United States Patent

McGourty

[15] **3,667,261**

[45] **June 6, 1972**

[54] PUSH BUTTON DOOR LOCK

[72] Inventor: **Thomas K. McGourty**, Aptos, Calif.

[73] Assignee: **Time Research Development Corporation**

[22] Filed: **Jan. 8, 1971**

[21] Appl. No.: **104,871**

[52] **U.S. Cl.** **70/301**, 70/214, 70/313, 70/318

[51] **Int. Cl.** **E05b 37/16**

[58] **Field of Search** 70/301, 313, 306, 302, 303, 70/318

[56] **References Cited**

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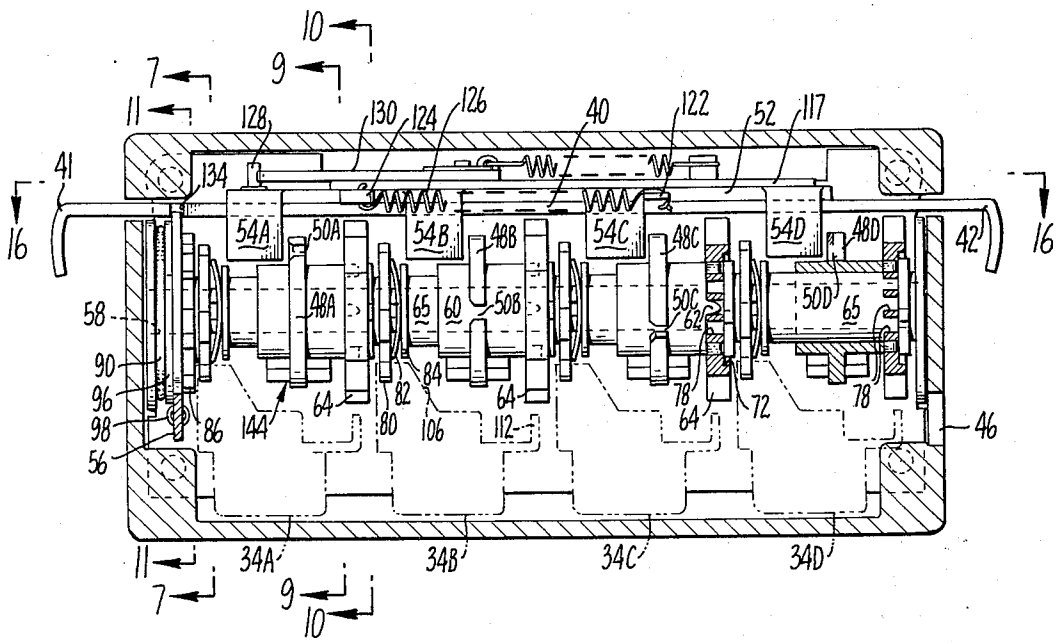
Primary Examiner—Albert G. Craig, Jr.

Attorney—Ecknoff & Hoppe

[57] **ABSTRACT**

A compact push button lock is provided which can be used as a door lock, automobile lock or for various other purposes. The lock has a large number of permutations and permits the owner to set the lock to a new combination without disassembling the lock or the use of tools.

5 Claims, 26 Drawing Figures



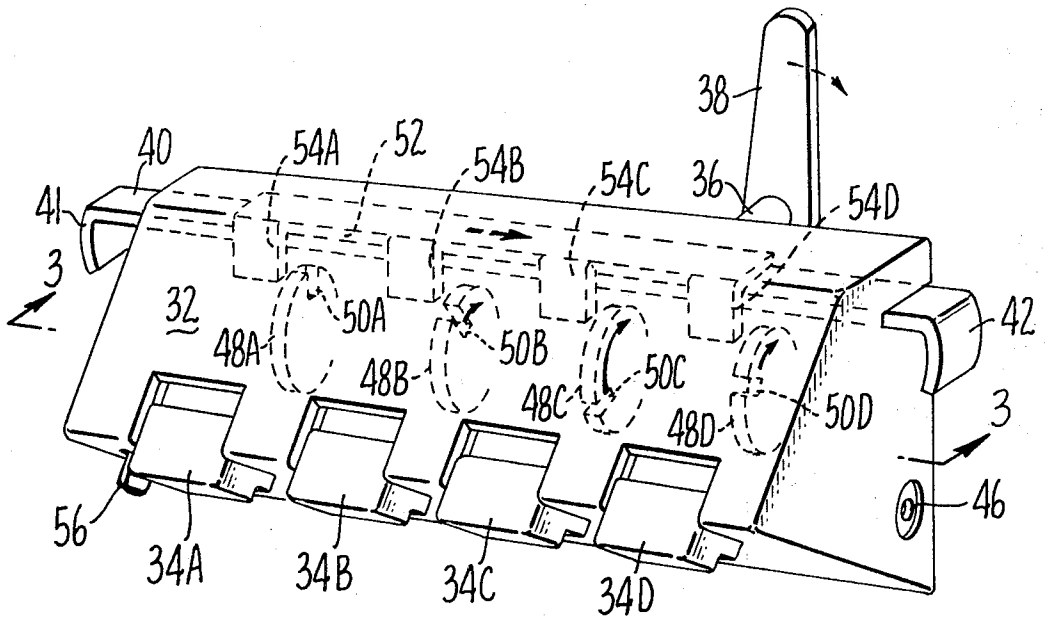


FIG. 1.

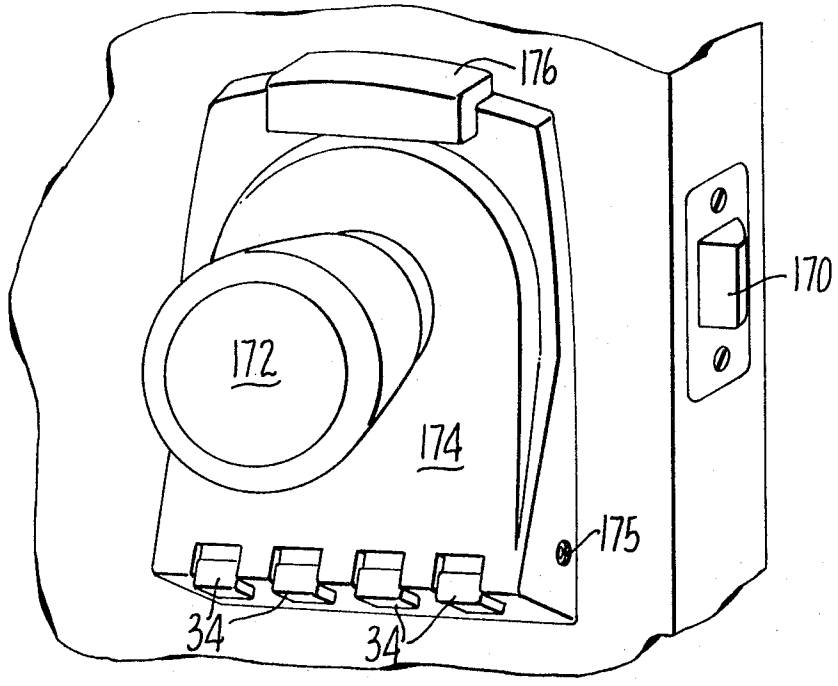


FIG. 2.

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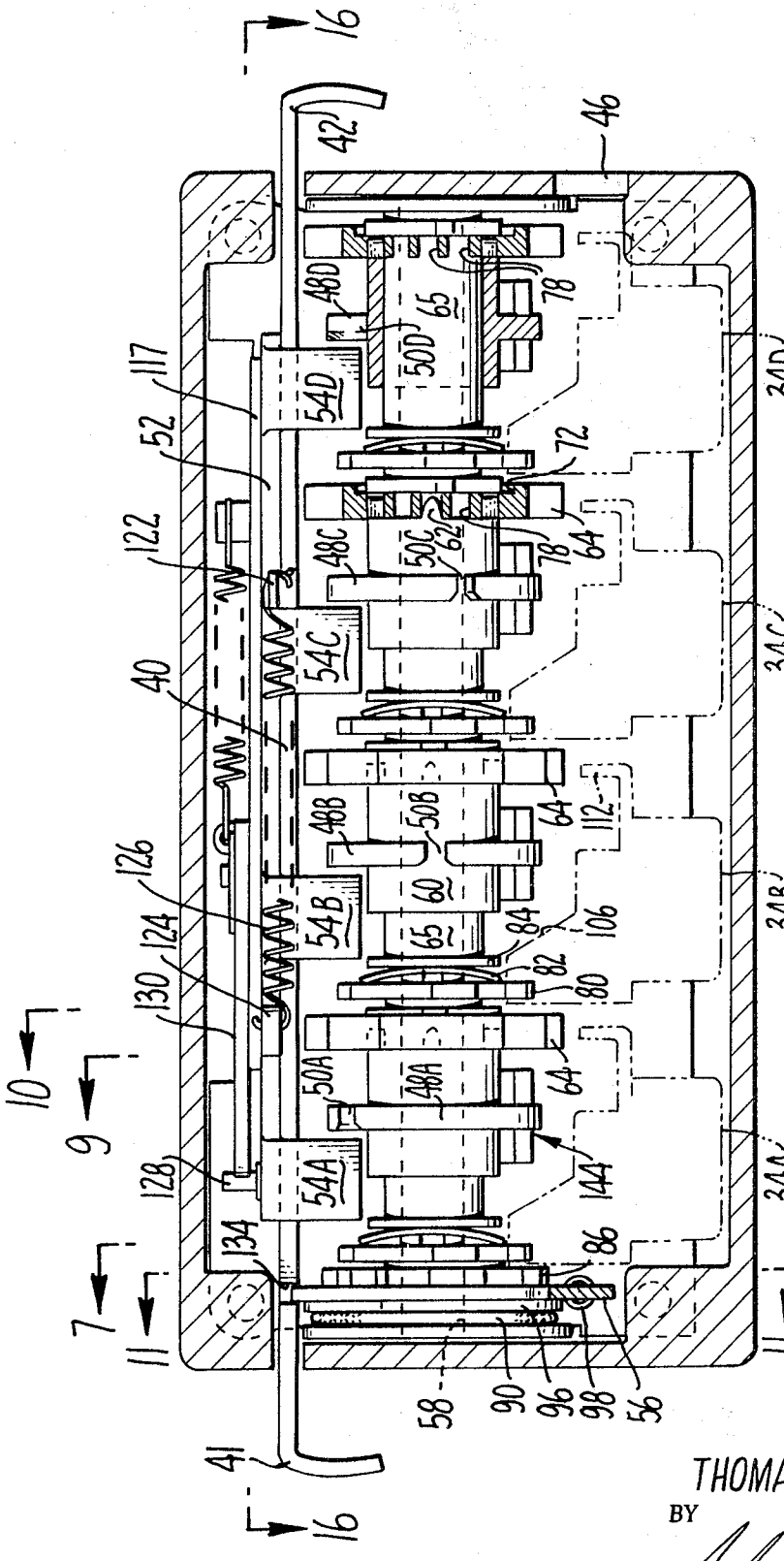

FIG. 3.

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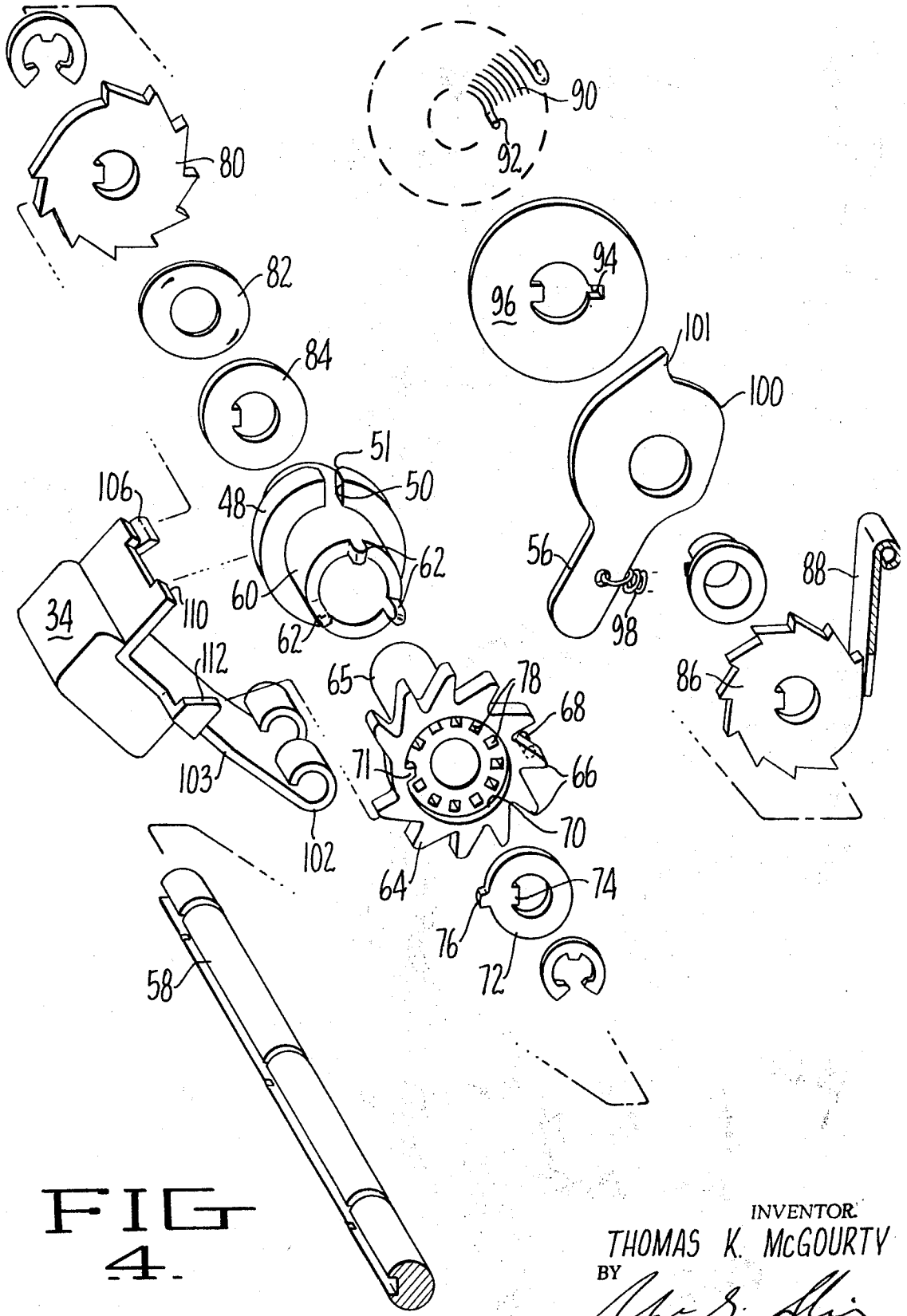

FIG 4.

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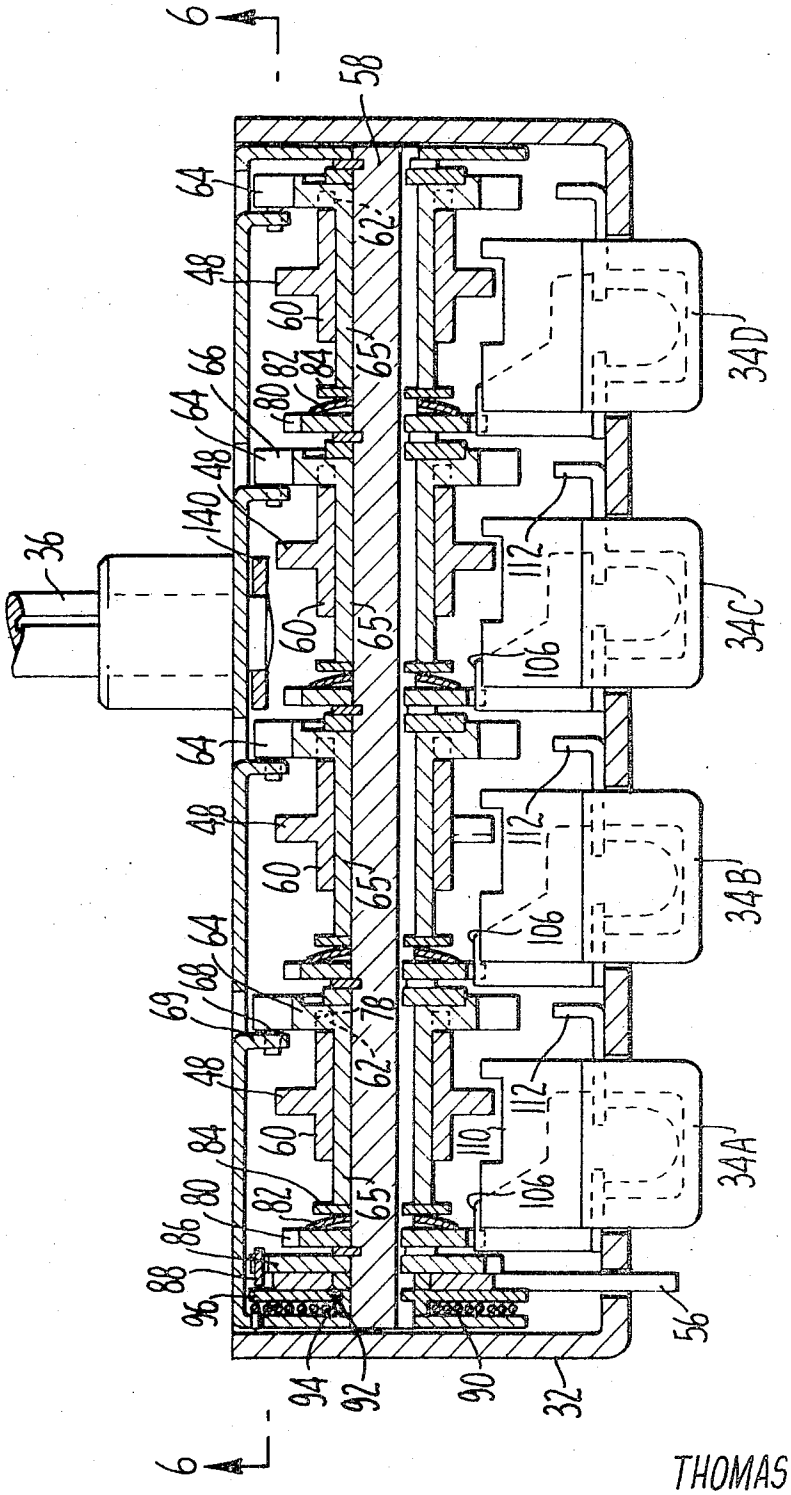

FIG - 5

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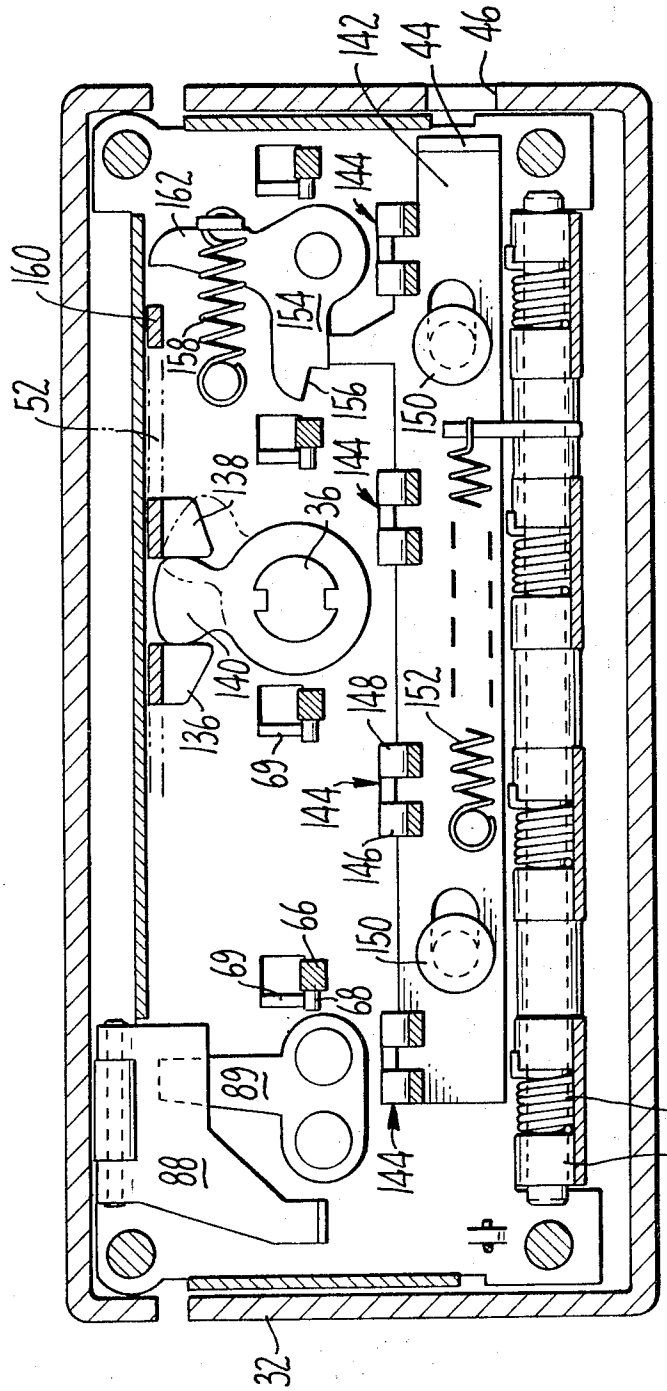

FIG. 6.

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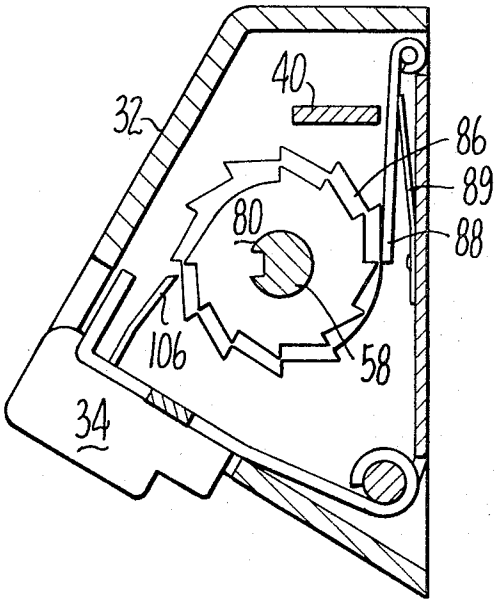
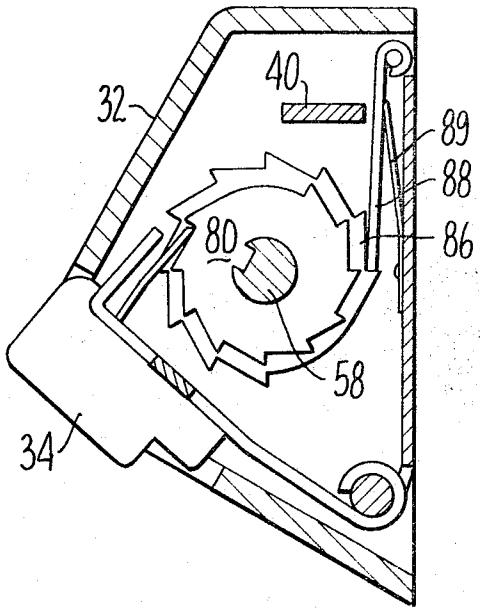


FIG. 7.



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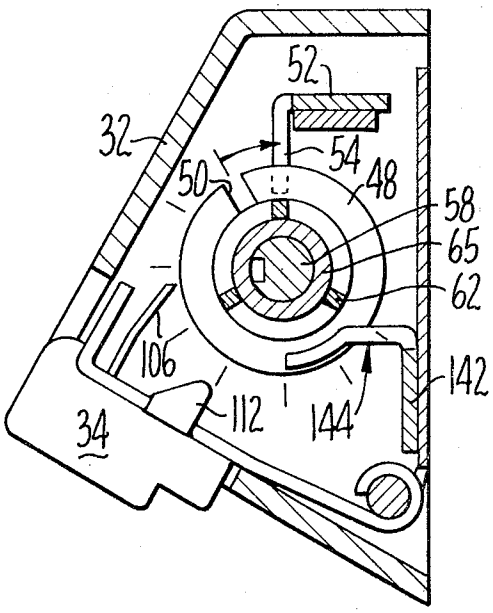

FIG. 9.

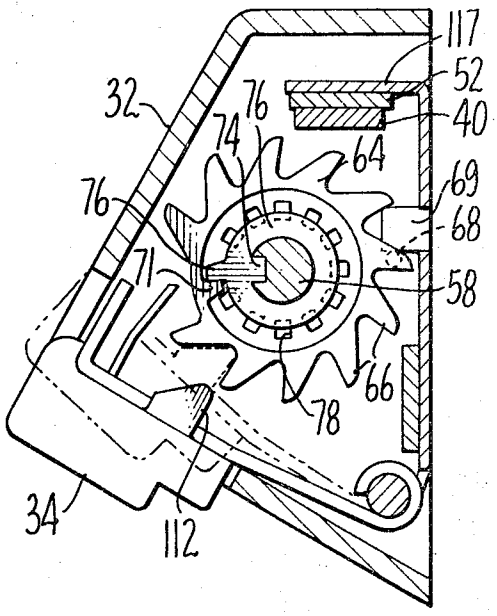

FIG. 10.

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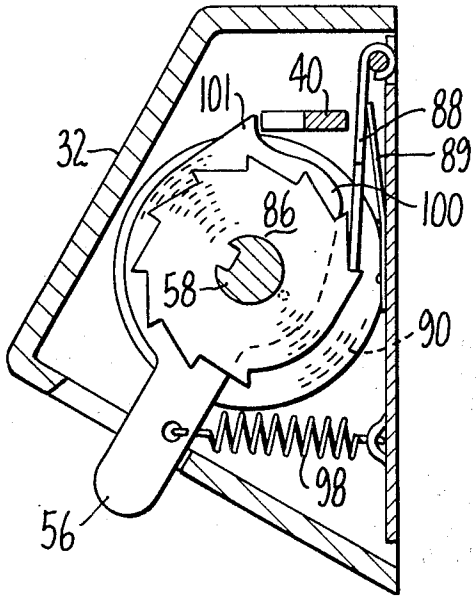
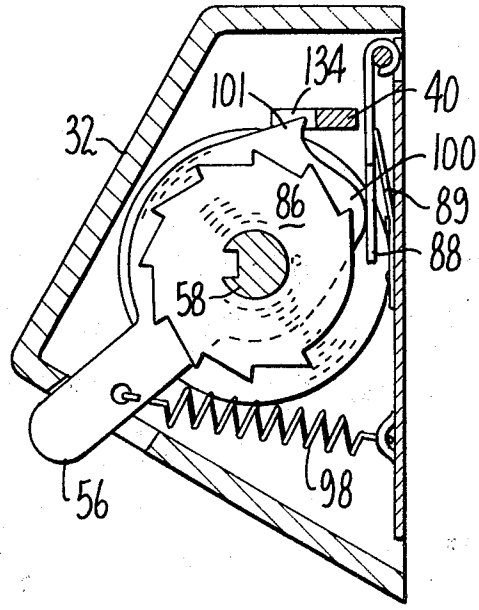


FIG. 11.



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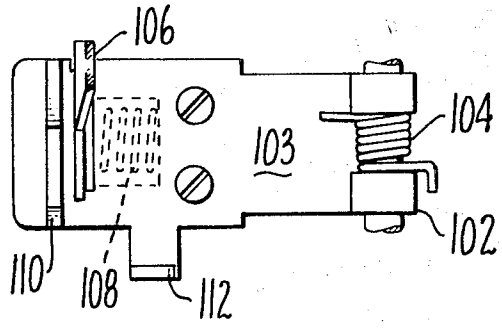

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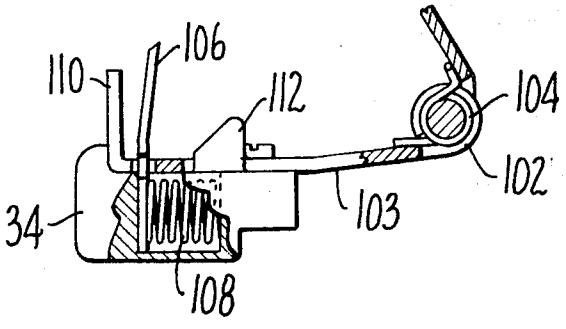

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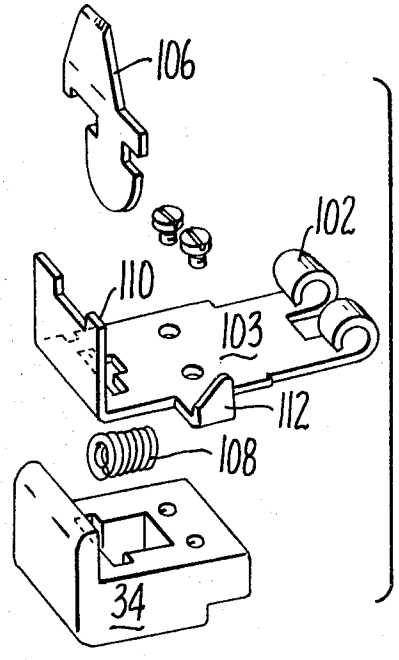

FIG. 15.

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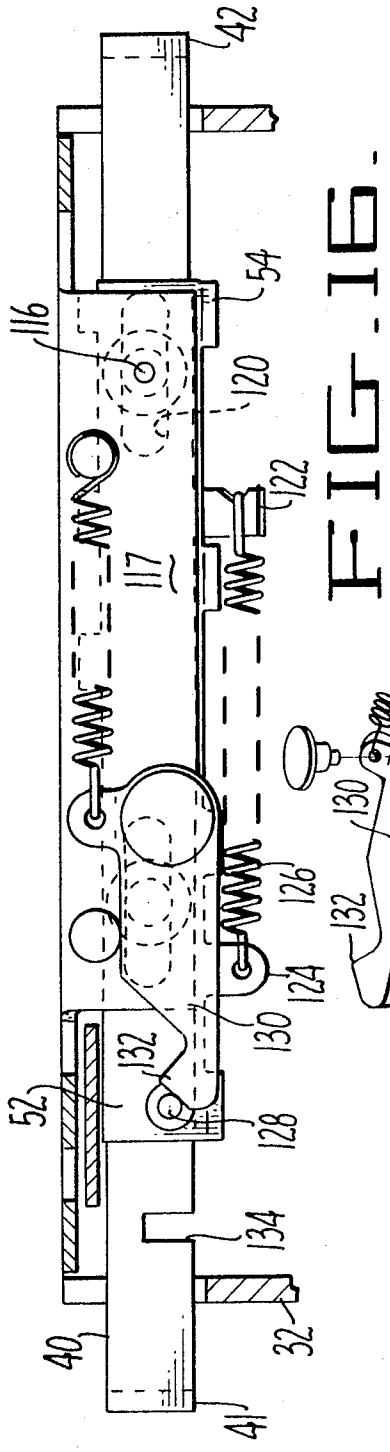

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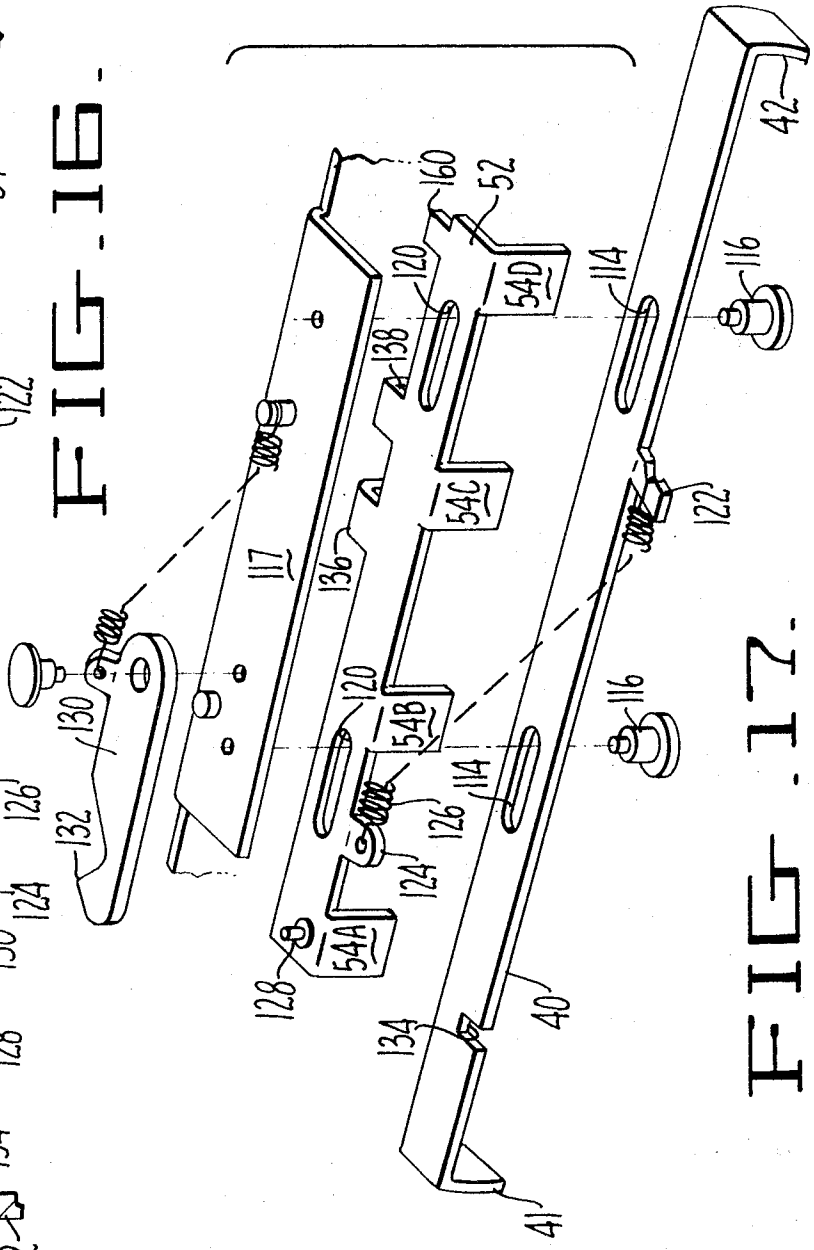

FIG. 17.

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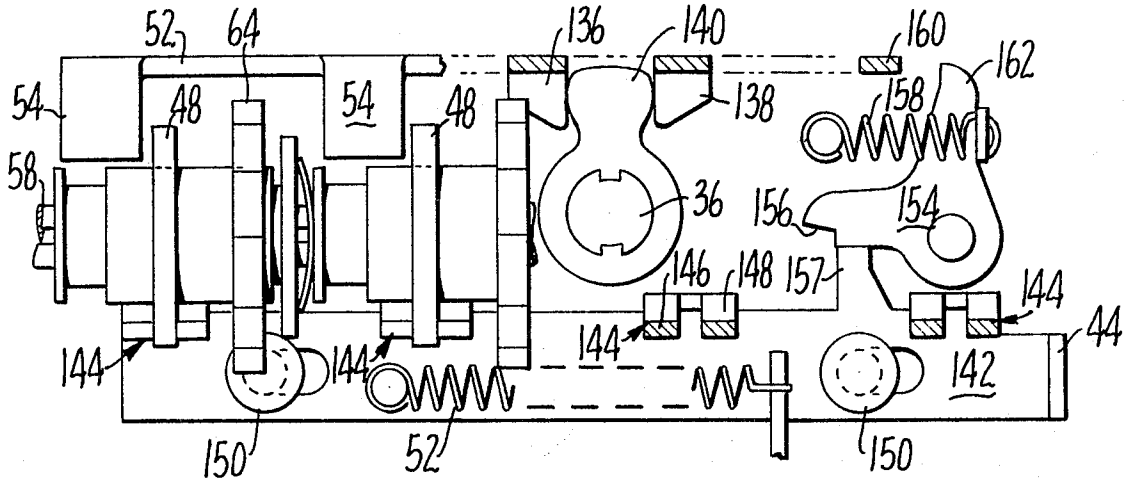

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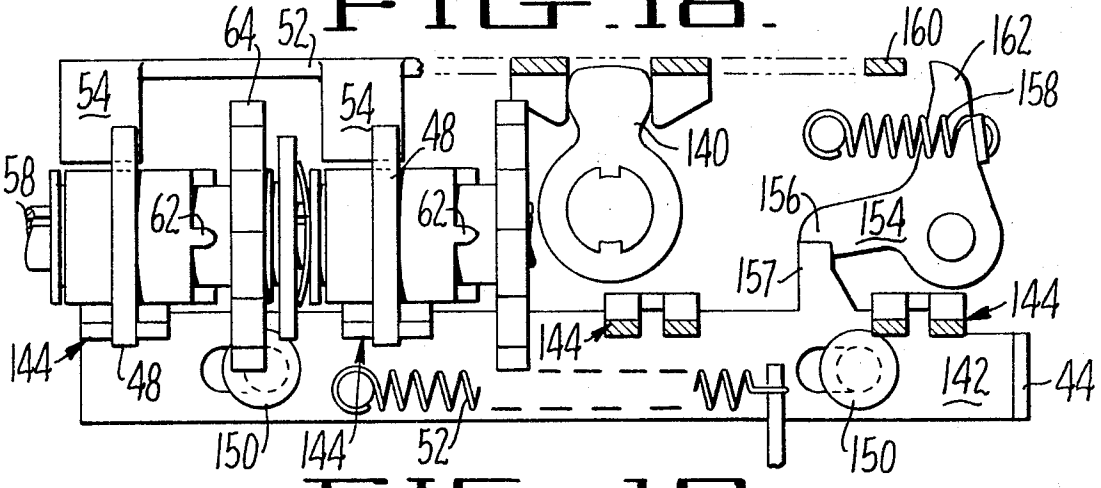

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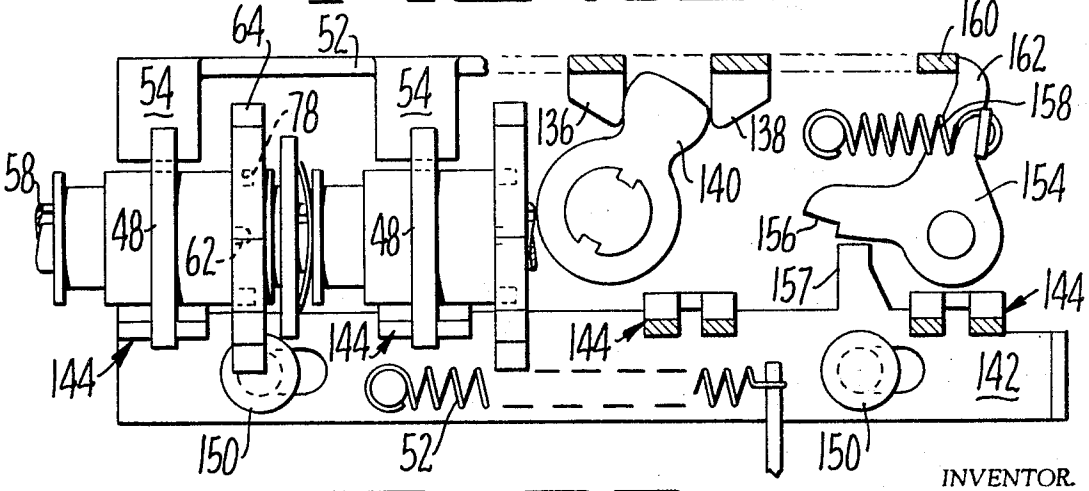

FIG. 20.

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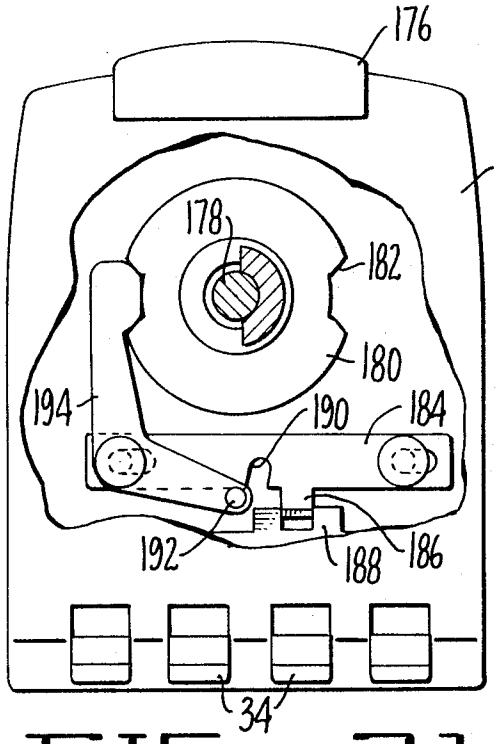

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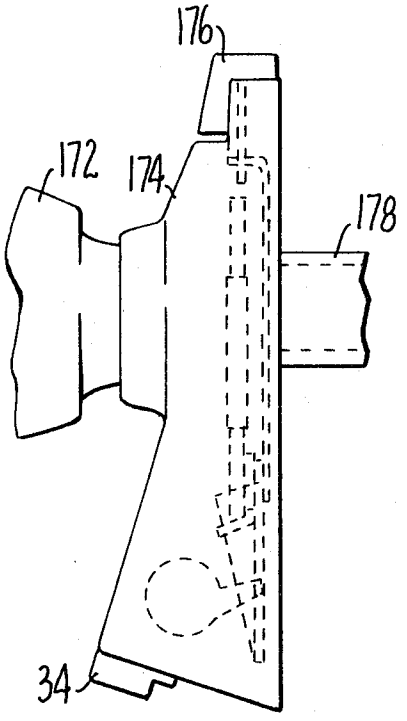

FIG. 22

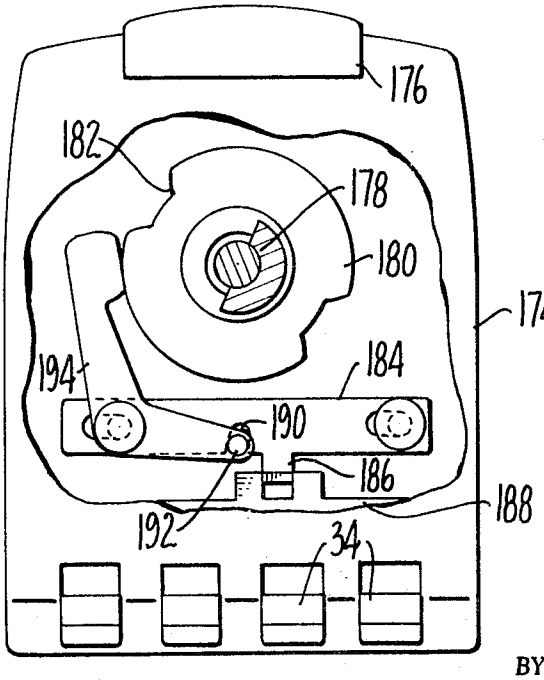

FIG. 23.

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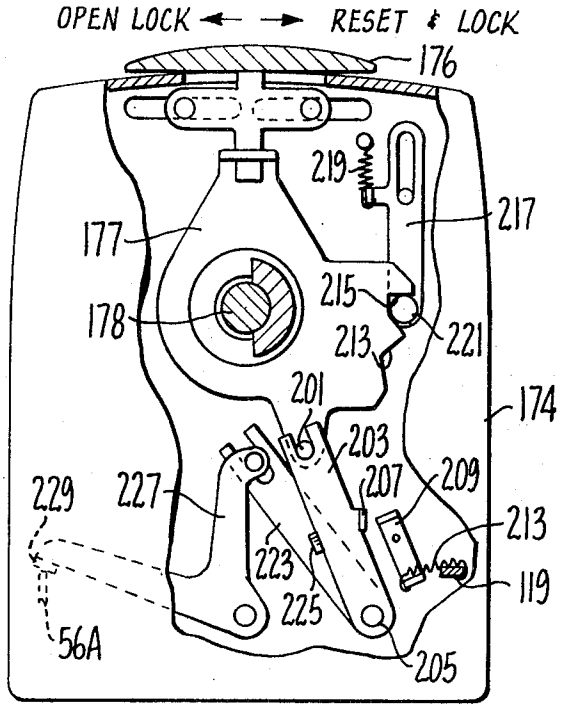

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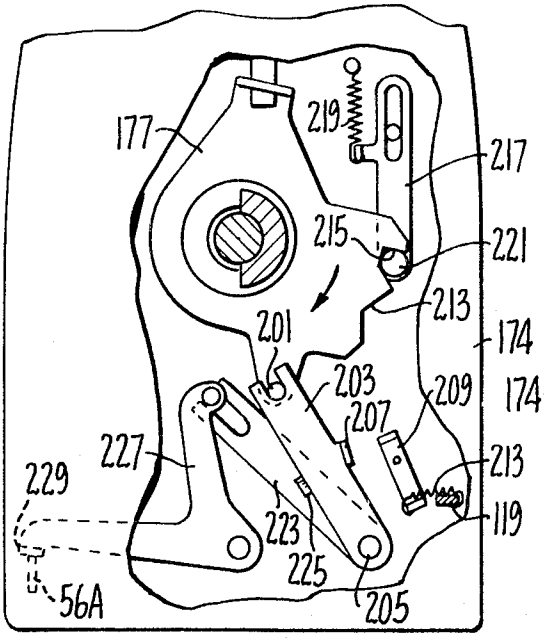

FIG. 25.

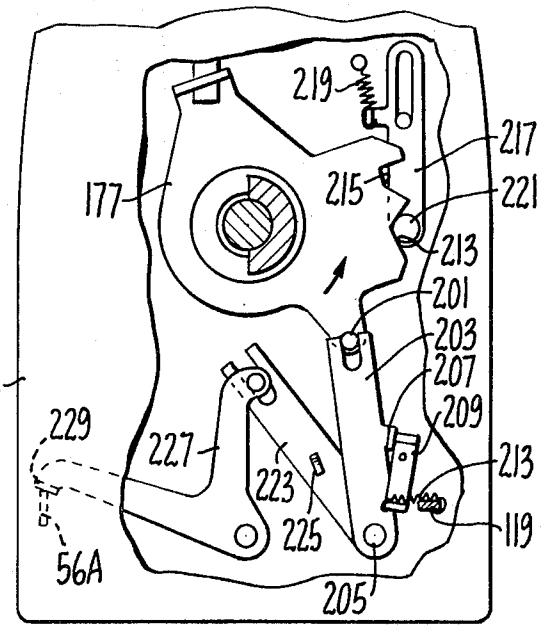

FIG. 26.

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PUSH BUTTON DOOR LOCK

SUMMARY OF THE INVENTION

The push button lock of the present invention operates on the same broad principle as that of my co-pending application Ser. No. 6,167 filed Jan. 27, 1970, but has several improvements thereover. In common with the lock of the co-pending application, the lock of the present invention has a large number of combinations so that it is almost impossible for one who does not know the combination to open the lock upon any reasonably long period of experimentation. For instance, in the embodiment shown, four locking discs are provided which can go into any one of ten positions, alone or in combination, so that on the order of 20,000 combinations are possible. If even this number is insufficient, the number of discs or the number of positions for each of the discs can be easily increased.

The lock of the present invention is of very compact construction so that it can be easily incorporated into a standard door latch so that no special cutting of the door is required. It is also so compact that it can be readily adapted for use on automobiles, luggage or almost any other application where a lock is desired.

An outstanding feature of the present invention is that the combination can be changed at will by the user without the use of special tools and without disassembling the lock in any manner.

Since the lock can be set by the owner, there is no possibility that the manufacturer or installer would know the ultimate combination. Further, the number of combinations is so great that it is extremely unlikely that there be a duplication of combinations in any given community.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a lock mechanism with some of the parts in phantom showing the broad principle of operation.

FIG. 2 is a perspective view showing the lock of FIG. 1 installed on an ordinary door.

FIG. 3 is a detailed sectional view generally on the line 3—3 of FIG. 1.

FIG. 4 is an enlarged exploded view showing in detail parts of the four locking mechanism.

FIG. 5 is a section from the top through the center of the locking mechanism.

FIG. 6 is a section on the line 6—6 of FIG. 5.

FIG. 7 is a section on the line 7—7 of FIG. 3.

FIG. 8 is a view similar to FIG. 7 except showing one of the buttons in a depressed position.

FIG. 9 is a section on the line 9—9 of FIG. 3.

FIG. 10 is a section on the line 10—10 of FIG. 3.

FIG. 11 is a section on the line 11—11 of FIG. 3.

FIG. 12 is a view similar to FIG. 11 showing the method of releasing the lock either when one wishes to lock the lock or when a false combination has been set up and one wishes to restore the lock to a starting position.

FIG. 13 is a side detailed view, partly in section, of one of the push buttons and its mounting assembly.

FIG. 14 is a plan view of the button shown in FIG. 13.

FIG. 15 is an exploded view of the button shown in FIGS. 13 and 14.

FIG. 16 is a section on the line 16—16 of FIG. 3.

FIG. 17 is an exploded view of the parts shown in FIG. 16.

FIG. 18 is a partial enlarged view of the resetting mechanism wherein the lock is in the unlocked position.

FIG. 19 is a view similar to FIG. 18 but showing the shift resetting mechanism wherein the buttons are pushed to rotate the shaft while selectively withholding the cogged wheels.

FIG. 20 is a view similar to FIG. 18 showing the parts repositioned after a new combination has been set into the lock.

FIG. 21 is a view of the lock as applied to a door showing the unlocking mechanism.

FIG. 22 is a side view of the lock shown in FIG. 21 with some of the parts in section.

FIG. 23 is a view, similar to that shown in FIG. 21, showing the parts in an unlocked position.

FIG. 24 is an internal view of the mechanism shown in FIG. 21 showing the operation of the combination reset and locking levers.

FIG. 25 is a partial view of the mechanism shown in FIG. 24 showing the position of the parts as the locking mechanism is activated.

FIG. 26 is a view similar to FIG. 25 showing the parts in an unlocked position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The general over-all operation of the device will be described first, followed by a detailed analysis of the method by which the various parts operate. Referring specifically to FIGS. 1 and 3, the lock of the present invention has a housing 32 with four push buttons, 34A, B, C and D extending therefrom. A shaft 36 extends from the rear of the housing which may have a lever 38 thereon which is released when the lock is unlocked to operate a latch or the like. An arm 40 having ends 41 and 42 extends through the lock and, when the discs are in an unlocked position as is later described, movement of this arm will actuate shaft 36 and lever 38. Within the lock a shift lever 142 having an upturned tab 44 (see FIG. 6) is provided which serves to shift the discs when the combination is being changed and which can be reached by inserting a pin or any small object through the hole 46 in the casing 32. Within the housing are a plurality of locking discs 48A, B, C and D. Each of the locking discs has a slot as at 50A, B, C and D. Arm 40 has attached thereto by a lost motion arrangement described in detail later, an arm 52 which carries locking lugs 54A, B, C and D, it being understood that one of the locking lugs 54 will fit into one of the slots 50 on the corresponding disc 48.

The arrangements of the buttons and discs is such that as any of the buttons is depressed, it will tend to rotate the shaft on which the discs are mounted. However, the discs are mounted by means of friction washers and the buttons are provided with a stop arrangement so that as a particular button is depressed, the corresponding disc will not rotate but the others will. In the arrangement shown in FIG. 1, the slot 50A is lined up adjacent to the lug 54A, the slot 50B is one position removed from its lug, disc C is three positions removed from its lug while the disc D is two positions removed. Thus, if one pushes the button 34A all of the discs except the A disc will advance one position, bringing the B disc in line with the lug and leaving the C disc two positions from the lug and the D disc one position from the lug. Since A and B are now in line, one pushes the A and B buttons simultaneously which leaves the corresponding disc unmoved while the C disc is advanced to a point two positions removed from the locking lug and the D disc is moved to one position from the lug. Now if one presses the A and B buttons again, the D disc is brought into alignment while the C disc is still one position removed. One now presses A, B and D which moves only the C disc into position. This brings all of the discs into alignment with the respective locking lugs which can now move through the slots. Bar 40 is now free and can be moved to actuate the lever 38, opening the lock.

Thus in FIG. 1 the set combination can be expressed as follows:

A
AB
AB
AB D

When one wishes to lock the door, lever 56 is tripped which causes the discs to all spring back to their home positions as is shown in FIG. 1. If one wishes to change the combination on the lock, one places a small pin or other object in the hole 46 which releases the discs so that one can dial in a new combination. When the lock is again locked, the lock responds only to the new combination.

The way in which these various movements are carried out will now be described in detail. Reference is particularly made to FIGS. 3, 4 and 5 for the detailed description of the locking and unlocking mechanisms. All of the rotating parts are mounted on a keyed shaft 58 but only some of the parts are keyed to the shaft, the others being driven by friction. The locking discs 48 have a collar 60 thereon while the cogged wheels 64 have a collar 65 thereon the outer surface of which is adapted to serve as a bearing for the collar 60. The inner diameter of collar 65 is such that it rotates freely on the shaft 58. Cog wheel 64 has a stop pin 68. The disc 48 has a slot 50 therein which is champfered as at 51 to permit the ready entrance of a locking lug. The collar 60 has a series of pins 62 thereon while the cogged wheel 64 has corresponding series of holes 78. The cogged wheel 64 has teeth 66 thereon and one end of the cogged wheel is recessed at 70 while a small pin 71 sticks inwardly into the recess. Washer 72 has a key 74 so that it rotates with the shaft 58 and has an outwardly projecting pin 76. The pin 76 extends into the recess 70 so that the restraining cog 64 can revolve almost a complete revolution with respect to washer 72 and shaft 58. This permits the cog to stand still while the shaft revolves, but when the shaft is released the cog will be returned to home position. As previously described the restraining cog 64 has a series of openings therein 78 which are adapted to mate with the pins 62. Thus, if the pins 62 are out of the holes 78, disc 48 and cog 64 can revolve freely relative to each other but if they are pressed together, the pins 62 will engage the openings 78 so that the two must revolve as a unit.

Ratchet wheel 80 is keyed on the shaft 58 and is pressed against the collar 60 on disc 48 by means of a spring washer 82 and a keyed washer 84. Thus if one turns the wheel 80 the members 64 and 48 will tend to turn also but, because the drive is a friction one, these members may be restrained from turning even if ratchet wheel 80 and shaft 58 do turn. A second ratchet wheel 86, is also provided on the shaft and a pawl 88 having a spring 89 normally prevents the shaft from turning backward. The shaft is urged to turn backwardly by means of a helical spring 90 mounted on the shaft which has a pin 92 fitting into a slot 94 in keyed washer 96. Spring 90 is wound as the shaft turns forward. Lever 56, normally biased by means of spring 98 is also rotatably mounted on the shaft and it has a cam-like portion 100 which can be brought to bear against detent arm 88 and a projection 101, the purpose of which will be later described. Stops 69 engage pin 68 to establish the home position for cog 64.

The buttons 34 are mounted on arm 103 over shaft 58 by means of hinge 102. (See FIGS. 13, 14 and 15). The hinge is normally biased by means of a spring 104 away from shaft 58 and each button has three teeth thereon. First there is a spring mounted tooth 106 normally held outwardly by the action of compression spring 108. The action of tooth 106 is such that as the key is depressed, tooth 106 comes into contact with one of the teeth of ratchet 80 causing shaft 58 to rotate. (See FIGS. 7 and 8.) A second tooth 110 acts as a stop and contacts the smooth outside surface of disc 48 so that the shaft is advanced only the distance of one tooth when the button 34 is pushed. A third tooth 112 (See FIG. 10) is adapted to contact one of the cog teeth of the restraining cog 64 and prevent it from rotating. The net result is that any locking disc corresponding with a key which is pushed stands still each time a button is pressed while all of the others advance one position. (FIGS. 7, 8 and 9). For instance if one pushes buttons A and B the corresponding discs A and B stand still while discs C and D would be advanced one position by the turning of the shaft 58. This turning would be accomplished against the action of the spring 90 but the shaft would be prevented from returning to its former position by means of ratchet 86 and pawl 88. When all of the discs are lined up, the locking lugs 54 fit into the slot 50 allowing the lever 40 to actuate the latch mechanism 38. When it is desired to lock the lock, it is only necessary to pull the lever 56 and the cam 100 will press against pawl 88 releasing the ratchet, allowing spring 90 to return the shaft to its "home" or locked position.

It was previously mentioned that the bar 40 serves as the mechanism to actuate the latch and this action will now be described in detail, particularly with reference to FIGS. 16 and 17. The bar 40 has two elongated slots 114 and is mounted for sliding movement on the pins 116 on frame 117 which is attached to housing 32. A second bar 52 (which carries the locking tabs 54 A, B, C and D, previously described) also has slots 120 and is slideably mounted between bar 40 and frame 117. Bar 40 has a lug 122 while bar 52 has a corresponding lug 124 and the two lugs are connected together by means of spring 126. Because of this spring mounting, the bars will move together if the lugs 54 are unrestrained, i.e. aligned with the slots in the discs. However, if one restrains bar 52, the bar 40 will still move but, instead of moving bar 52 and the locking mechanism, the spring will merely be stretched. This provides a safety measure on the lock since one cannot force the actuating bar 40. If the lock is locked, the actuating bar still moves freely while the actual lock actuating bar 52 does not move but the spring is merely stretched. It is desirable that the bar 40 be free to move yet that it stay in one of its end positions and not some intermediate position. To accomplish this, bar 52 has a pin 128 thereon while a spring mounted detent 130 having a wedge shaped tooth 132 is urged against the pin 128. Thus the bar can be moved to the right or to the left but will not stay in an intermediate position.

If one tripped the reset lever 56 while the actuating lever 40 was in the opened position, i.e. while locking tabs 54 were in the corresponding slots 50, the discs would all be restrained while shaft 58 would return to the home position, destroying the combination which had been set into the lock and, in effect, setting the lock on a blank combination so that it could be opened at will merely by pulling the reset lever and actuating the rod 40. In order to prevent this, the rod 40 has a slot 134 therein which is in the path of the reset lever 56 only when the lock is in the locked position. The location of these parts is best shown in FIG. 3 and it will be apparent that the reset lever 56 can only be actuated when the arm 40 is in its locked position with the tabs 54 out of the slots 50.

The way in which the actual unlocking function takes place will now be described. Arm 52 carries tongues 136 and 138 which lie on either side of a cam 140 which is attached to shaft 36. If the tabs 54 are lined up with the slots 50, one can now move the arm 40 which in turn will move the arm 52 causing tongues 136 and 138 to actuate cam 140 and thus the unlocking shaft 36. The lock in locked position is shown in solid lines in FIG. 6 while the unlocked position is shown in dash lines.

The mechanism thus far described shows a completely operating lock but does not show a novel feature of the present invention wherein the combination can be reset by the user at will. As was previously mentioned, discs 48 are slideably as well as rotatably mounted on the collars 65 of the restraining cog wheels 64. If the parts are slightly separated, disc 40 is free to rotate relatively to the cog 64 but if the parts are pressed together, pins 62 engaged holes 78 so the two units must rotate as one. In an inexpensive lock of the type described, these two parts could be combined, presetting the lock to some particular combination at the factory. However, in the improved lock of the present invention it is desirable that means be provided so that the user can reset the combination at will. (See FIGS. 6, 18, 19 and 20). For this purpose, a shift rod 142 is provided having an upturned end 44 which is accessible through the opening in the case 46 as previously described. This shift rod 142 carries a plurality of shift yokes 144 having arms 146 and 148 which lie on each side of a disc 48. Naturally there is one yoke for each disc. Rod 142 is mounted for sliding movement on pins 150 and normally spring 152 biases the shift rod 142 to the right, as shown in FIG. 6, in which position pins 62 are forced in the openings 78 so that parts 48 and 64 rotate as a unit. Now, if one wishes to set a new combination, rod 142 is pushed to the left as by inserting a pin or any small object through the opening 46 against the upturned end 44 and the yokes 144 pull the discs

48 to the left so that each disc can rotate independently of its restraining cog 64. In order to hold the shift rod 142 in its inwardly spring biased position while a new combination is being set, a detent 154 is provided having notch 156, the detent being biased in a counter-clockwise position by means of spring 158. Thus, when the resetting arm 142 is moved to the left, notch 156 engages the arm 157 holding the arm 142 in its pushed in position as is seen in FIG. 19. Before the combination can be changed it is necessary to first unlock the lock by having the locking tabs lined up with the slots in the discs. One can now push in on arm 142 whereupon the yokes 144 will engage the discs 48 and move them to the left so that pins 62 no longer are in the holes 78; also the discs have been shifted onto the locking tabs and are thus now restained by the tabs, while the restaining cogs 64 are free to move independent of the discs. If one attempted to push in on arm 142 while the tabs were not lined up with the slots in the discs it is obvious that the tabs would engage the side of the discs so that the arm 142 could not be pushed in. One now pulls on lever 56 and this releases shaft 58 so that the action of spring 90 returns it to its home position. Now the tabs are all restraining the discs and there is no combination on the lock. At this point, one can then dial in a desired new combination. One next pushes on arm 40 which, of course, moves arm 52. Arm 52 has a tab 160 thereon and this tab engages arm 162 located on lever 154 rotating this member to the right, releasing notch 156 from arm 157 so that arm 142 is now returned to its right hand position and is best seen in FIG. 20. At this point the lock is unlocked and has a new combination therein so that arm 40 can be moved freely back and forth. Now the arm can be moved to the locked position and the lever 56 pulled which will lock the lock as previously described.

The structure heretofore described is one of general application and can be used on doors, luggage, automobiles or other situations where a combination lock is desired.

FIGS. 2 and 21 through 26 show how the lock of the present invention might be applied as an ordinary door lock. The basic locking mechanism is exactly as previously described except that the two actuating levers are brought out differently. Instead of employing the bar 40 which protrudes from the case, together with its lost motion action, an arm 119 is connected to the sliding lever 52 which carries the locking tabs 54 and the lost motion is provided as is later described in detail. The locking or resetting lever 56 also does not protrude from the case and extends from the mechanism as a small bar 56A. A small opening 175 at the side of the lock housing permits access to arm 44 for changing the combination. Such locks ordinarily have a latch 170 controlled by a knob 172. A housing 174 is provided with a combined reset and locking lever 176 at the top thereof. The buttons 34 protrude through openings in the bottom of housing 174. Knob 172 is carried on a shaft 178 and attached to this shaft in known manner is a disc 180 having locking slots 182 therein. A slider 184 is connected by means of extension 186 through arm 188. Sliding arm 184 has a slot 190 therein and when arm 188 moves to the unlocked position, slot 190 lines up with a pin 192 on crank arm 194. In this position one can now rotate the knob as is shown in FIG. 23 and this will move arm 194 counterclockwise and pin 192 into slot 190 permitting the door to be opened.

The lever 176 at the top of the housing serves a two-fold purpose. When it is moved to the left it serves to open the lock and when it is moved to the right it serves to reset the combination and to relock to lock. Lever 176 is mounted for sliding movement, as shown, and serves to actuate a yoke 177. Yoke 177 has a pin 201 which fits into a notch of arm 203 which is pivoted at point 205. Arm 203 has a contact 207 thereon adapted to contact a hand on arm 209 which is connected to the arm 119 by means of a spring 213 to arm 119. In this manner a lost motion is provided so that if the slots are lined up with the locking tabs, arm 119 will move through the slots permitting the door to become unlocked. On the other hand, if the slots are not properly lined up, one can still move the lever 176 to the left but it will merely stretch the spring 213 leaving the door in a locked position.

Yoke 177 has notches 215 and 213 therein and mounted adjacent to the yoke is a detent arm 217 normally held in the up position by means of a spring 219, said detent arm carrying a pin 221. Now, assuming that the discs are lined up, if one moves the lock to the open position, unlocking it, pin 221 will engage in the slot 213 holding the lock in the unlocked position until it is relocked.

Also pivoted at point 205 is a second arm 223 having an extension 225 thereon. Arm 223 has a slot in the end thereof and is thus connected to a second crank arm 227. Arm 227 has an end 229 located adjacent to arm 56A, previously described. If one now wishes to lock the lock, lever 176 is moved to the right and this causes arm 203 to push against the extension 225 and transmits this motion through lever 227 to arm 56A relocking the combination. At the same time, pin 221 will fall on notch 215 and the action of the spring 219 will be such that the lever 176 is restored to its central position when released.

It will be obvious to those skilled in the art that many variations can be made in the exact structure shown without departing from the spirit of this invention. For instance, four discs and associated buttons have been shown but a smaller or larger number might be employed, depending on whether one wishes a more complicated or a simpler lock. Similarly, the ratchets have been shown as moveable to any one of ten positions. Here again a smaller or larger number might be used.

I claim:

1. A push button combination lock comprising:
   a. a shaft,
   b. a plurality of sets of rotating members mounted on said shaft each set comprising (1) a ratchet wheel, (2) a slotted disc and (3) a toothed wheel,
   c. friction drive means between said shaft, said slotted disc and said toothed wheel,
   d. means between said ratchet wheel and said shaft whereby said shaft is positively driven by said ratchet wheel,
   e. push button means, said push button having a first tooth for engaging and driving said ratchet wheel and the second tooth for restraining said toothed wheel,
   f. lock releasing means whereby said lock will be released when all of said notched disc means are brought into alignment.

2. The structure of claim 1 wherein said toothed wheel and said slotted disk are adapted to be coupled together in a first position and are free to rotate when in a second position whereby the combination of the lock can be changed by changing the relative rotative positions of the said toothed wheel and said slotted disk.

3. The structure of claim 1 having a bar with extending locking lugs thereon, said bar actuating the lock release mechanism, said slotted discs normally blocking said locking lugs, said slotted discs permitting said lugs to pass when the slots of all of said discs are in alignment.

4. The structure of claim 3 wherein said lock has an operating lever extending therefrom with a spring biased lost motion linkage to said bar whereby said operating lever can be moved without moving said bar when said bar is in a locked position.

5. The structure of claim 1 wherein said slotted disc and said toothed wheel are slideably mounted relative to each other and are locked when together and free to rotate relative to each other when in spaced relationship and having a reset mechanism with yokes thereon adapted to move the slotted disk toward and away from said toothed wheel.

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