

Nov. 2, 1971

T. K. MCGOURTY

3,616,667

PUSH BUTTON DOOR LOCK

Filed Jan. 27, 1970

7 Sheets-Sheet 1

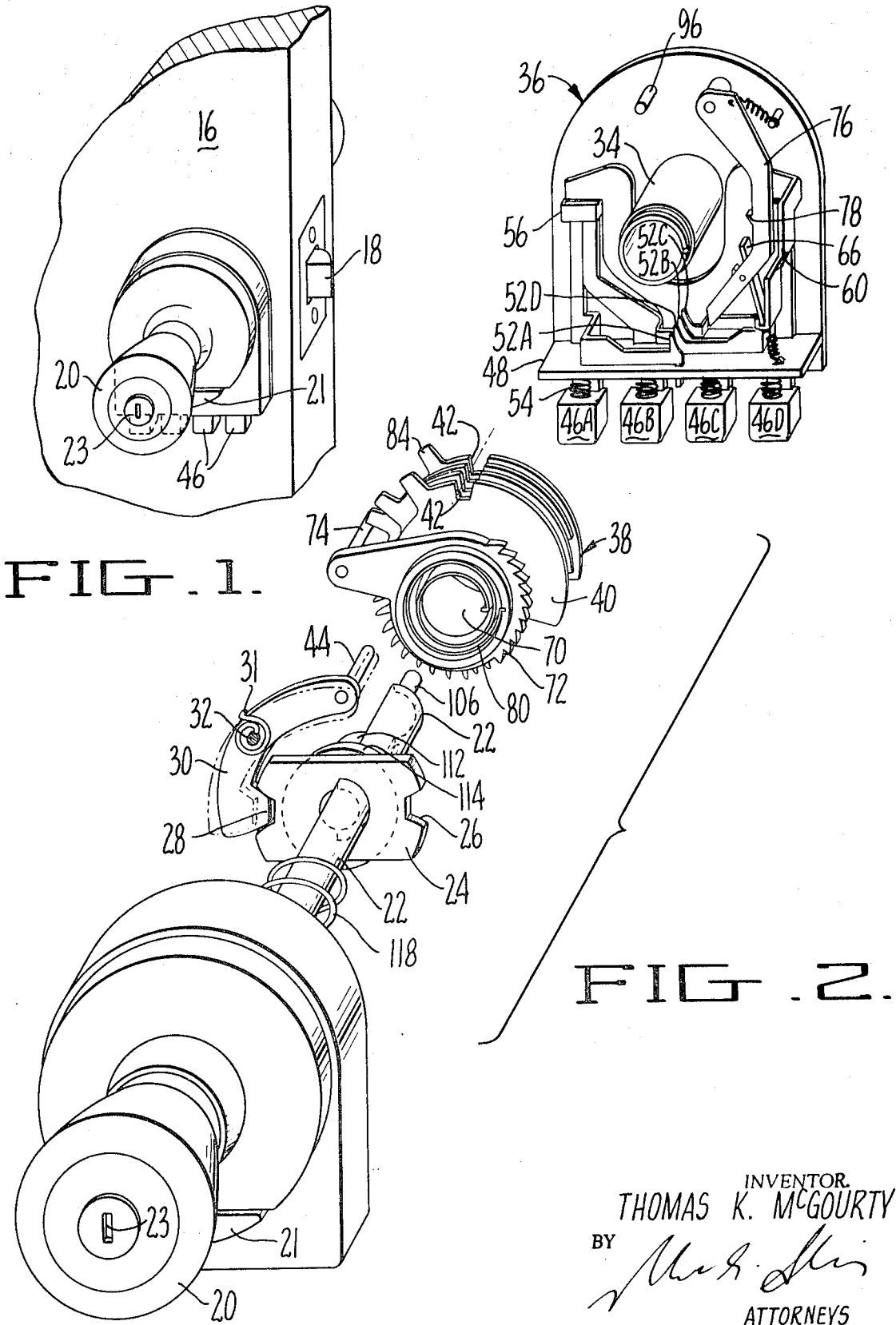


FIG. 1.

FIG. 2.

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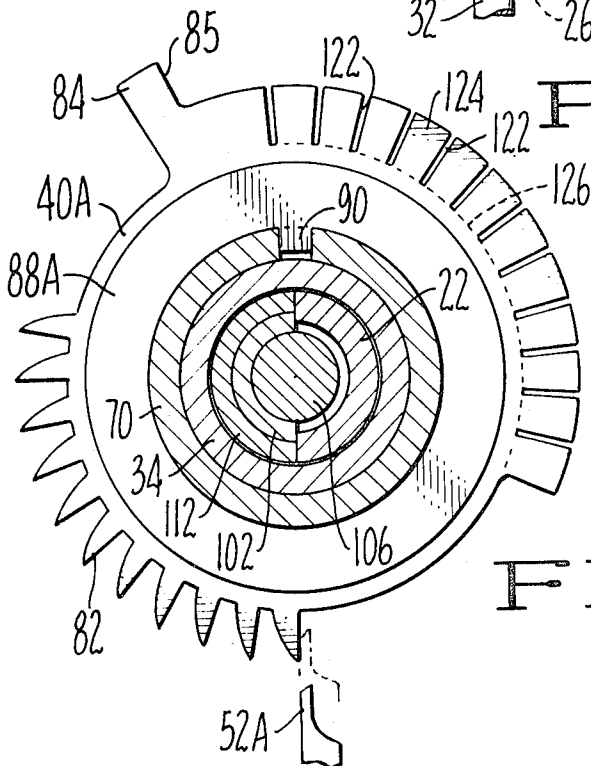
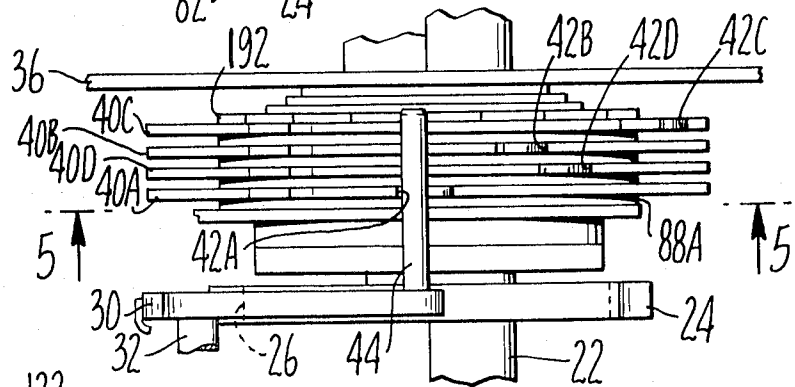
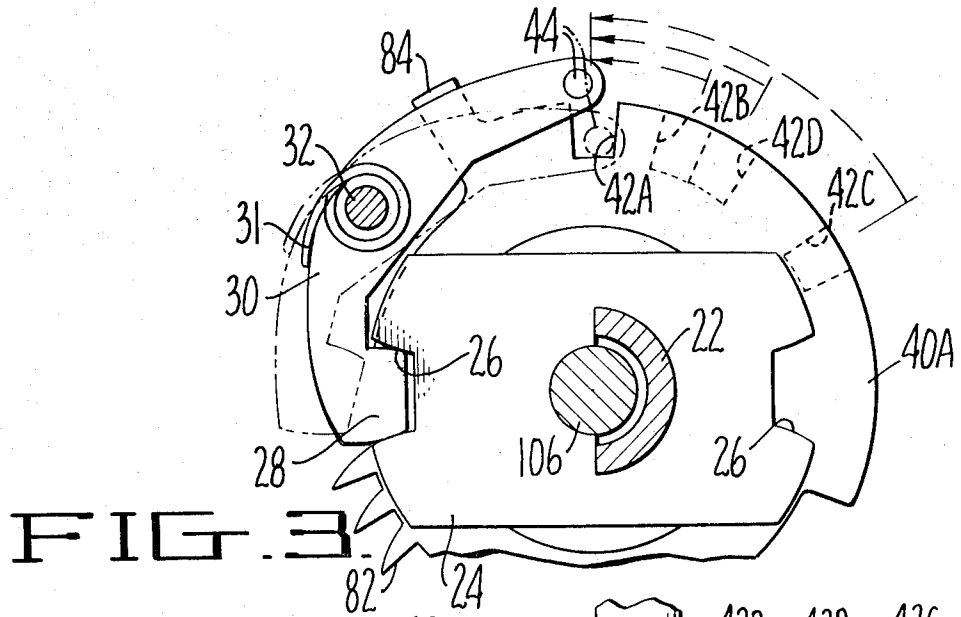
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7 Sheets-Sheet 2



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7 Sheets-Sheet 3

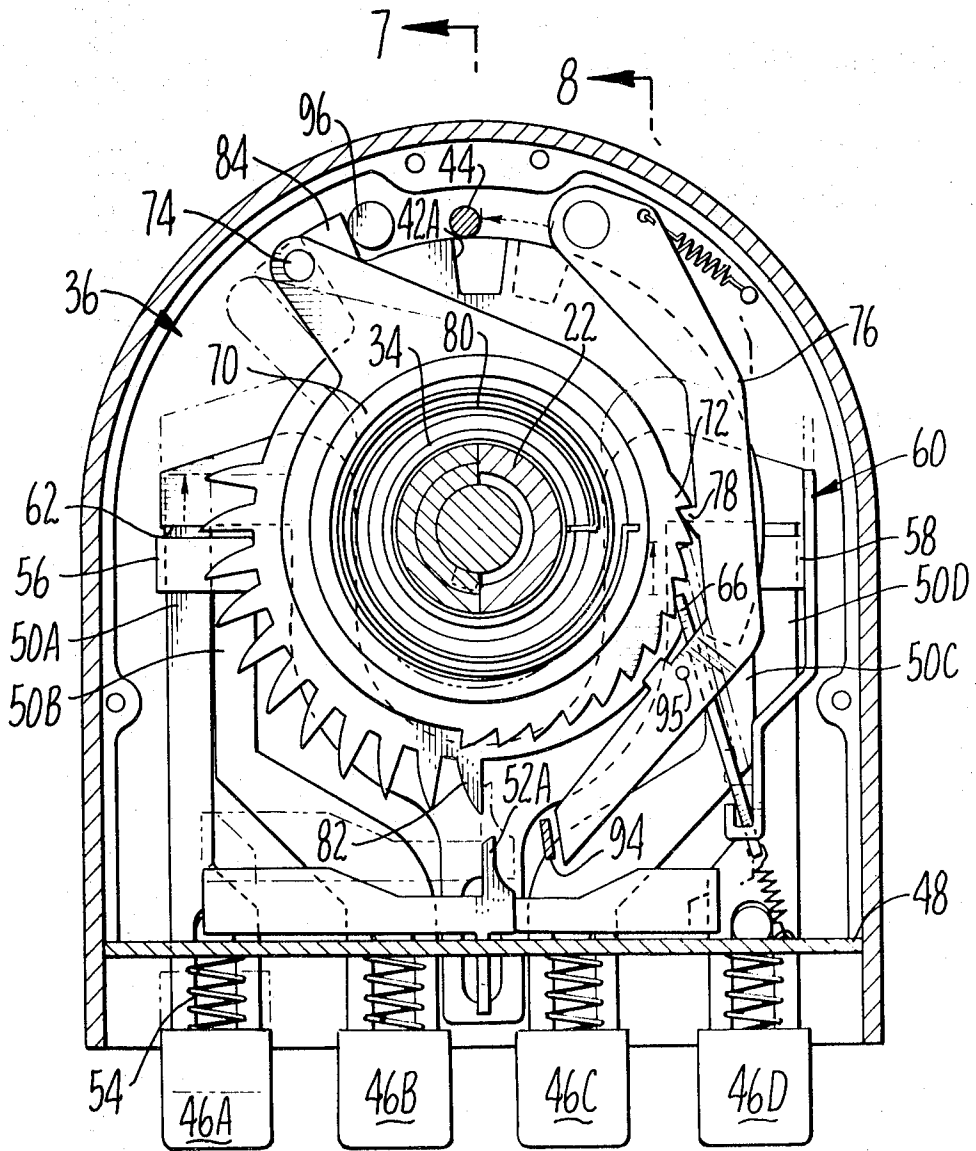


FIG. 6.

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7 Sheets-Sheet 4

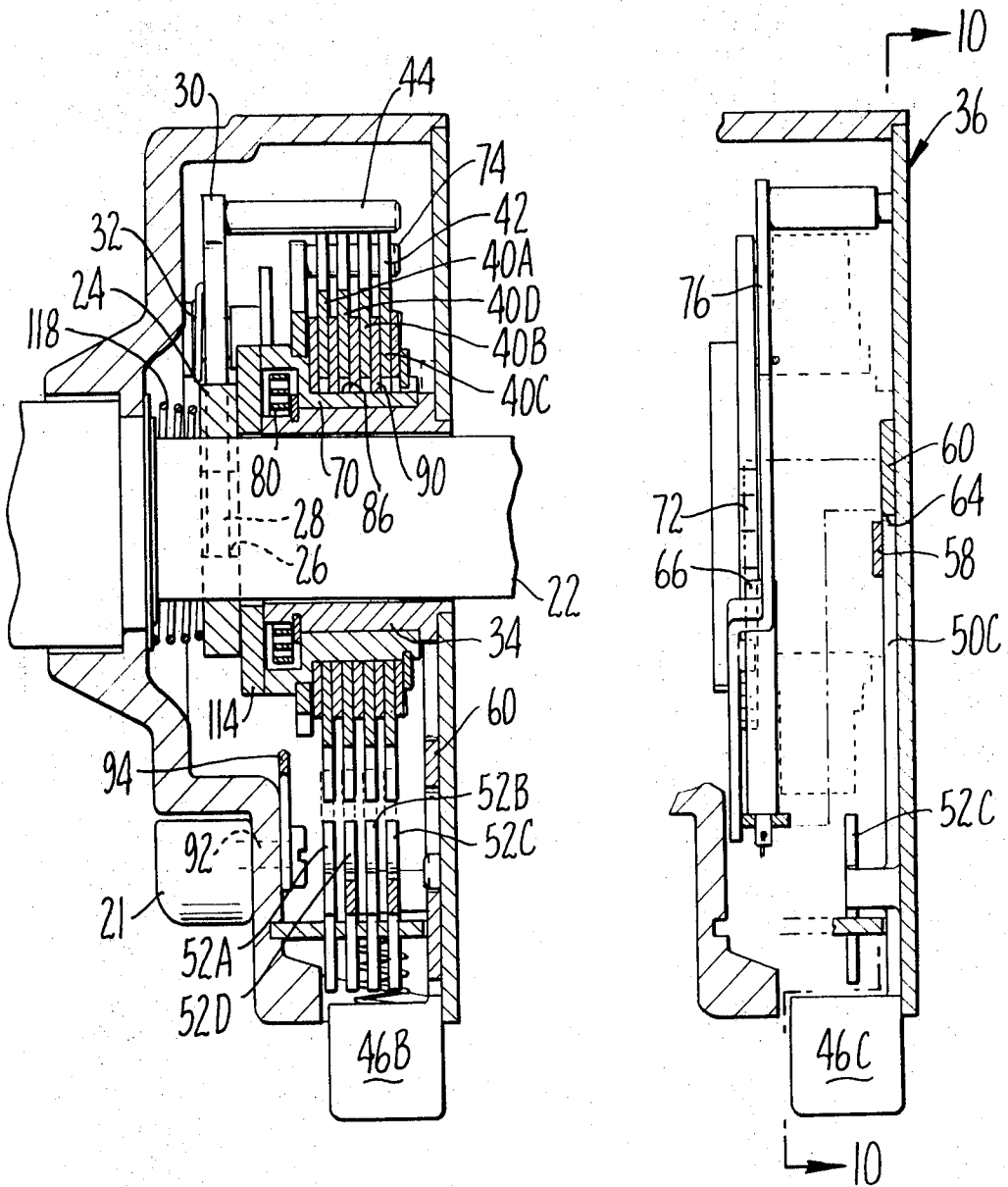


FIG. 7.

FIG. 8.

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7 Sheets-Sheet 5

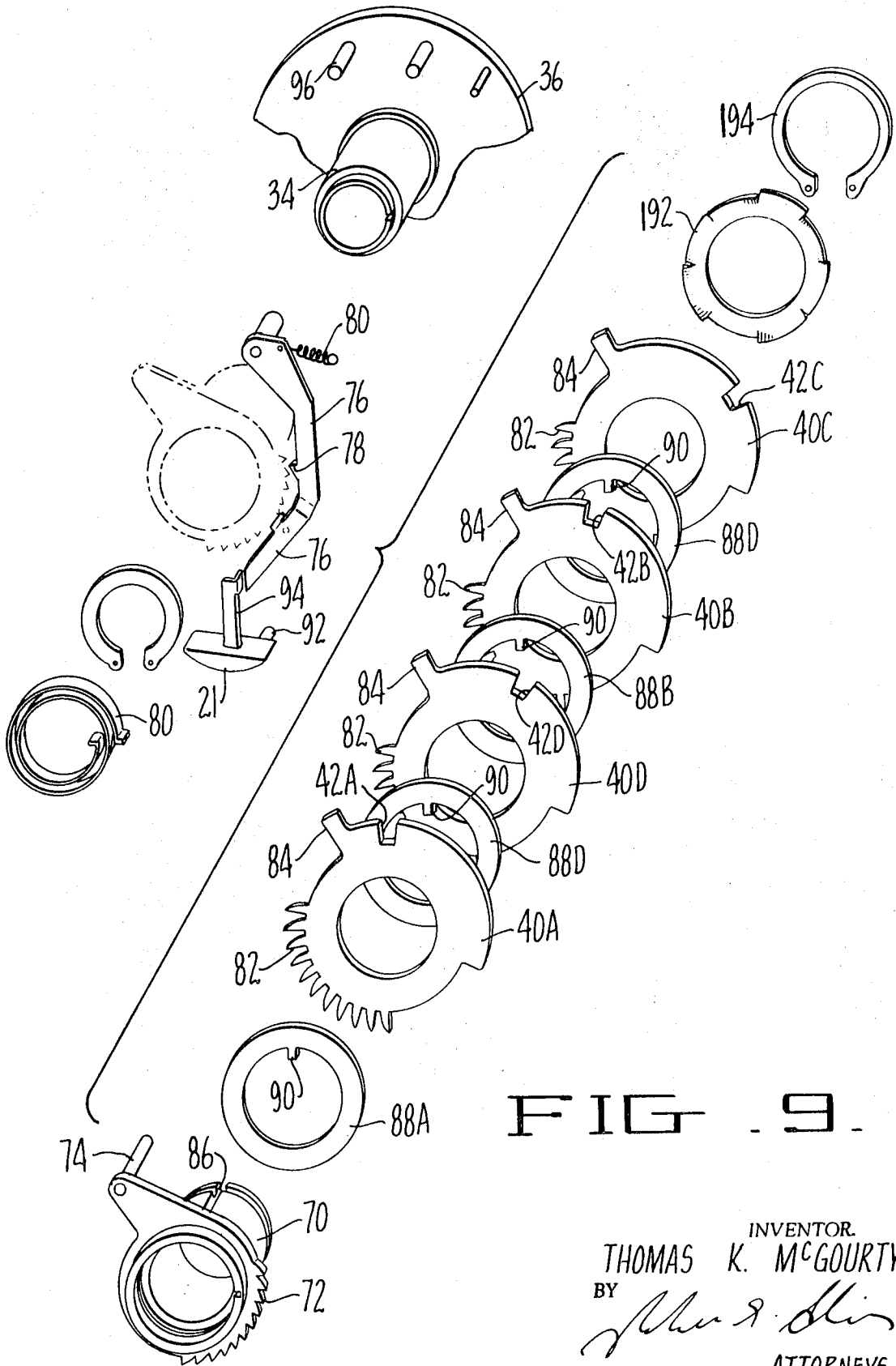


FIG. 9.

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3,616,667

PUSH BUTTON DOOR LOCK

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7 Sheets-Sheet 6

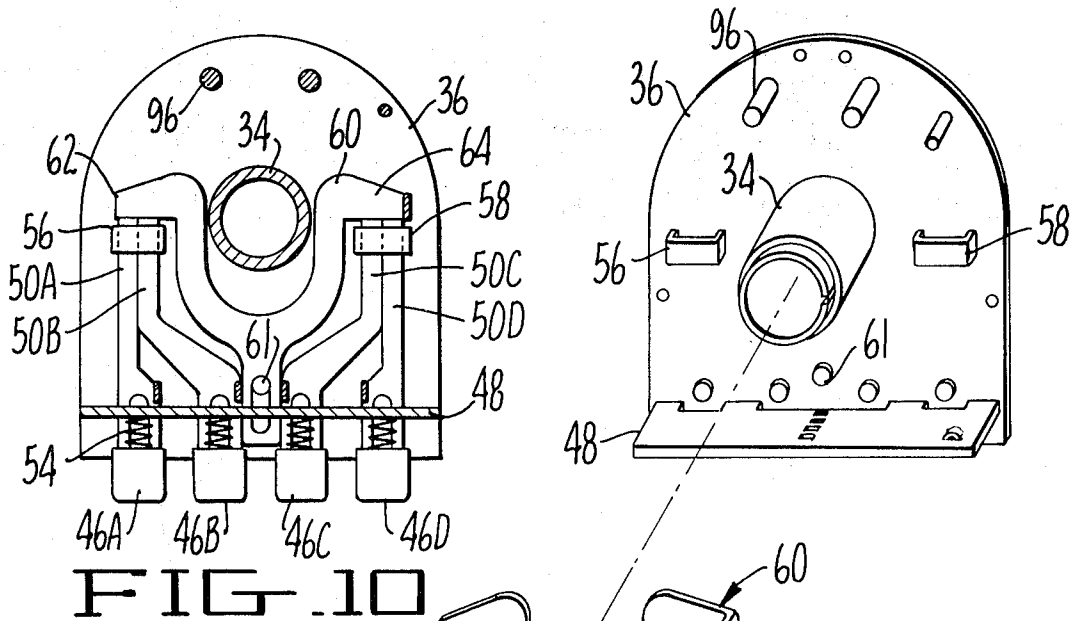


FIG. 10

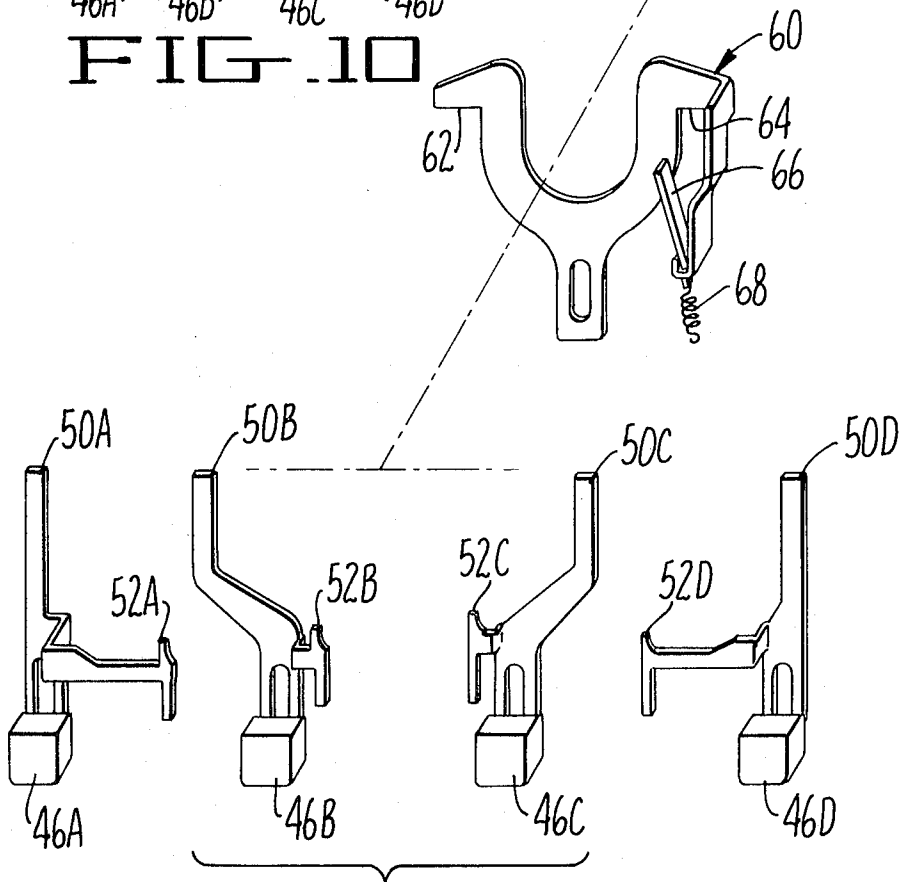


FIG. 11.

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3,616,667

PUSH BUTTON DOOR LOCK

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7 Sheets-Sheet 7

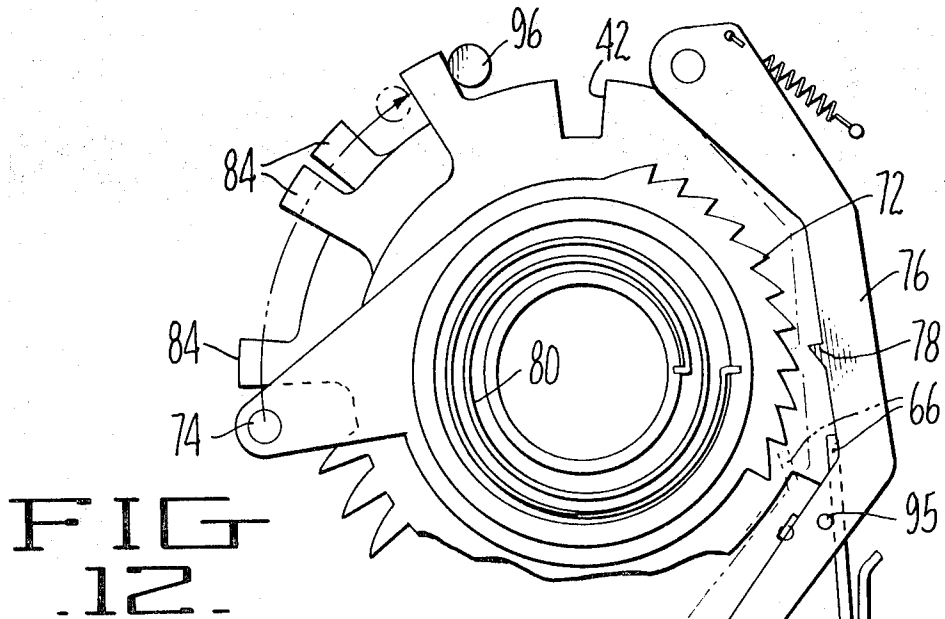


FIG. 12.

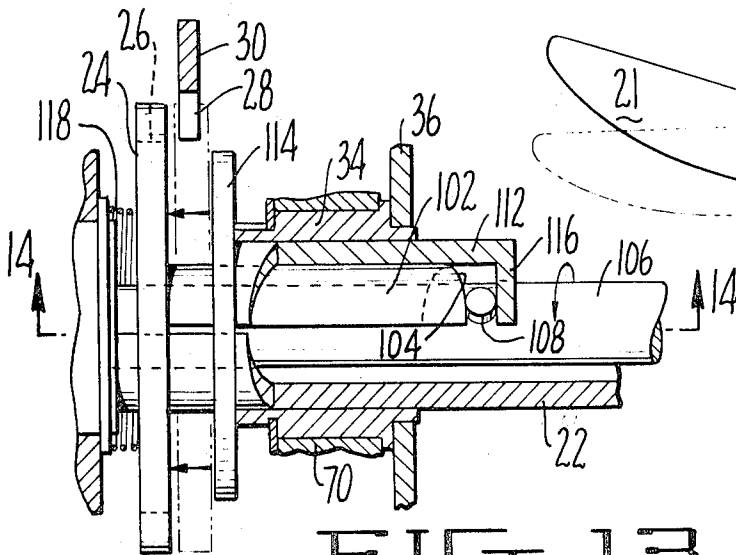


FIG. 13.

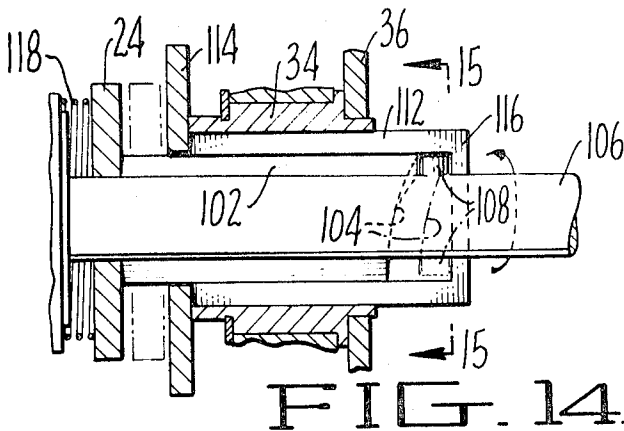


FIG. 14.

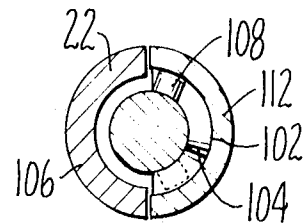


FIG. 15.

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3,616,667

PUSH BUTTON DOOR LOCK

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Int. Cl. E05b 37/16

U.S. Cl. 70—285

9 Claims

ABSTRACT OF THE DISCLOSURE

A compact push button door lock is provided which can be installed in an ordinary door without enlarging the normal opening through which a conventional lock is installed and utilizing a standard latch. The lock includes a plurality of friction driven discs each of which has a control button. A large number of permutations are possible despite the small size of the lock making it almost impossible for someone who does not know the combination to open the lock. In accordance with one embodiment of the present invention, the discs are provided with breakout members so that the home owner can provide his own combination. The lock can also be opened in the usual manner with a key.

SUMMARY OF THE INVENTION

The present invention provides a door lock of the combination type so that it is not necessary for the user to carry a key. Combination locks for doors have been known in the past but they have suffered from a number of defects. Some of the locks have had relatively simple combinations so that if one did not know the exact combination, the lock could be opened upon a short period of experimentation. The present invention provides a lock which has a very large number of possible combinations, so that it would be virtually impossible for someone to run through all of the permutations and open the lock in any reasonable time. For instance, in an illustrated preferred embodiment of the lock, four locking discs are provided, each of which can go into any one of twelve different positions. Thus the discs can be in over 20,000 different configurations making the lock virtually impossible to open with any ordinary experimentation. The structure is such that the number of discs as well as the number of positions could readily be increased if this number were considered not sufficient.

Other push button locks have been known which were bulky and which required relatively large mounting holes in the door. The lock of the present invention fits readily onto a standard door latch so that no special cutting of the door is required.

The lock of the present invention is one which can be made with relatively few moving parts so that it is relatively inexpensive and has a long service life.

Another feature of the present invention is that it is easy to fabricate the discs in such a manner that the user or installer of the lock can readily alter the discs to give any desired combination which serves the two fold purpose of simplifying the lock from the manufacturer's standpoint and allowing the home owner or installer to work out a combination himself with reasonable assurance that it has not been duplicated elsewhere or known to others.

Various other features of the lock of the present invention will be brought out in the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a portion of a door showing a lock embodying the present invention in place on the door.

2

FIG. 2 is an enlarged, perspective, exploded view of the lock shown in FIG. 1.

FIG. 3 is an enlarged end view of the locking mechanism.

5 FIG. 4 is a top view of the locking mechanism.

FIG. 5 is a section on the line 5—5 of FIG. 4.

FIG. 6 is an enlarged detailed view of the locking mechanism with the front cover plate removed.

FIG. 7 is a section on the line 7—7 of FIG. 6.

10 FIG. 8 is a section on the line 8—8 of FIG. 6.

FIG. 9 is an exploded view of the latching mechanism employed.

FIG. 10 is a reduced section on the line 10—10 of FIG. 8.

15 FIG. 11 is an exploded view, with certain parts removed showing the indexing and latching mechanism.

FIG. 12 is an enlarged diagrammatic view showing the resetting mechanism.

20 FIG. 13 is a side view in section illustrating the method by which the lock is disengaged.

FIG. 14 is a section on the line 14—14 of FIG. 13.

FIG. 15 is a section on the line 15—15 of FIG. 14.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

25 Referring now to the drawings by reference characters there is shown in FIGS. 1 and 2 a door 16, having a usual latch 18 and door knob 20. Knob 20 is located on half round shaft 22 and latch 18 is normally actuated by means not illustrated in these first two figures but well known to those skilled in the art. A locking and resetting lever 21 is provided and the knob has the usual key opening 23. Mounted on the shaft 22 is arm 24 having notches 26 on each side thereof. Normally arm 22 is kept from rotating by the finger 28 located on lever 30 which is pivoted at 32. It will be noted that shaft 22 is actually half-round and it can be rotated 180° to accommodate right or left handed doors.

30 Shaft 22 is mounted for rotation in a bearing 34 mounted on frame 36. Mounted on the outside of the bearing 34 is a locking mechanism generally designated 38 having a plurality of discs, one of which has been designated 40, each of the discs having a slot such as the one designated 42 in disc 40. Normally the slots in the several discs are not in alignment and a rod 44 mounted on the end of lever arm 30 opposite of finger 28 lies against the outer surface of the disc holding rod 44 in the position shown in solid lines and thus the finger 28 in the locked position in notch 26. Spring 31 normally biases the arm 30 in the locked position. When the discs are brought into alignment, as is shown in FIG. 2, rod 44 can be moved into the position shown in dash lines by the cam action of slot 26 and finger 28, now allowing the shaft 22 to turn the latch 18. Aligning the discs is brought about by the action of the buttons 46 and it is this mechanism that forms the crux of the present invention and which will now be described in detail.

35 The four push buttons 46A, B, C and D are slidably mounted on a bracket 48 which is attached to the frame member 36. As can be seen in FIG. 11, each of the buttons has two members attached thereto, namely an advancing member 50 and a holding finger 52. Springs 54 bias the buttons downwardly but they can be readily pushed upwardly against the spring pressure. A pair of U shaped brackets 56 and 58 each retain the ends of two of the advancing members in sliding relationship. Thus the advancing members 50A and 50B slide in the brackets 56 while the advancing members 50C and 50D slide in the bracket 58. A U shaped member generally designated 60 mounted for sliding motion on pin 61 has flanges 62 and 64 thereon and the ends of the advancing members 50A and 50B bear against 62 while 50C and

50D bear against 64. Thus pushing any one of the four buttons 46 upwardly will cause the U shape member 60 to move upwardly.

Attached to the U shaped member is an advancing pawl 66. A spring 68 normally biases the U shape member 60 downwardly and also causes the upper end of the pawl to be biased toward the left.

Mounted on the outer surface of bearing 34 is a rotating sleeve 70 which carries a ratchet wheel 72. Also mounted on the ratchet wheel 72 is a rearwardly extending return arm 74. A spring mounted arm 76 carrying a detent pawl 78 is pivoted on the plate 36. As the ratchet wheel turns, the detent pawl 78 tends to hold it in any advanced position it assumes. Thus, the ratchet wheel can be advanced by pushing any of the buttons 46 acting through the pawl 66 and the ratchet wheel will stay in its advanced position by means of pawl 78. A spring 80 tends to rotate the ratchet wheel 72 clockwise and thus keeps it in contact with the detents 66 and 78.

Mounted for rotation on the sleeve 70 are the toothed discs 40 which have been designated 40A, B, C, and D, there being one disc corresponding to each of the buttons 46. Each of the discs 40 has a series of teeth 82 thereon, a return lever 84, a slot 42 and a shoulder 85. The four discs 40 are identical except for the location of the slots 42. The sleeve 70 has a keyway 86 therein and a series of friction washers 88A-D, each of which has a key 90, are mounted on 70, each with its key 90 extending in the key way 86. The discs 40 and the friction washers 88 are kept under tension by means of a spring 192 and the whole assembly is held on the sleeve 70 by means of a locking ring 194. The holding fingers 52A-D are staggered, as is best seen in FIG. 2, so that one of these holding fingers mates with one of the toothed discs 40. In other words, 52A lies directly below the teeth 82 on wheel 40A and so on. When any one of the buttons is pushed upwardly, it will engage the tooth 82 of the corresponding wheel, keeping that wheel from rotating while the friction discs will cause any wheel not so retarded to advance. Return arm 74 underlies the return levers 84 on each of the toothed wheels 40.

As was previously mentioned, a locking and reset plate 21 is provided on the front of the combination lock. The function of this can best be seen in FIG. 12. Plate 21 is pivoted in pin 92 and attached to this plate is arm 94. Arm 94 is in contact with arm 76 which carries the holding pawl 78 and this arm has a projection 95 which bears against the advancing pawl 66. Thus, when the plate 21 is pushed upwardly, as is shown in FIG. 12, arm 94 causes both the advancing and holding detents 66 and 78 to be pulled away from the ratchet wheels 72 so that the spring 80 causes this wheel to rotate clockwise. This moves the return arm 74 against the levers 84 causing all of the discs to rotate to their maximum clockwise position with levers 84 against stop 96.

As was previously mentioned, in addition to using the combination, one can unlock the door with a key in the conventional manner. The means by which this is accomplished will now be described. Mounted for sliding movement within the hub 34 is a half round sleeve 102 extending from arm 24 and formed with a helix shaped cam surface 104 along its distal face. Sleeve 102 is situated diametrically opposite half round hollow shaft 22, mounted within these hollow members (22 and 102, is a solid shaft 106 leading from and rotated by key lock 23. A pin 108 extends from shaft 106 and acts on cam surface 104. Thus when shaft 106 is rotated, through the action of key in key lock 23, pin 108 will act on cam 104 and displace arm 24 from the lock position (shown in phantom line in FIGS. 13 and 14) to an unlocked position, out of engagement with lever 30 (shown in solid line in FIGS. 13 and 14). With notch 26 out of alignment with finger 28, the bolt 18 may now be withdrawn by turning knob 20 in the usual manner. Another half round sleeve 112 extends coaxial with sleeve

102 and has shoulder flanges 114 and 116 which abut the end of bearing 34 and pin 108 respectively and act to capture pin 108 in the proper position between shoulder 116 and cam 104. Thus as may be seen, as shaft 106 is rotated, pin 108 will displace sleeve 102 and arm 24 against compression spring 118. This will move notch 26 out of alignment with finger 28 and allow arm 24 to be rotated. Shoulder 116 of sleeve 112 will supply the proper back-up for pin 108 to prevent it from moving axially relative to the cam surface. When shaft 106 is rotated back to relock the door spring 118 will displace arm 24 back into alignment with finger 32 of lever 30. At this point the door will be locked and either of the two unlocking actions may be employed to unlock it once again.

One optional feature of the present invention is that the locking discs can all be made the same in the factory and the home owner or installer of the lock can then set any combination he wishes on the lock, simplifying both the manufacture of the lock and insuring the homeowner that no one else has knowledge of his combination. This structure is shown in FIG. 5. Here the disc 40A is used for illustrative purposes. Disc 46 is not made solid but rather has a series of slots as at 122, forming a series of tabs 124. It is obvious that slots 122 must be quite narrow so that the arm 44 will not catch on the slots. At the root of each of the slots the metal is weakened as at 126. Therefore, it is a simple matter to break off any one of the tabs 124, as by bending with a pair of pliers, so that the lock can be adjusted to the owners individual desired combination.

A typical operation of the lock will now be described. In the embodiment illustrated, the lock is set for the following sequence of operations:

A
A
AB
ABD
ABD

It will be remembered, that unless a disc is restrained, it will move forward one notch each time any one of the buttons is depressed. In the embodiment illustrated, A has already been set to the open position so that each time any of the buttons is pressed, the A button must be pressed since otherwise the A disc would move to a locked position. The C disc has its notch five notches removed from the open position so that the C button must not be pressed at any time if the combination is set for 5 presses. The B disc is two notches removed from the unlocked position so that B button must be simultaneously pressed during three of the operations to bring it into position while the D disc is three notches removed and therefore it must be pressed twice to bring it into position. Thus, the first two presses hold the A disc in place and each press moves the other disc up one notch so that upon the second press, the A disc and B disc have their notches aligned. The third press holds the A and B discs in place and moves the other two discs up one notch and so on. At the end of the sequence, all four of the notches in the four discs are brought to the position shown in FIG. 2 and now as one turns the knob, the camming action of the notch 26 on finger 28 will cause the lock to open since the pin 44 can now pass into the four slots 42.

If one makes a mistake while pushing the buttons, or if one wishes to lock the door upon leaving, it is only necessary to press the resetting lever 21 which will cause arm 76 to move to the right releasing the detents from the ratchet pawl 72, causing arm 74 to contact all of the return levers 84 which will rotate all of the discs clockwise against the stop 96, returning the lock to the starting position. If one wishes to open the lock with a key it can be done as previously described. Further, the lock can be opened with the knob from the inside in the usual

5

manner without using either the key or the combination lock.

Although in the example given the combination was worked with five series of operations, a larger or smaller number might be employed, depending upon the initial set-up of the discs. In the embodiment illustrated, each disc has ten possible slots, so that a combination employing as many as 10 operations might be used.

Although a specific embodiment of the lock of the present invention has been described, it will be obvious to those skilled in the art that many variations can be made of the exact structure shown without departing from the spirit of this invention. For instance, the number of discs and the number of positions in which the discs can be placed can be increased or decreased, the position of the push buttons could be altered the key lock feature eliminated, and the like.

I claim:

1. A push button lock comprising in combination:

- (a) a plurality of toothed discs mounted for rotation,
- (b) a plurality of push buttons, one push button corresponding with each of said toothed discs,
- (c) friction means connected between said discs and said push buttons whereby pushing any of said buttons will tend to rotate all of said discs,
- (d) holding means on each of said buttons whereby said holding means prevents the rotation of the corresponding disc when the button is depressed and,
- (e) unlocking means whereby said combination lock is unlocked when said discs are brought to a predetermined alignment.

2. The structure of claim 1 wherein said toothed discs are mounted on a common shaft with a friction washer keyed to turn with the shaft mounted on said shaft in contact with each of said discs.

3. The structure of claim 2 wherein each of said push buttons is connected to a pawl through a lost motion linkage and wherein said shaft has ratchet teeth thereon in contact with said pawl whereby advancement of any button causes said shaft to turn.

6

4. The structure of claim 1 wherein each of said discs has a slot therein and wherein the locking mechanism has an arm bearing against said disc, whereby the slots on all the discs can be brought into alignment, unlocking said lock.

5. The structure of claim 1 wherein the holding means comprises a finger attached to each push button, said finger moving into contact with the teeth of a disc when the button is pushed, preventing rotation of said disc.

6. The structure of claim 1 wherein said discs are biased by a spring in one direction and moved forward against a pawl in the opposite direction with reset means, whereby said pawl can be released, causing said discs to be spring returned to a starting position.

7. The structure of claim 1 wherein said toothed discs are provided with series of slots forming tabs on the periphery of the disc and with the root of each tab weakened whereby a tab can be broken off, forming a slot in said disc.

8. The structure of claim 1 wherein a key lock is provided, said key lock overriding said combination whereby the lock can be opened either by the key lock or the combination lock.

9. The structure of claim 1 wherein 4 discs and 4 push buttons are employed.

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70-301, 313, 314, 323