of tumbler positions, said plurality of tumbler rings when appropriately aligned spelling out at least one word from the first word list, said at least one word representing an unlocking combination.

15. The machine-readable medium of claim 14, wherein each tumbler ring position is assigned a plurality of letters.

16. The machine-readable medium of claim 14, wherein each tumbler ring position is assigned a word from the first word list.

17. The machine-readable medium of claim 14, wherein each tumbler ring is replaceable.

18. The machine-readable medium of claim 14, wherein each word in the first word list is related to a common theme.

19. The machine-readable medium of claim 14, wherein each word in the first word list is obtained via the Internet.

20. The machine-readable medium of claim 14, further comprising:

- e. defining a set of words in a second word list, said first word list being used to assign at least one letter to a first set of at least one tumbler ring, the second word list being used to assign at least one letter to a second set of at least one tumbler ring.

21. A machine-readable medium having instructions to cause a machine to perform a method, the method comprising:

- a. defining a set of words in a first word list;

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- b. defining a set of words in a second word list, said first word list being used to assign at least one letter to a first set of at least one tumbler ring, the second word list being used to assign at least one letter to a second set of at least one tumbler ring;

- c. determining a first quantity of words from the first word list having common letters at each of a plurality of tumbler positions for the first set of at least one tumbler ring;

- d. determining a second quantity of words from the second word list having common letters at each of a plurality of tumbler positions for a second set of at least one tumbler ring;

- e. assigning at least one letter to each of the plurality of tumbler positions on the first set of at least one tumbler ring based on the first quantity of words;

- f. assigning at least one letter to each of the plurality of tumbler positions on the second set of at least one tumbler ring based on the second quantity of words;

- g. repeating steps c, d, e, and f for each of a plurality of tumblers, thereby producing a plurality of tumbler rings each having the plurality of assigned letters at each of the plurality of tumbler positions, said plurality of tumbler rings when appropriately aligned spelling out at least one word from the first and second word lists, said at least one word representing an unlocking combination.

22. The machine-readable medium of claim 21, wherein each tumbler ring position is assigned a plurality of letters.

23. The machine-readable medium of claim 21, wherein each tumbler ring is replaceable.

24. The machine-readable medium of claim 21, wherein each word in the first word list is related to a first common theme and each word in the second word list is related to a second common theme.

25. The machine-readable medium of claim 21, wherein each word in the first and the second word list is obtained via the Internet.

* * * * *



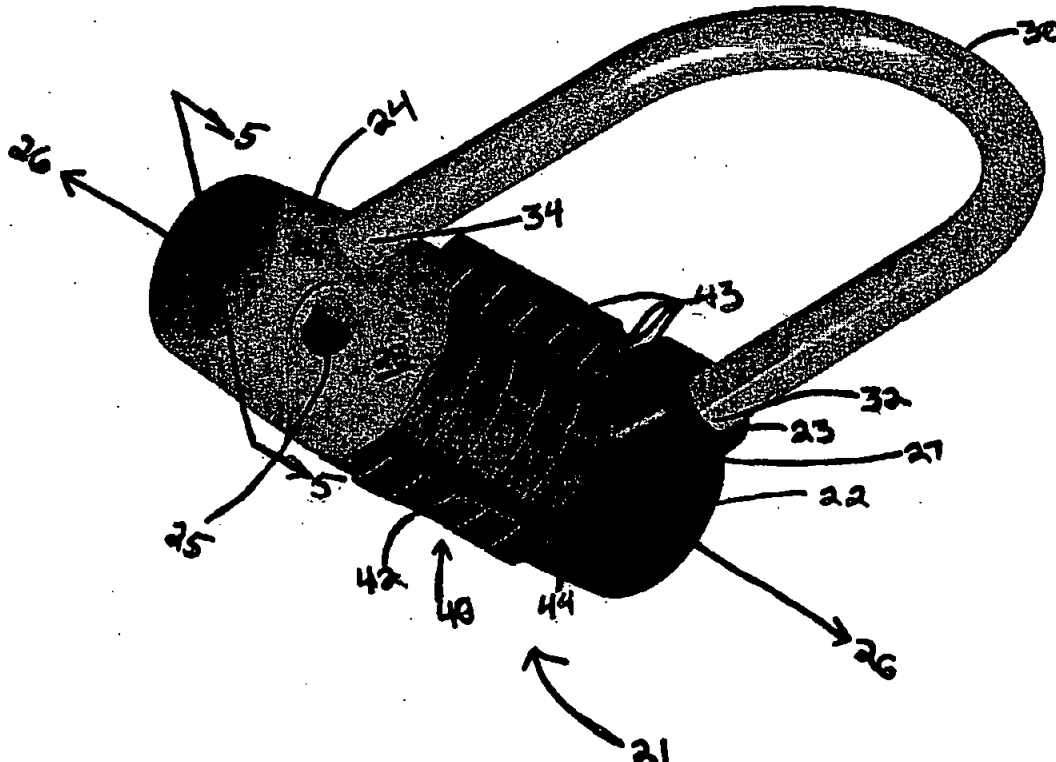
US 20060169007A1

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Framingham, MA**(21) **Appl. No.: 11/115,710**(22) **Filed: Apr. 27, 2005****Related U.S. Application Data**(60) **Provisional application No. 60/649,305, filed on Feb. 2, 2005.**(57) **ABSTRACT**

The invention is generally directed to a lock having a combination that may be reset by a user. The combination of the lock may be reset when a portion of the lock body is moved relative to another portion of the lock body, thereby moving the lock body from a lock position to a reset position. The lock may include a locking member, such as a shackle. One end of the locking member may be connected to a fixed portion of the lock body while the other end of the locking member may be connectable to a movable portion of the lock body. The lock may also include an unlocking member, such as a plurality of dials, that when aligned in an unlocking position, allow the lock to be opened. The unlocking position of the unlocking member may be reset when the lock body is in a reset position.



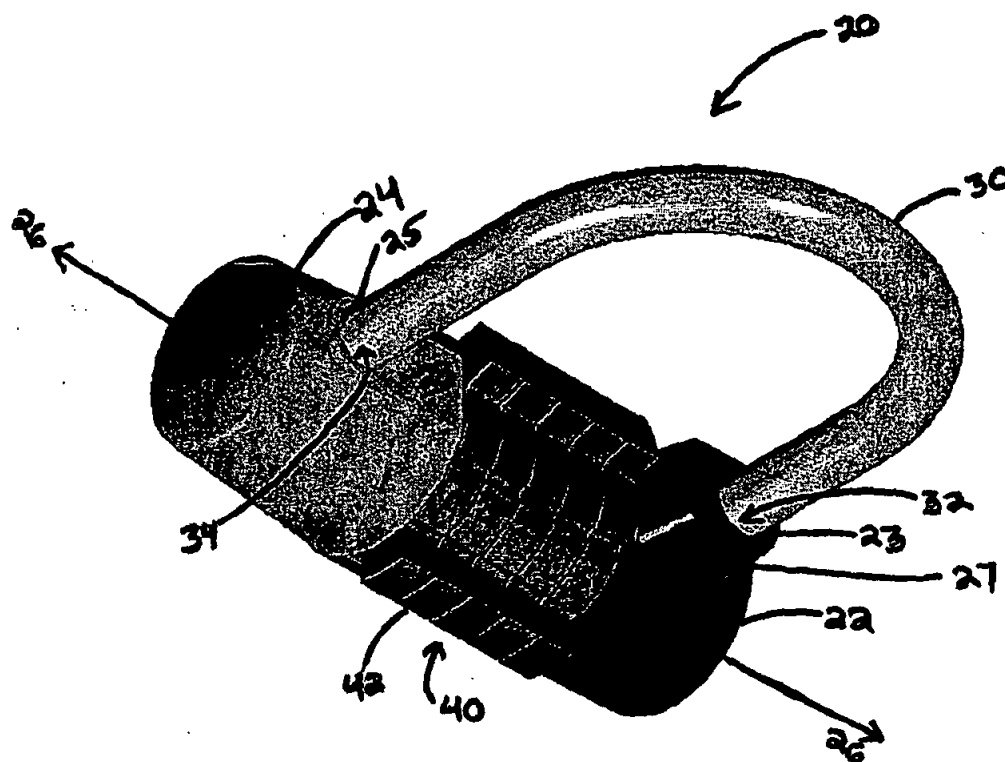


FIG. 1A

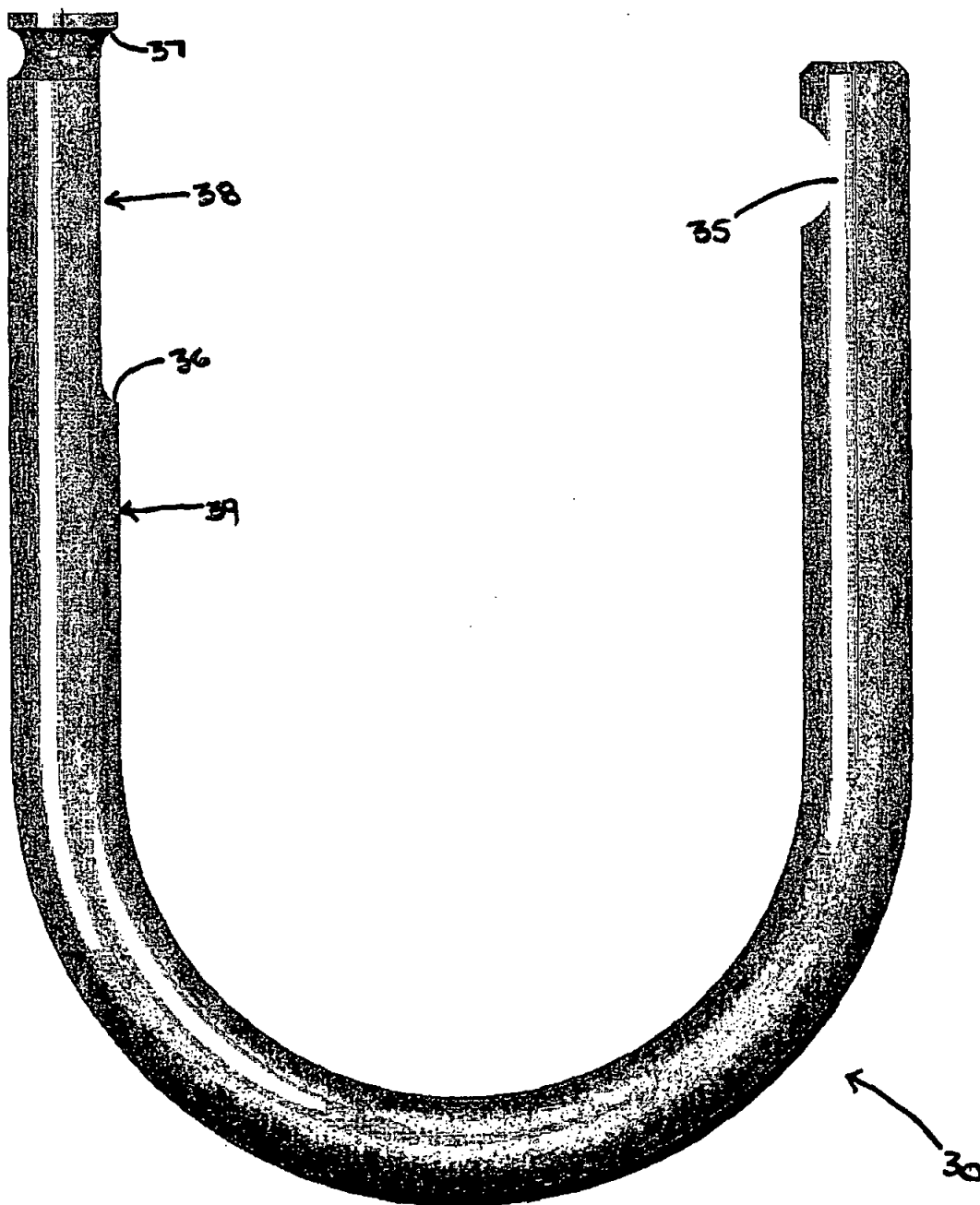


FIG. 2

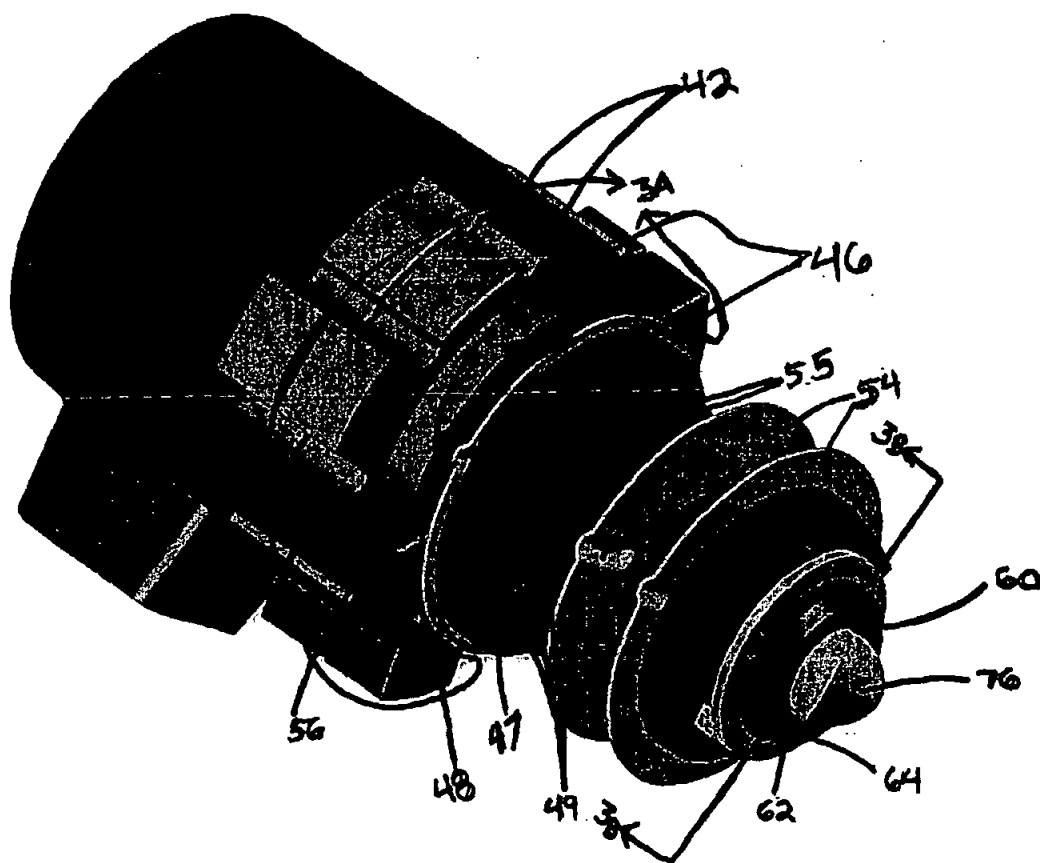


FIG. 3

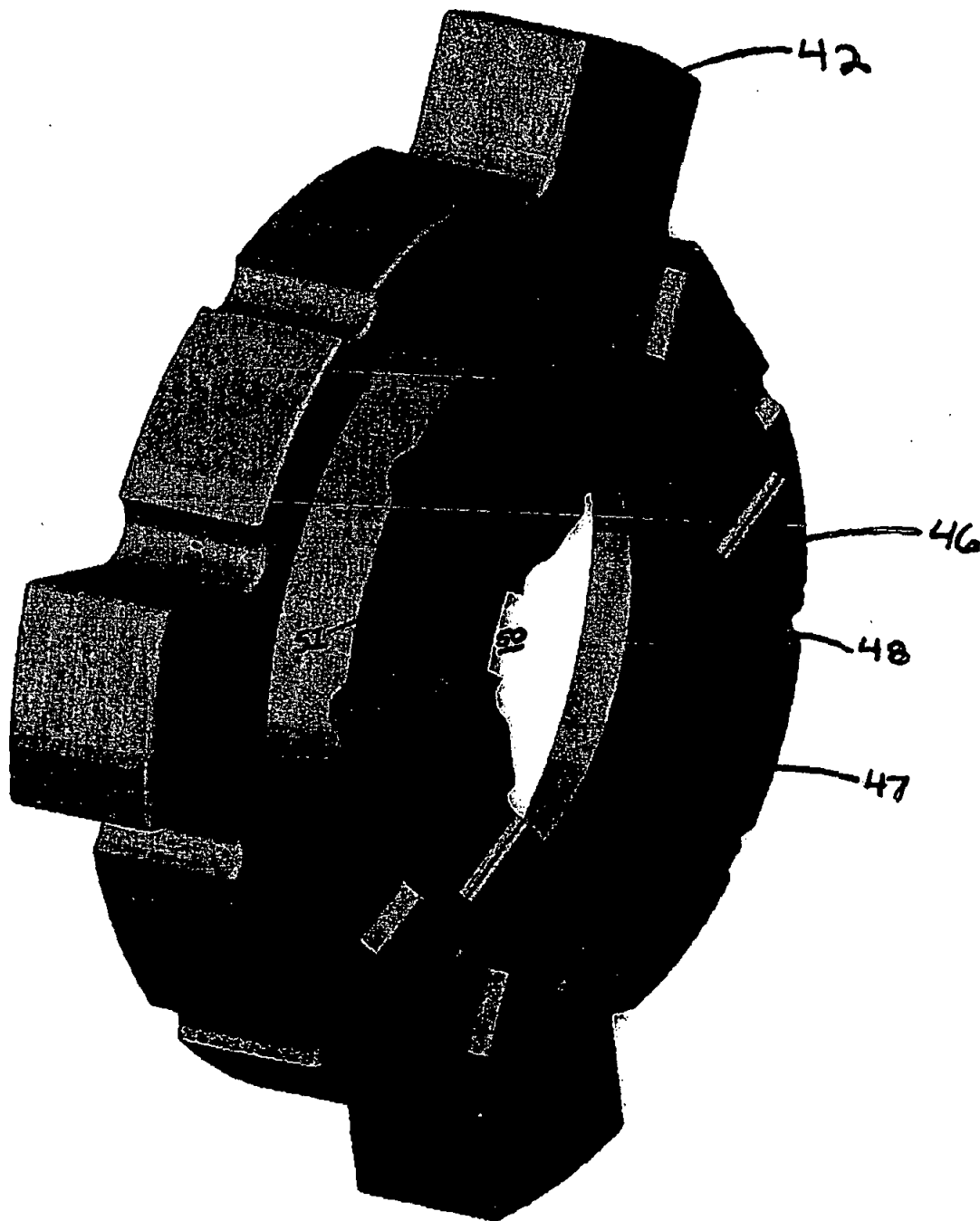


FIG. 3A

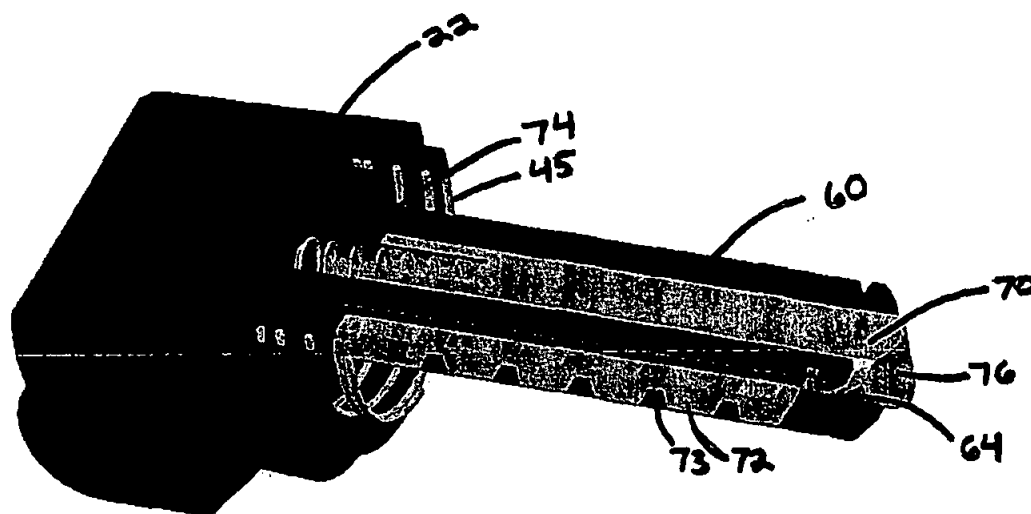


FIG. 3B

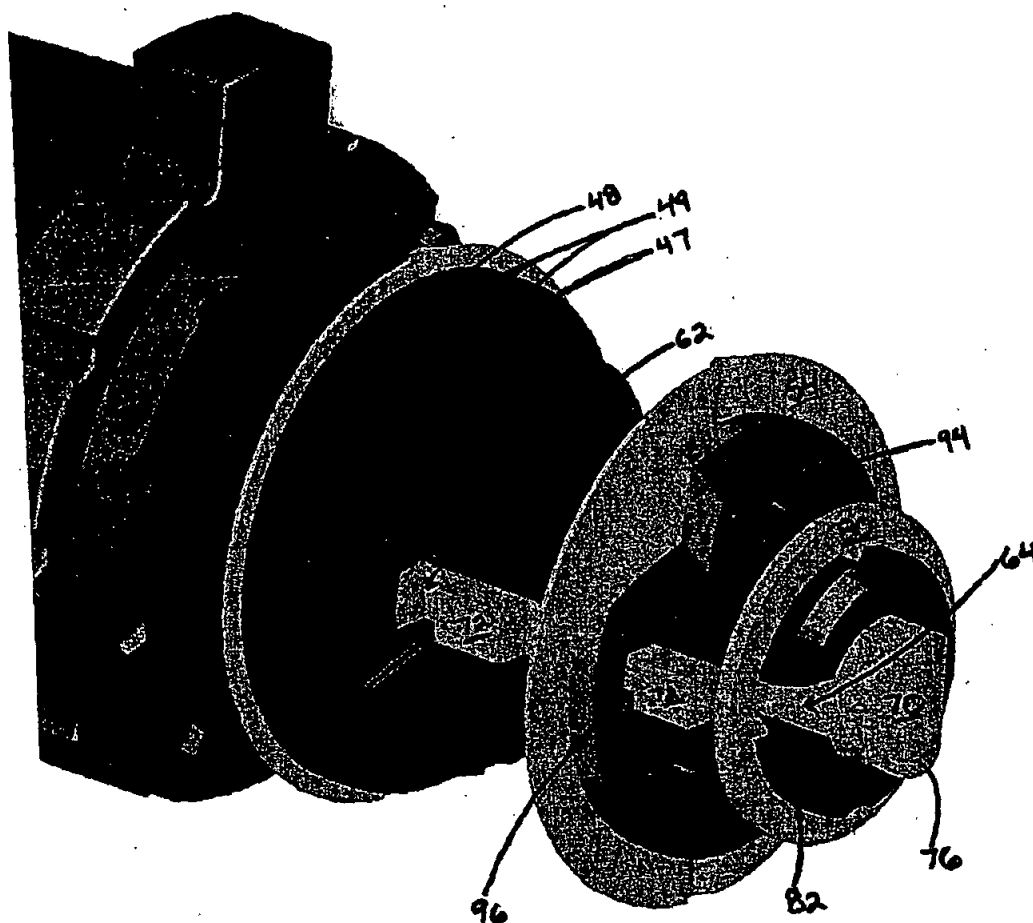


FIG. 4

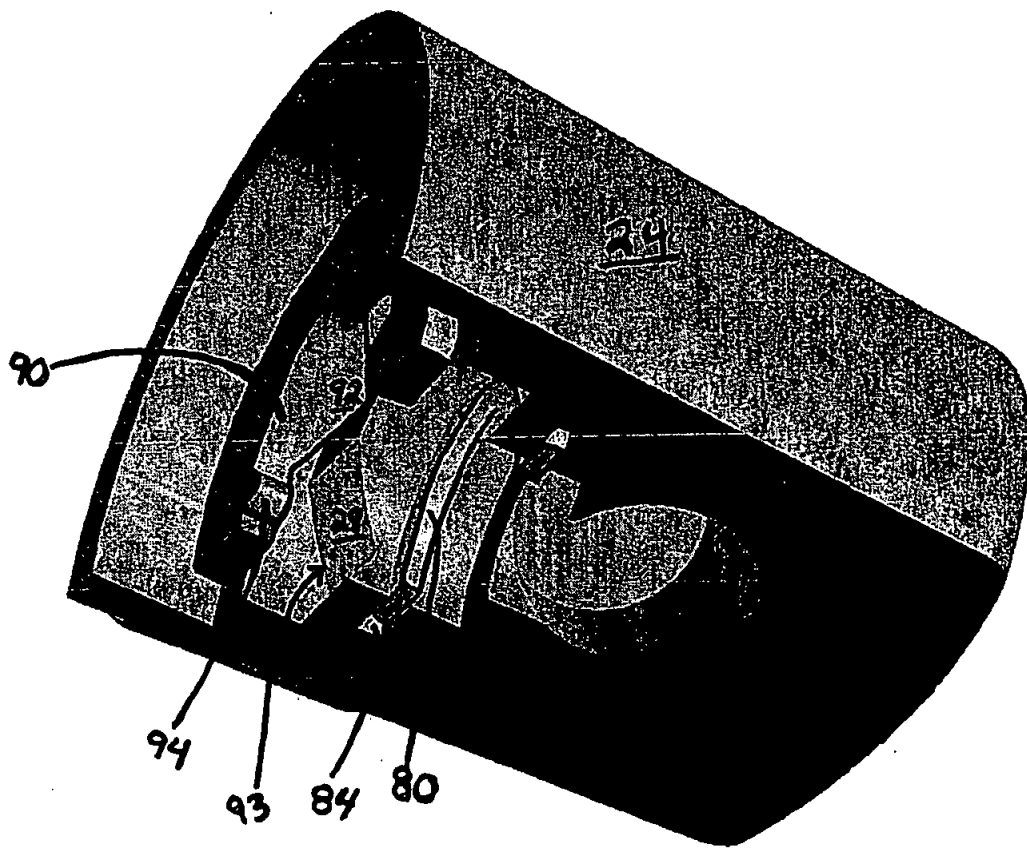


FIG. 5

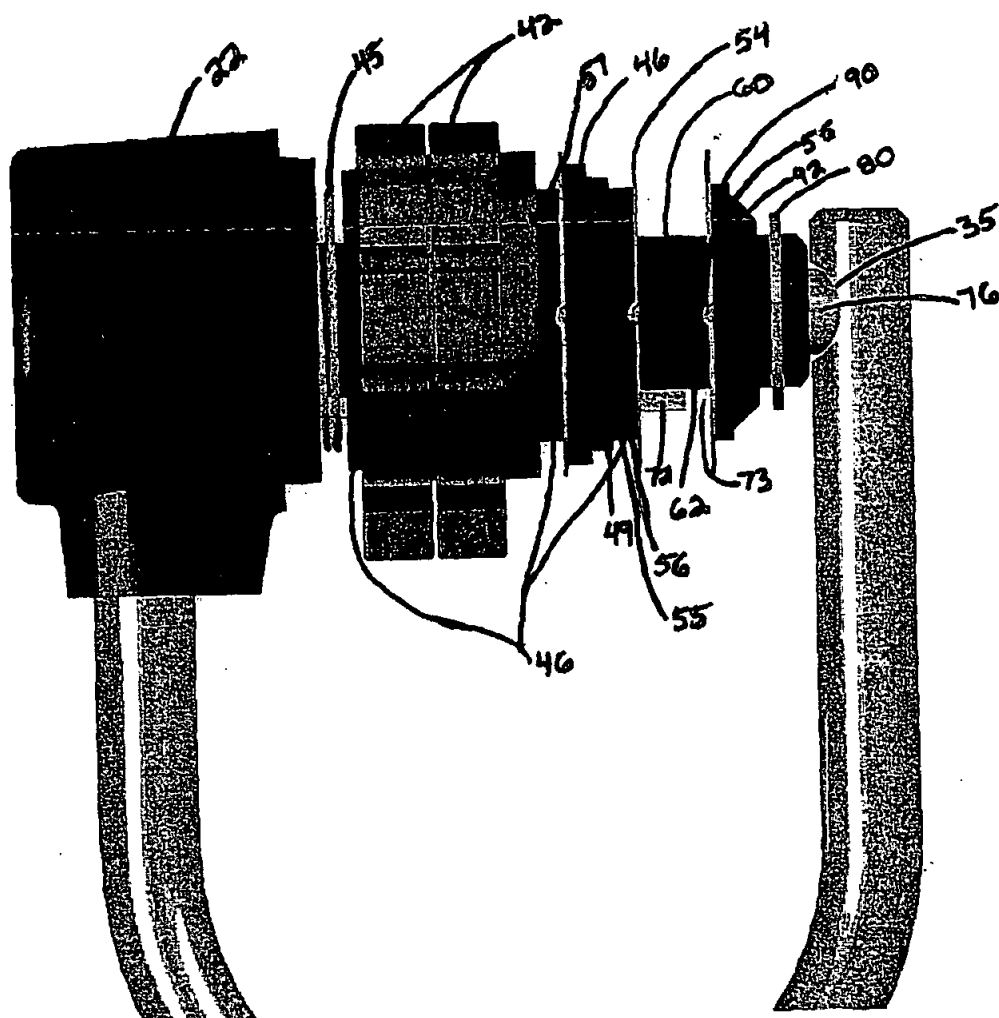


FIG. 6A

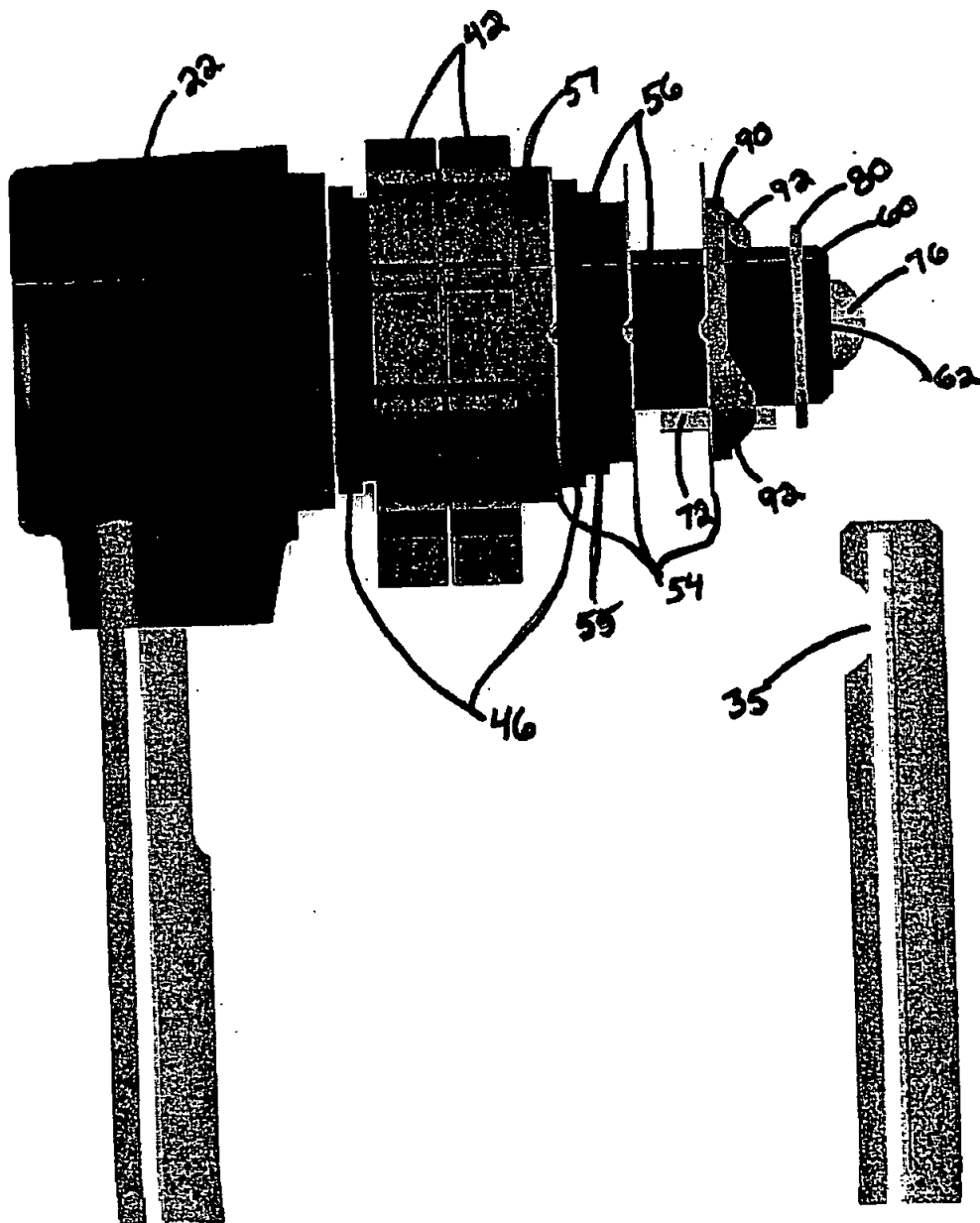


FIG. 6B

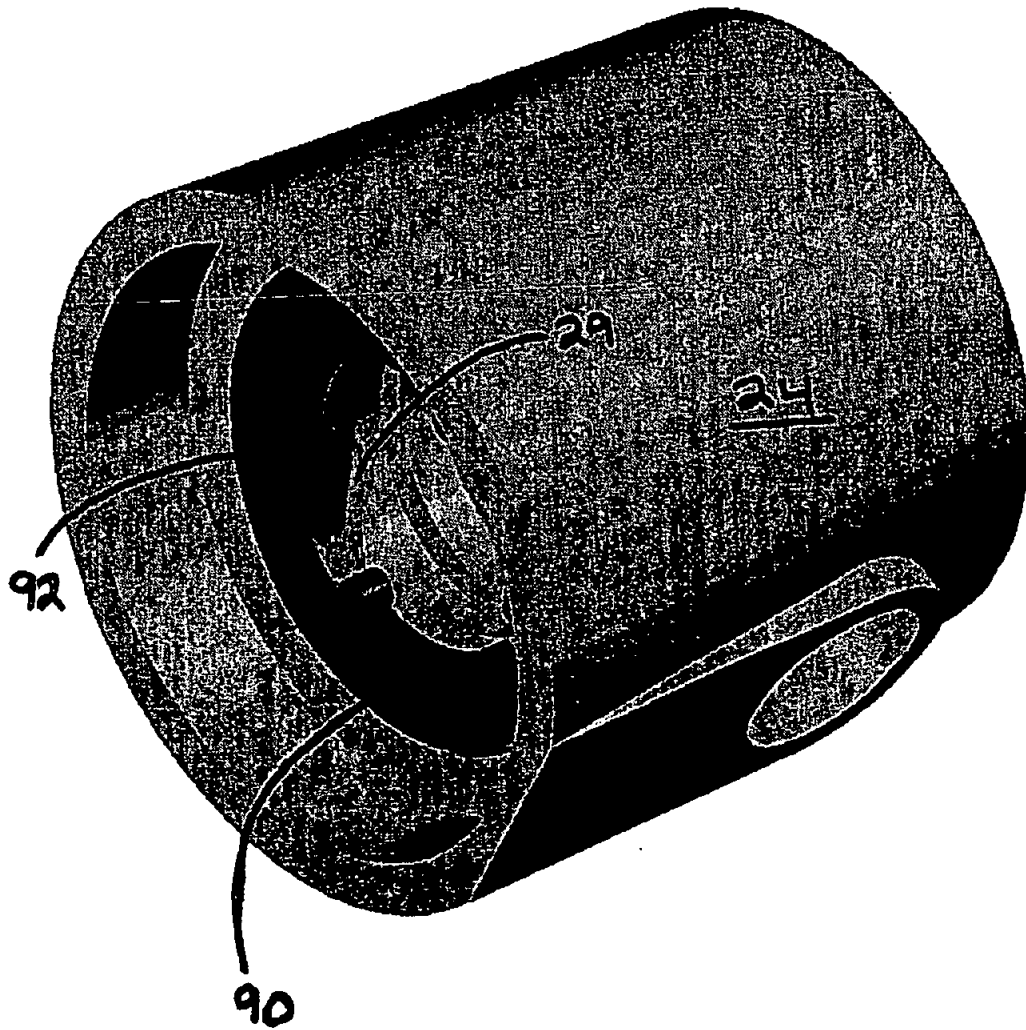


FIG. 7

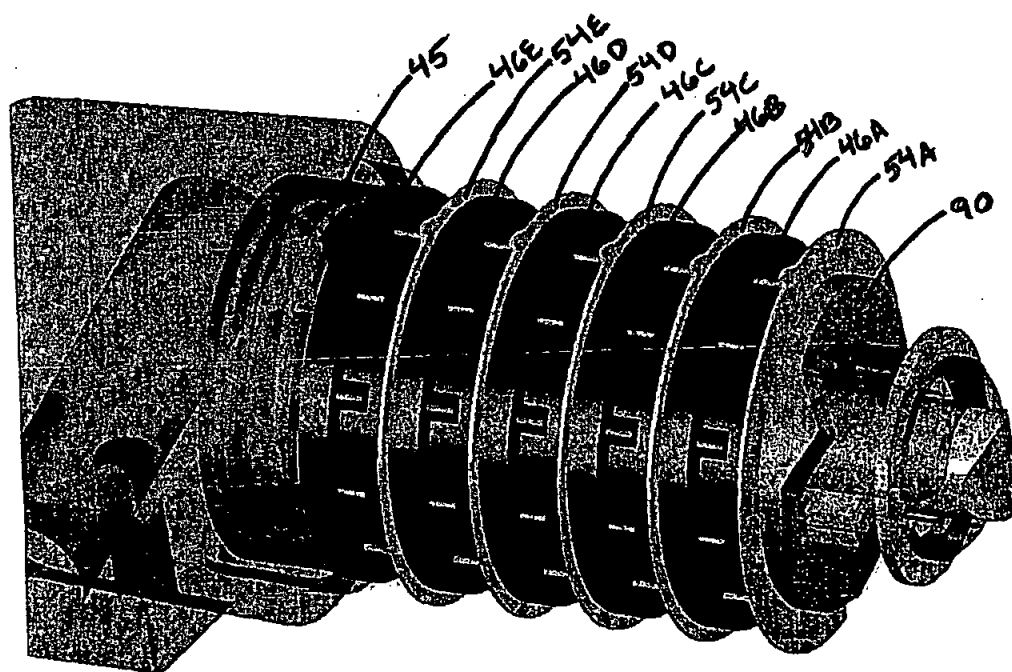


FIG. 8

RESETTABLE LOCK

RELATED APPLICATIONS

[0001] This application claims the benefit under 35 U.S.C. § 119(e) to U.S. Provisional Patent Application Ser. No. 60/649,305, entitled "Resettable Lock," filed on Feb. 2, 2005, which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention relates to locks, more particularly to a combination lock having a resettable combination and a method of resetting a combination lock.

BACKGROUND OF THE INVENTION

[0003] Numerous lock constructions have been developed and are widely employed by individuals to prevent unauthorized persons from gaining access to any area which has been closed and locked. Although many locks are constructed to be opened by a key, numerous combination locks have been developed which are opened by knowledge of a particular combination.

[0004] One particular type of combination lock that has become very popular due to its ease and convenience of use is a combination lock which employs a plurality of rotatable independent dials. On each dial are a plurality of indicia, usually numerals or letters, which may be chosen as a part of the combination for releasing the lock. The dial may be rotated into a variety of positions, however a 'clicking' mechanism may guide the user into discrete positions. Typically, each discrete position will correspond to one of the indicia. Typically, the combination lock has one mode or position in which the user is able to set or reset the desired combination sequence. Although locks of this general nature have been available for several decades, these prior art combination lock constructions suffer from common deficiencies which have not been successfully overcome.

[0005] Although many manufacturers have attempted to solve the problems associated with rotatable dial or combination locks, these prior art constructions have been unable to produce a lock construction which inhibits the lock from locking when the lock is in its combination set or reset position. As a result, the combination can be accidentally or inadvertently changed without the user becoming aware of the new combination.

[0006] Additionally, the resetting feature of most combination locks is an additional mechanical piece, such as a button or a key. The addition of such a feature may not only increase manufacturing costs, but provides an additional piece that could be damaged or lost, possibly rendering the lock worthless.

[0007] Another common problem with combination locks is that when the user is resetting the desired combination sequence, the 'clicking' feature of the lock, which guides the dials into the discrete positions, cannot be employed.

SUMMARY OF THE INVENTION

[0008] The present invention presents a novel lock that may be transformed into a reset position by moving a portion of the lock body. When the lock is in this reset position, the lock may not be accidentally or inadvertently locked. In

addition, the lock may have an unlocking member that when the combination or unlocking position is being reset or repositioned, enables the user to feel a 'clicking' or detent that guides the user into resetting the lock in one of the discrete positions.

[0009] According to one aspect, a combination lock is provided. The lock may include a lock body including a movable portion. A locking member may be connectable to the movable portion. When the movable portion is moved to a reset position, a combination of the lock is adapted to be reset.

[0010] According to another aspect, a lock is provided. The lock may include a locking member having a first end and a second end and being movable between an open position and a closed position. The lock may also include a lock body having a first lock body portion and a second lock body portion. The first end of the locking member may be connected to the first lock body portion and the second end of the locking member may be connectable to the second lock body portion. The lock body may be convertible between a lock position, wherein the first lock body portion is in a first configuration relative to the second lock body portion, and a reset position, wherein the first lock body portion is in a second configuration relative to the second lock body portion. The first configuration may be different from the second configuration. The lock may further include an unlocking member connected to the lock body. The unlocking member may be movable between an unlocking position and at least one locking position. The unlocking position of the unlocking member may be adapted to be repositioned when the lock body is in the reset position.

[0011] According to another aspect, a combination lock is provided. The combination lock may include a locking member having a first end and a second end and being movable between an open position and a closed position. The combination lock may further include a lock body having a first lock body portion and a second lock body portion. The first end of the locking member may be connected to the first lock body portion and the second end of the locking member may be connectable to the second lock body portion. The combination lock may also include an unlocking member connected to the lock body. The unlocking member may be movable between an unlocking position, at least one locking position and a repositioning position. When the unlocking member is in the repositioning position, the unlocking position of the locking member may be repositioned. The unlocking member may include a dial, a flange, and a shim. When the unlocking member is in the unlocking position or in the at least one locking position, the shim may directly engage the flange and the flange may directly engage the dial. When the unlocking member is in the repositioning position, the shim may directly engage the dial.

[0012] Various embodiments of the present invention provide certain advantages. Not all embodiments of the invention share the same advantages and those that do may not share them under all circumstances.

[0013] Further features and advantages of the present invention, as well as the structure of various embodiments of the present invention are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0014] The accompanying drawings are not intended to be drawn to scale. In the drawings, similar features are represented by like reference numerals. For purposes of clarity, not every component is labeled in every drawing. In the drawings:

[0015] **FIG. 1A** is a perspective view of an illustrative embodiment of a lock in a lock position;

[0016] **FIG. 1B** is a perspective view of the lock of **FIG. 1A** in a reset position;

[0017] **FIG. 2** is a perspective view of an illustrative embodiment of a locking member of a lock;

[0018] **FIG. 3** is a fragmented, perspective view of an illustrative embodiment of a lock having some components removed to better illustrate the interrelationship of certain components;

[0019] **FIG. 3A** is an enlarged, perspective view of some of the unlocking member components encircled by line 3A of **FIG. 3**;

[0020] **FIG. 3B** is a cross-sectional view of an illustrative embodiment of a portion of a lock body and a ram, taken along line 3B-3B of **FIG. 3**;

[0021] **FIG. 4** is a fragmented, perspective view of an illustrative embodiment of a lock having some components removed to better illustrate the interrelationship of certain components;

[0022] **FIG. 5** is an enlarged, cross-sectional view of an illustrative embodiment of a portion of a lock body, a pusher and a retaining ring, taken along line 5-5 of **FIG. 1B**;

[0023] **FIG. 6A** is a fragmented, side view of an illustrative embodiment of a lock in a lock position, the lock having some components removed to better illustrate the interrelationship of certain components

[0024] **FIG. 6B** is a fragmented, side view of the lock of **FIG. 6A** in a reset position, the lock having some components removed to better illustrate the interrelationship of certain components

[0025] **FIG. 7** is a perspective view of an interior of a portion of a lock body and a pusher, when the lock body is in a lock position; and

[0026] **FIG. 8** is a fragmented, perspective view of an illustrative embodiment of a portion of lock with a portion of a lock body shown in semi-transparency.

DETAILED DESCRIPTION OF THE INVENTION

[0027] This invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including," "comprising," or "having," "containing," "involving," and variations thereof herein, is meant to encompass the items listed thereafter and equivalents thereof as well as additional items.

[0028] Aspects of the invention are described below with reference to illustrative embodiments. It should be understood that reference to these illustrative embodiments is not made to limit aspects of the invention in any way. Instead, illustrative embodiments are used to aid in the description and understanding of various aspects of the invention. Therefore, the following description is intended to be illustrative, not limiting.

[0029] A lock is provided where the combination of the lock may be reset by moving at least a portion of the lock body relative to another portion of the lock body. One embodiment of the present invention is generally directed to a combination lock having a combination that may be reset. The combination of the lock may be reset when a portion of the lock body is moved relative to another portion of the lock body. The combination lock may include a lock body, locking member, such as a shackle or a cable, and an unlocking member, such as dials containing indicia thereon.

[0030] The shackle may have two ends, one of which is connected to the lock body and the other of which is connectable to the lock body. When both ends of the shackle are connected to the lock body, the shackle is in a closed position and the lock is locked. When one end of the shackle is disconnected from the lock body, the shackle is in an open position and the lock is unlocked. To disconnect one end of the shackle from the lock body and unlock the lock, the dials must be aligned in the combination of the lock. When the indicia are aligned to display the combination, the dials are in an unlocking position. When the indicia do not display the combination, the dials are in a locking position and the lock may not be unlocked.

[0031] The unlocking position of the dials (e.g., the combination of the lock) may be reset by a user by moving the lock body from a lock position into a reset position. This conversion may be accomplished by moving a moving portion of the lock body relative to a fixed portion of the body. In one embodiment, this conversion may be accomplished by rotating the movable portion relative to the fixed portion.

[0032] In one embodiment, the unlocking member may include at least one dial, at least one flange and at least one shim. The dial is constructed and arranged so that a user can control the positioning of the dial. The flange is constructed and arranged so that when the lock is being locked or unlocked, the dial controls the positioning of the flange and when the lock is being reset, the dial does not control the positioning of the flange. The shim is constructed and arranged so that when the lock is being locked or unlocked, the shim clicks the flange into position and when the lock is being reset, the shim clicks the dial into position.

[0033] The aspects of the present invention may be employed singularly or in any suitable combination as the present invention is not limited in this respect. Also, any or all of these aspects may be employed in a lock, such as a combination lock; however, the present invention is not limited in this respect, as aspects of the invention may be used in cable locks (e.g., where the locking member is a cable), button locks (e.g., where the unlocking member includes buttons), keypad locks (e.g., where the unlocking member includes a keypad) or with any other locks, including other locks employing any electronic or mechanical elements. Various aspects and embodiments of the invention

will now be described in more detail with respect to the accompanying figures. The invention is not, however, limited to the aspects and embodiments shown. In some of the figures that follow, specific numerical values are used to describe the numbers of elements and/or performance/size parameters. It should be appreciated that such values are not necessarily limiting, but rather, are merely exemplary only.

[0034] As can be seen in the embodiments shown in FIGS. 1A and 1B, lock 20 may include a lock body 21 having a first lock body portion 22 and a second lock body portion 24, a locking member, such as a shackle 30, and an unlocking member 40, which may include dials 42. Lock body 21, which may also be described as, for example, a lock housing or casing, may be selectively and repeatedly convertible between a lock position, as is shown in the embodiment depicted in FIG. 1A, and a reset position, as is shown in the embodiment depicted in FIG. 1B. The locking member may be repeatedly convertible between an open position, as is shown in the embodiment depicted in FIG. 1B, and a closed position, as is shown in the embodiment depicted in FIG. 1A.

[0035] Lock body 21 may have a generally cylindrical shape and may define a lock axis 26. Lock axis 26 may be the axis about which second lock body portion 24 rotates when converting lock body 21 between the lock position and the reset position. Lock axis 26 may also run generally perpendicular to direction in which locking member 30 moves when traveling between the open position and the closed position.

[0036] First lock body portion 22 may have a generally cylindrical shape and include a first inlet 23 into which a portion of the locking member may be inserted. First inlet 23 may be located in a raised portion 27 of first lock body portion 22, as shown in FIGS. 1A & 1B, may be flush with the major surface of first lock body portion 22 (not shown) or may be located in an indented portion of the first lock body portion (not shown), as the present invention is not intended to be limiting in this manner.

[0037] Second lock body portion 24 may also have a generally cylindrical shape and include a second inlet 25 into which another portion of the locking member may be inserted. Although second inlet 25 is shown relatively flush with a major surface 28 of second lock body portion 24, the second inlet may be located in a raised or indented portion of the second lock body portion. It should be appreciated that the lock body and the lock body portions may have any shape, such as cubical, pyramidal, spherical or any other shape, and the lock body portions need not have similar shapes to one another, as the present invention is not limited in this respect.

[0038] In one embodiment, second lock body portion 24 is the moving portion of the lock body and first lock body portion 22 is the fixed portion of the lock body.

[0039] As shown in FIGS. 1A and 1B, the locking member may be a shackle 30 having a U or J shape. As alluded to above, shackle 30, which may also be described as, for example, a hook, hasp or fastener, may have a first portion, such as a first end 32, which may be connected to first lock body portion 22, and a second portion, such as a second end 34, which may be connectable to second lock body portion 24. First end 32 may contain a first lip 36 and a second lip

37. First lip 36 may be positioned to abut the outside of first inlet 23 when shackle 30 is in the closed position; second lip 37 may be positioned to abut the inside of first inlet 23 when shackle 30 is in the open position. Although in FIG. 2, lips 36, 37 may be created by carving out a portion 38 of shackle 30 between the two lips, it should be appreciated that the lips may protrude out of major surface 39 the locking member (not shown). Second end 34 may contain a divot 35 into which the head of the ram will be inserted, as will be explained below.

[0040] When the locking member is in the closed position, as is shown in the embodiment depicted in FIG. 1A, first end 32 is connected to first lock body portion 22 via first inlet 23 and second end 34 is connected to second lock body portion 24 via second inlet 25. When the locking member is in the open position, first end 32 is connected to first lock body portion 22 via first inlet 23 and second end 34 is not connected to second lock body portion 24. First end 32 of the locking member may be inhibited from disconnecting completely from first lock body portion 22 by second lip 37 abutting against the inside of first inlet 23.

[0041] In order to move locking member 30 from the closed position to the open position, unlocking member 40 must be in the correct unlocking position. As shown in the embodiments of FIGS. 1A and 1B, unlocking member 40 may include dials 42, which may also be described as, for example, tumblers, rings, discs, wheels, sleeves, or knobs. Dials 42 may be donut-like rings that rotate independently about lock axis 26. Each dial 42 may have indicia 43 located thereon in discrete locations, such that when dial 42 is rotated, indicia 43 rotate with dial 42 and, resultantly, indicia 43 change positions. Indicia 43 may be letters, numbers, ciphers, symbols, colors, patterns, textures, any combination thereof, or any marking or indicator that is distinguishable from another marking or indicator, as the present invention is not intended to be limiting in this respect. To facilitate rotating and positioning of dials 42, dials 42 may include a raised portion 44 or another form of grip or texture, as the present invention is not limited in this respect. Although in the embodiments depicted in many of the accompanying figures, there are five dials, it should be appreciated that there may be one, two, three, four, five, ten or any number of dials, as the present invention is not limited in this respect.

[0042] As is shown in the embodiment represented in FIG. 3, unlocking member 40 may also include flanges 46, which may also be described as, for example, cups, rolls, discs, dials, sleeves, clutches, rings or actuating members. Flanges 46 may be donut-like rings that rotate about lock axis 26 independently from one another. Although in the embodiments depicted in many of the accompanying figures, there are five flanges, it should be appreciated that there may be one, two, three, four, five, ten or any number of flanges, as the present invention is not limited in this respect. Additionally, although in the embodiments depicted there are the same number of dials as there are flanges, it should be appreciated that there may be additional flanges or dials as the present invention is not intended to be limiting in this respect.

[0043] When the lock is in the lock position, as shown in FIGS. 1A and 3, each flange 46 may be connected to a dial 42. As is shown in enlarged unlocking member in FIG. 3A, dial 42 may have a dial engaging feature, such as holes 51,

that engages a flange engaging feature, such as projections 49, such that when dial 42 is turned, flange 46 turns therewith. Spring 45 may bias flanges 46 towards engagement with dials 42.

[0044] Each flange 46 may have a first portion 47 having a smaller circumference than a second portion 48 having a larger circumference. The larger size of second portion 48 may inhibit spring 45 from biasing flange 46 towards moving completely through dial 42, as second portion 48, in combination with the flange engaging feature, will obstructed by the inside of dial 42. The smaller size of first portion 47, however, allows it to pass completely through dial 42 to engage a shim 54. Additionally, the inside of second portion 48 of flange 46 may have a larger diameter than the inside of first portion 47 of flange 46, thereby creating a cavity 59 in which teeth 72 may be allowed to rotate freely, as will be explained further below.

[0045] Because the shim, which may also be described as, for example, a spacer, snap means or detenter, is constructed to assist in positioning the dial and the flange, it is desirable for at least one of flange 46 and dial 42 to engage shim 54. Shim 54 may be a disc that is stamped with a shim mating feature, such as detents 56. The shim mating feature may be constructed to engage with a flange mating feature, such as notches 55, which may be located on first portion 47 of flange 46. Detents 56 and notches 55 may guide flange 46 to 'click' into a discrete number of positions, allowing the user to know when flange 46 is in one of the discrete number of positions. Without detents 56 and notches 55, it may be very difficult and time consuming for a user to try to manually maneuver flange 46 (via manipulating dial 42) into one of a nearly infinite number of positions. It should be appreciated, however, that this is a feature of some embodiments of the present invention and is not intended to be a required feature of all embodiments. The shim mating feature may also be constructed to engage with a dial mating feature, such as notches 57 (the purpose of which will be explained below with respect to repositioning the unlocking member).

[0046] To inhibit shim 54 from rotating about lock axis 26 with flange 46 or dial 42 when flange 46 and/or dial 42 are rotated, shim 54 may have a tongue-like projection 58 adapted to fit into a groove 62 in an intermediate lock body portion 60. Although groove 62 may inhibit shim 54 from turning about lock axis 26, groove 62 may allow tongue 58 to slide along groove 62, thereby enabling shim 54 to move along lock axis 26. It should be appreciated that the above description is one illustrative method of inhibiting rotation of an element about an axis while allowing movement along the axis and may be accomplished by a variety of constructions, as the present invention is not intended to be limiting in this manner.

[0047] It should also be appreciated that the above description is one illustrative embodiment of an unlocking member and the function of the unlocking member (e.g. controlling the locking and unlocking of the lock) may be performed by a variety of structures, such as buttons, switches, keys, any other control, or any combination thereof, as the present invention is not intended to be limiting in this respect.

[0048] As can be seen in the embodiments in FIGS. 3 and 4, intermediate lock body portion 60 may be a tube and may be formed integrally with first lock body portion 22, such

that when second lock body portion 24 moves relative to first lock body portion 22, second lock body portion 24 may also move relative to intermediate lock body portion 60. Intermediate lock body portion 60 may have at least one groove 62 running along one side thereof and an opening 64 along another side thereof. Opening 64 may be adapted to accommodate teeth 72 of a ram 70.

[0049] As shown in the embodiments depicted in FIGS. 3B and 4, ram 70, which may also be described as, for example, a dead bolt, lock shaft, stop rod, locking bolt or toothed rod, may be a cylinder centered about lock axis 26. Teeth 72 may project radially along one side of ram 70 and through opening 64 in intermediate lock body portion 60. Ram 70 may be adapted to slide along the inside of intermediate lock body portion 60, while teeth 72 are free to move along opening 64. Teeth 72 may extend beyond opening 64 and abut flanges 46.

[0050] As shown in the embodiment depicted in FIG. 4, shim 54 and first portion 47 of flange 46 may have alcoves 52, 50 adapted to accommodate teeth 72. As will be explained further below, when first portion 47 of flange 46 is positioned in a space 73 between teeth 72 and teeth 72 are located in cavity 59 underneath second portion 48 of flange 46, flange 46 may rotate relatively unrestrained about lock axis 26. When teeth 72 are in an alcove 50 of a flange 46, however, that flange 46 may be inhibited from rotating about lock axis 26.

[0051] In one embodiment, the number of teeth 72 may correspond to the number of dials 42 and flanges 46 and/or alcoves 50. In an alternative embodiment, some of the dials may be 'dummy dials' in that they need not be correctly positioned for the lock to open. Therefore, there may be fewer teeth than dials 42 and flanges 46, as the present invention is not intended to be limiting in this respect.

[0052] As can be seen in FIG. 3B, ram 70 may further have a spring 74 at one end that biases ram 70 towards second lock body portion 24 and away from first lock body portion 22. In one embodiment, when spring 74, which may also be described as, for example, an elastic or biasing member, is extended and ram 70 is biased towards second lock body portion 24, flanges 46 may rotate unrestrained by teeth 72, as teeth 72 will be positioned in cavity 59 underneath second portion 48 of flange 46. Ram 70 may not be able to be moved against the spring bias, however, until alcoves 50 of flanges 46 are positioned about spaces 73, so that teeth 72 may be slid into alcoves 50, as will be explained further below.

[0053] Ram head 76 is located at the non-spring end of ram 70. Ram head 76 may be constructed to engage divot 35 in second end 34 of shackle 30. Spring 74 biases ram head 76 to remain engaged with divot 35, thereby inhibiting shackle 30 from being removed from second lock body portion 24. The above-described functions of the ram, teeth and ram head may be accomplished by a variety of constructions and arrangements and the present invention is not intended to be limited in this respect.

[0054] Because ram 70 may be spring biased to inhibit ram 70 from coming too far or completely out of intermediate lock body portion 60, an instrument for retaining the ram in intermediate lock body portion 60 may be utilized. In one embodiment, a retaining ring 80 may be used to inhibit

ram 70 from exiting intermediate lock body portion 60. Retaining ring 80 may be fixedly attached to intermediate lock body portion 60 and may contain a lip 82. Lip 82 may fit into and block a portion of opening 64, thereby inhibiting teeth 72 from coming out of intermediate lock body portion 60. Further, to maintain a connection between second lock body portion 24 and the other parts of the lock, second lock body portion 24 may have a ring-receiving cavity 84 into which retaining ring 80 may fit. These functions may be performed by a variety of structures, such as a stop that is attached to the intermediate lock body portion 70 (not shown) located in opening 64 and/or in ring-receiving cavity 84, as the present invention is not intended to be limiting in this respect.

[0055] In one embodiment, as is depicted in FIGS. 4 and 5, a pusher 90 may be positioned to be pushed by second lock body portion 24 when second lock body portion 24 is moved relative to first lock body portion 22. Pusher 90, which may also be described as, for example, an actuator, push ring or urging member, may have at least one tongue 94 adapted to fit into groove 62, to inhibit pusher 90 from rotating about lock axis 26. Although, as described above with respect to the shim, this function may be accomplished by a variety of constructions and arrangements as the present invention is not intended to be limited in this respect.

[0056] Pusher 90 may also have a ramp 92 adapted to engage with a ramp 29 of second lock body portion 24. As is shown in the embodiment depicted in FIG. 7, when the lock is in the lock position, ramp 92 is flush with ramp 29. When the lock is moved from the lock position (shown in FIG. 7) to the reset position (shown in FIG. 5), ramp 29 of second lock body portion 24 and ramp 92 of pusher 90 may abut against one another, causing pusher 90 to move farther away from second lock body portion 24. Again, this function may be accomplished by a variety of structures and arrangements as the present invention is not intended to be limiting in this respect.

[0057] Pusher 90 may abut at least a portion of the unlocking member and transmit the pushing force onto the portion of the unlocking member, causing the portion of the unlocking member to move farther away from second lock body portion 24. As can be seen in the embodiment of FIG. 8, pusher 90 abuts shim 54A, such that when pusher 90 is pushed away from second lock body portion 24, shim 54A is pushed along intermediate lock body portion 60, pushing some of the other pieces of the unlocking member (e.g., flanges 46A, 46B, 46C, 46D, and 46E and other shims 54B, 54C, 54D, and 54E), against the bias of spring 45.

[0058] It should be appreciated that a variety of elements may cause at least a portion of the unlocking member to shift away from second lock body portion 24 when second lock body portion 24 is moved relative to first lock body portion 22. For example, the shim nearest to the second lock body portion may have a surface against which second lock body portion 24 may push, as the present invention is not intended to be limiting in this respect.

[0059] As can be seen in the embodiment of FIG. 4, pusher 90 may also have an alcove 96 for teeth 72 of ram 70.

[0060] The mechanics of how the lock works will now be explained. As described briefly above, the lock body may be convertible between a lock position, as shown in the

embodiment of FIG. 1A, and a reset position, as shown in the embodiment of FIG. 1B. The locking member or shackle 30 may be movable between a closed position, as shown in the embodiment depicted in FIG. 1A, and an open position, as shown in the embodiment depicted in FIG. 1B. Additionally, unlocking member 40 may be movable between an unlocking position (not shown), at least one locking position, as shown in the embodiment of FIG. 6A, and a repositioning position, as shown in the embodiment of FIG. 6B. When the lock body is in the lock position, the locking member may be in either the open or the closed position and the unlocking member may be in either the unlocking or a locking position. When the lock body is in the reset position, the locking member may be in the open position and the unlocking member may be in the repositioning position.

[0061] As is shown in the embodiments depicted in FIGS. 1A, 3, 6A and 7, the lock is in a lock position, the locking member is in a closed position and the unlocking member is in a locking position. In these embodiments: first lock body portion 22 is in a first configuration relative to second lock body portion 24; first and second inlets 23, 25 of lock body 21 may be aligned about lock axis 26; first lip 36 of shackle 30 may be abutting the outside of first inlet 23; spring 45 may be extended, thereby pushing flange 46 into dial 42 so that the flange engaging feature may be engaging the dial engaging feature (e.g., projections 49 of flanges 46 may be in holes 51 of dials 42); the shim mating feature may be engaging the flange mating feature (e.g., detents 56 of shims 54 may be in notches 55 of flanges 46); spring 74 of ram 70 may be extended, such that ram 70 may be biased towards second lock body portion 24; ram head 76 may be inserted into divot 35 of shackle 30, so that shackle 30 may not be disconnected from lock body 21; teeth 72 may be located in cavities 59 underneath second portions 48 of flanges 46 and first portions 47 of flanges 46 may be located in spaces 73 in-between teeth 72, so that flanges 46 may rotate uninhibited by teeth 72; and ramp 92 of pusher 90 may be flush with ramp 29 of second lock body portion 24.

[0062] To move the unlocking member from a locking position to the unlocking position, a user may turn dials 42 until all of the dials are aligned in the unlocking combination (i.e., indicia 43e aligned in the unlocking combination). As the user turns each dial 42, flange 46 will turn with that dial 42, because the flange engaging feature may be engaged with the dial engaging feature (e.g., projections 49 of flange 46 may be in holes 51 of dial 42, as can be seen in FIG. 3A). As flange 46 turns, detents 56 of shim 54 may periodically engage notches 55 of the flange, thereby guiding dial 42 and flange 46 into one of the discrete number of positions. When dials 42 have been guided in to an unlocking position, such that each alcove 50 of each flange 46 is aligned over a space 73, teeth 72 can move into alcoves 50, thereby allowing ram 70 to move against the bias of spring 74 and towards first lock body portion 22. Once ram 70 is able to move towards first lock body portion 22, ram head 76 may disengage with divot 35 of shackle 30 and second end 34 of shackle 30 may be pulled out of second lock body portion 24.

[0063] To enable a user to choose a different unlocking combination of indicia, the lock body may be moved from the lock position to a reset position, allowing the relationship between the flange and the dial to be repositioned. The second lock body portion may be moved relative to the first lock body portion, thereby moving the second lock body

portion into a second configuration relative to the first lock body portion. In one embodiment, the second lock body portion may be rotated about lock axis 26. For example, second lock body portion 24 may be rotated so that second inlet 25 is 45° offset from first inlet 23, as is shown in the embodiment in FIG. 1B. It should be appreciated that the second lock body portion may be rotated less than 45° or more than 45° as the present invention is not intended to be limited in this respect. Additionally, the second lock body portion need not be rotated about the lock axis, but may be moved in another way, such as moving along the lock axis, displacement from the lock axis or any other movement relative to another portion of the lock body as the present invention is not intended to be limited in this respect.

[0064] It should be appreciated that in the embodiment, such as is shown in FIG. 1B, wherein second inlet 25 is moved out of alignment with second end 34 of the locking member, the lock may not be accidentally locked. That is, second end 34 of shackle 30 may not be inserted into second inlet 25 because the two pieces are out of alignment. If the locking member were moved towards second lock body portion 24, it would contact the surface of the lock body and not be aligned to enter second inlet 25.

[0065] As shown in the embodiments depicted in FIGS. 1B, 4, 5 and 6B, second lock body portion 24 may be rotated about lock axis 26 relative to first lock body portion 22 and/or relative to intermediate lock body portion 60. As second lock body portion 24 is rotated, ramp 29 of second lock body portion 24 moves against ramp 92 of pusher 90. Because retaining ring 80 holds second lock body portion 24 fixed with respect to intermediate lock body portion 60 and pusher 90 cannot rotate with second lock body portion 24 due to tongues 94 being in grooves 62, pusher 90 is pushed along intermediate lock body portion 60. As can be seen in the embodiment depicted in FIG. 8, as pusher 90 is moved, it pushes against shim 54A, which pushes against flange 46A, which pushes against shim 54B, which pushes against flange 46B, which pushes against shim 54C, which pushes against flange 46C, which pushes against shim 54D, which pushes against flange 46D, which pushes against shim 54E, which pushes against flange 46E, which pushes against the bias of spring 45. As long as second lock body portion 24 remains in the reset position, the shims and flanges may remain pushed away from second lock body portion 24 in a repositioning position.

[0066] When shims 54 and flanges 46 are pushed, dials 42 disengage from flanges 46 and dials 42 remain in the same position relative to first lock body portion 22 and/or intermediate lock body portion 60. In one embodiment and as is shown in the embodiment depicted in FIG. 1B, dial 42 nearest to first lock body portion 22 abuts first lock body portion 22, such that dials 42 may not move any closer to first lock body portion 22. As flanges 46 are pushed, projections 49 of flanges 46 may extricate themselves out of holes 51 of dials 42, thereby disengaging flange 46 from dial 42. In addition, as flanges 46 are pushed towards first lock body portion 22, alcoves 50 are pushed onto teeth 72. As discussed above, when alcoves 50 are on top of teeth 72, flanges 46 may not rotate. As such, flanges 46 are fixed in their unlocking alignment, while dials 42 are able to be repositioned. Therefore, a user may reposition dials 42 into a new unlocking combination without worrying that flanges 46 are accidentally rotating with dials 42.

[0067] As shims 54 are pushed towards first lock body portion 22, detents 56 of shims 54 may engage with notches 57 of dials 42. Hence, when the user repositions dials 42, dials 42 will be 'clicked' or guided into one of the discrete positions and the user will not accidentally reposition dials 42 in an unlocking position that is in-between desired discrete positions.

[0068] Once the user has chosen a new unlocking combination (i.e., dials 42 have been repositioned with respect to flanges 46), the second lock body portion may be moved from the second configuration back into the first configuration, thereby converting the lock body from the reset position into the lock position. In one embodiment, as second lock body portion 24 is rotated about lock axis 26 so that first and second inlets 23, 25 are aligned, ramp 29 of second lock body portion 24 may be realigned with ramp 92 of pusher 90. As soon as ramp 92 may move with the spring bias (e.g., into opening 93 in front of ramp 29), spring 45, which has been compressed and has been exerting pressure against flanges 46, shims 54 and pusher 90, may push flanges 46, shims 54 and pusher 90 away from first lock body portion 22, thereby pushing ramp 92 into opening 93 in front of ramp 29 (as can be seen in the embodiment depicted in FIG. 5). As flanges 46 and shims 54 are pushed, the flange engaging features (e.g., projections 49) reengage the dial engaging features (e.g., holes 51), the dial mating feature (e.g., notches 57) disengages the shim mating feature (e.g., detents 56), and second portions 48 of flanges 46 move over teeth 72, such that teeth 72 are in cavities 59 under second portions 48 and alcoves 50, 52 are aligned with spaces 73.

[0069] It should be appreciated that any materials, such as metals, plastics, rubbers, woods, foams, or any other material, may be used to make any of the components of the lock. Further, some components may be made from one material while other components may be made from another material or one component may be made from more than one material, as the present invention is not intended to be limiting in this respect.

[0070] It should be appreciated that a variety of features employed in the art of locks may be used in combination with or to modify the above-described features and embodiments.

[0071] The foregoing written specification is to be considered to be sufficient to enable one skilled in the art to practice the invention. While the best mode for carrying out the invention has been described in detail, those skilled in the art to which this invention relates will recognize various alternative embodiments including those mentioned above as defined by the following claims. The examples disclosed herein are not to be construed as limiting of the invention as they are intended merely as illustrative of particular embodiments of the invention as enabled herein. Therefore, systems and methods that are functionally equivalent to those described herein are within the spirit and scope of the claims appended hereto. Indeed, various modifications of the invention in addition to those shown and described herein will become apparent to those skilled in the art from the foregoing description and fall within the scope of the appended claims.

What is claimed is:

1. A combination lock comprising:

a lock body including a movable lock body portion, a locking member being connectable to the movable lock body portion, the lock body defining a lock axis;

wherein when the movable lock body portion is rotated about the lock axis to a reset position, a combination of the lock is adapted to be reset.

2. The combination lock of claim 1, wherein the lock body further includes a fixed lock body portion being connected to the locking member, wherein when the movable lock body portion is rotated relative to the fixed lock body portion, the combination of the lock is adapted to be reset.

3. The combination lock of claim 1, wherein when the movable lock body portion is in the reset position, the movable lock body portion is adapted not to be connected to the locking member.

4. A lock comprising:

a locking member;

a lock body having a first lock body portion and a second lock body portion, a first end of the locking member being connected to the first lock body portion, a second end of the locking member being connectable to the second lock body portion, the lock body defining a lock axis, the lock body being convertible from a lock position to a reset position by rotating the second lock body portion about the lock axis relative to the first lock body portion; and

an unlocking member connected to the lock body, the unlocking member being movable between an unlocking position and at least one locking position;

wherein the unlocking position of the unlocking member is adapted to be repositioned when the lock body is in the reset position.

5. The lock of claim 4, wherein the locking member includes a shackle and the first end of the shackle is movably disposed within the first lock body portion and the second end of the shackle is insertable into the second lock body portion.

6. The lock of claim 4, wherein the lock body includes a first inlet on the first lock body portion and a second inlet on the second lock body portion, the first end of the locking member being inserted into the first inlet and the second end of the locking member being insertable into the second inlet, and wherein when the lock body is in the lock position, the first and second inlet are aligned about the lock axis and when the lock body is in the reset position, the second inlet is rotated about the lock axis relative to the first inlet.

7. The lock of claim 6, wherein when in the reset position, the second inlet is rotated approximately 45 degrees about the lock axis from the first inlet.

8. The lock of claim 4, wherein the unlocking member includes at least one flange and at least one dial having at least two indicia, the at least one flange detachably engaging the at least one dial.

9. The lock of claim 8, wherein the unlocking member further includes at least one shim, wherein when the lock body is in the lock position, the at least one shim directly engages the at least one flange and the at least one flange directly engages the at least one dial, and wherein when the

lock body is in the reset position, the at least one shim directly engages the at least one dial.

10. The lock of claim 8, wherein when the lock body is in the lock position, the at least one shim assists in aligning the at least one flange, and wherein when the lock body is in the reset position, the at least one shim assists in aligning the at least one dial.

11. The lock of claim 4, wherein when the lock body is in the reset position, the second end of the locking member is inhibited from being inserted into the second lock body portion.

12. The lock of claim 4, further comprising a pusher, the second lock body portion being adapted to move relative to the pusher as the lock body is moved from the lock position to the reset position.

13. A combination lock comprising:

a locking member;

a lock body having a first lock body portion and a second lock body portion, a first end of the locking member being connected to the first lock body portion, a second end of the locking member being connectable to the second lock body portion; and

an unlocking member connected to the lock body, the unlocking member being movable between an unlocking position, at least one locking position and a repositioning position, wherein when the unlocking member is in the repositioning position, the unlocking position of the locking member may be repositioned, the unlocking member including a dial, a flange, and a shim, the shim including a shim mating feature and the dial including a dial mating feature;

wherein when the unlocking member is in the unlocking position or in the at least one locking position, the shim mating feature directly engages the flange to guide the flange into at least one of a discrete number of flange positions and the flange directly engages the dial, and when the unlocking member is in the repositioning position, the shim mating feature directly engages the dial to guide the dial into at least one of a discrete number of dial positions.

14. The combination lock of claim 13, wherein the dial has at least one dial mating feature and the flange has at least one flange mating feature, wherein when the unlocking member is in the unlocking position or in the at least one locking position, the at least one shim mating feature matingly engages the at least one flange mating feature, and wherein when the unlocking member is in the repositioning position, the at least one shim mating feature matingly engages the at least one dial mating feature.

15. The combination lock of claim 14, wherein the at least one shim mating feature is a detent and the at least one flange mating feature and the at least one dial mating feature are notches.

16. The combination lock of claim 14, wherein the dial has at least one dial engaging feature and the flange has at least one flange engaging feature, and wherein when the unlocking member is in the unlocking position or in the at least one locking position, the at least one flange engaging feature engages the at least one dial engaging feature.

17. The combination lock of claim 16, wherein the at least one dial engaging feature is not the same feature as the at

least one dial mating feature and the at least one flange engaging feature is not the same feature as the at least one flange mating feature.

18. (canceled)

19. The combination lock of claim 13, further comprising a ram adapted to control a connection between the second end of the locking member and the second lock body portion, wherein when the second end of the locking member is connected to the second lock body portion and when the unlocking member is in the at least one locking position, the flange inhibits the ram from permitting the second end of the locking member from disconnecting with the second lock body portion, and wherein when the second end of the

locking member is connected to the second lock body portion and when the unlocking member is in the unlocking position, the flange allows the ram to permit the second end of the locking member to disconnect with the second lock body portion.

20. The combination lock of claim 19, wherein when the unlocking member is in the repositioning position, the ram inhibits the flange from moving, and wherein when the unlocking member is in the at least one locking position, the ram does not prevent the flange from moving.

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UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

2011-1195 – IN RE XIAO

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I, Jie Xiao, hereby certified that I served one original copy and eleven facsimile copies of Joint Appendix to the United States Court of Appeals for the Federal Circuit on June 18, 2011.

I hereby certified that I also served two copies of Joint Appendix to Office of the Solicitor, U.S. Patent and Trademark Office on June 18, 2011 by mail at US post office, addressed as follows:

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Respectfully,

A handwritten signature in black ink, appearing to be 'Jie Xiao', written over a horizontal line.

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