United States Patent [19]

Schulz

[11] **3,910,078**

[45] **Oct. 7, 1975**

[54] **PUSH BUTTON LOCK**

[75] Inventor: **Donald A. Schulz,** Milwaukee, Wis.

[73] Assignee: **S-B Manufacturing Co. Ltd.,** Milwaukee, Wis.

[22] Filed: **Apr. 1, 1974**

[21] Appl. No.: **456,582**

[52] **U.S. Cl.** **70/30;** 70/93; 70/129; 70/287; 70/298; 70/315; 70/443

[51] **Int. Cl.²** **E05B 37/16**

[58] **Field of Search** 70/25, 26; 30, 93, 181, 70/214, 287, 288, 297, 298, 299, 129, 315

[56] **References Cited**

UNITED STATES PATENTS

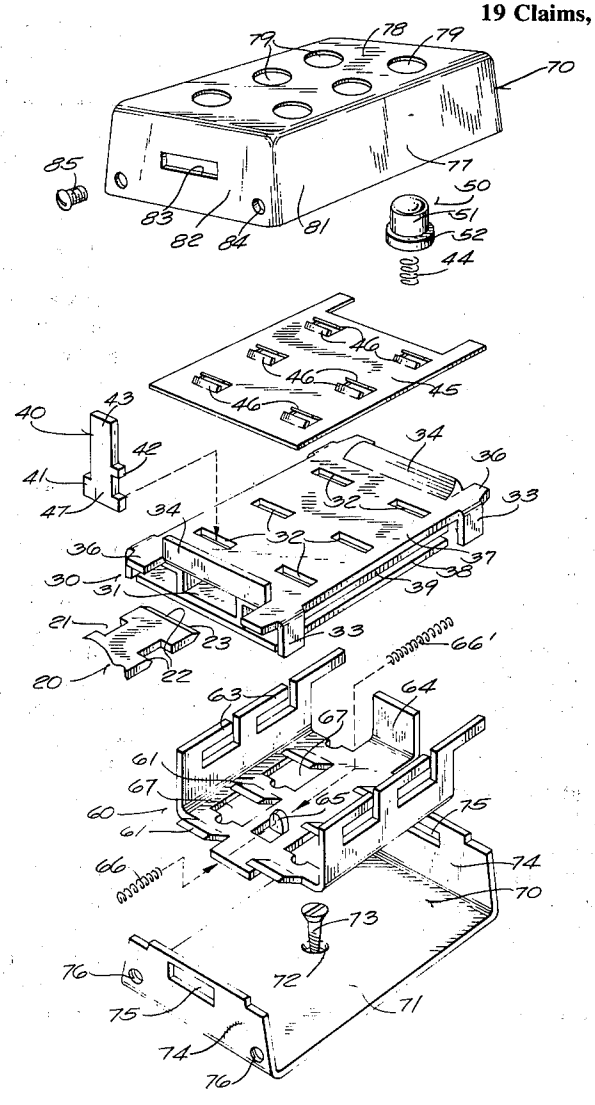
577,358	2/1897	Clarke	70/27
599,765	3/1898	Chase	70/28
685,135	10/1901	Hart	70/26
1,430,332	9/1922	Smith	70/149
1,686,632	10/1928	Mayer	70/25
2,101,264	12/1937	Mayer	70/25
2,772,555	12/1956	Smith	70/153
3,004,419	10/1961	Falk	70/93
3,161,035	12/1964	Adamel et al.	70/93

Primary Examiner—Albert G. Craig, Jr.
Attorney, Agent, or Firm—Wheeler, Morsell, House & Fuller

[57] **ABSTRACT**

A novel push button operated combination lock has a series of plungers on either side of a central channel in which the bolt operates. The plungers are notched differently on their respective sides and the combination may be changed by releasing the plungers and reversing them in their channels. The bolt is not releasable unless the correct plungers and only the correct plungers are depressed and there is no means of knowing from the push buttons which plungers or how many plungers must be depressed. The plungers may be reset by pressing the bolt for a new attempt at the right combination or to lock the mechanism. Although the mechanism is readily reset to change the combination when the cover is removed, the cover may only be removed when the bolt is out of the mechanism, securing it against tampering. A variety of forms are shown in which the mechanism is used on a security chain, a padlock, a window lock, and a dead bolt mechanism.

19 Claims, 11 Drawing Figures



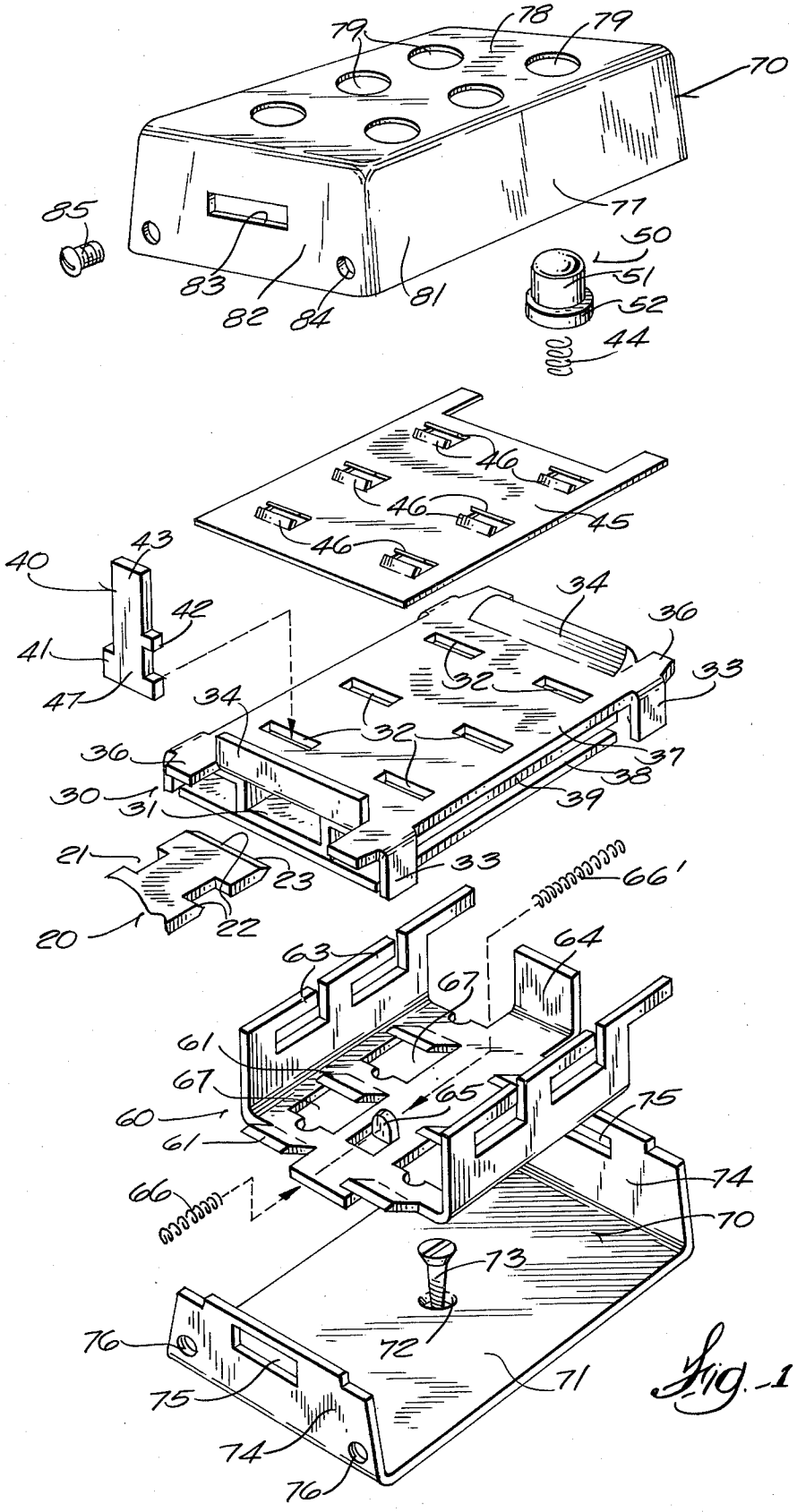

79
78
79
70
85
77
50
51
52
44
83
82
84
81
46
46
46
45
43
40
42
41
47
34
36
32
33
34
36
32
37
38
30
31
39
21
23
33
66'
20
22
63
64
67
61
67
65
75
60
61
74
66
70
73
72
76
71
75
74
76

Fig. 1

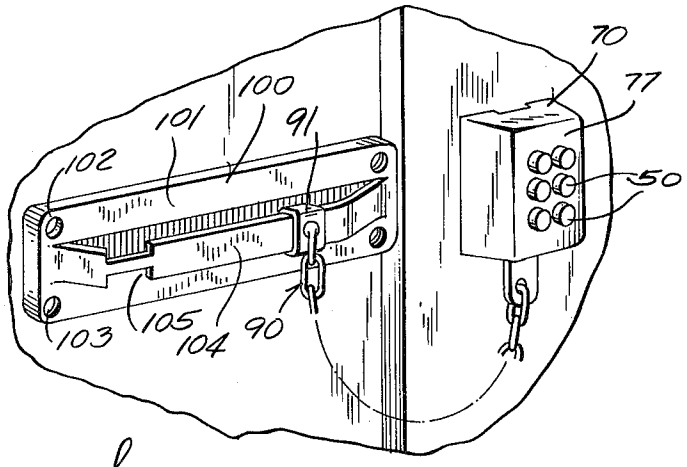


Fig. 2

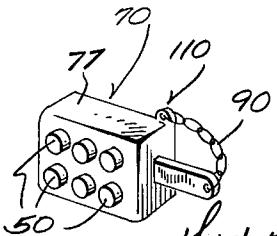


Fig. 3

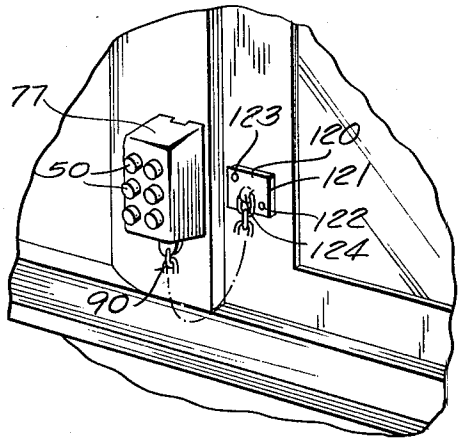


Fig. 4

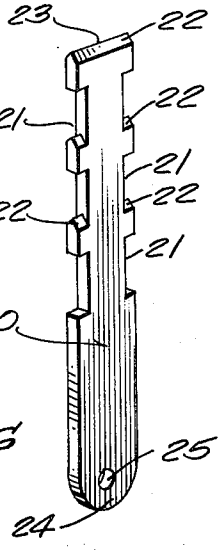


Fig. 6

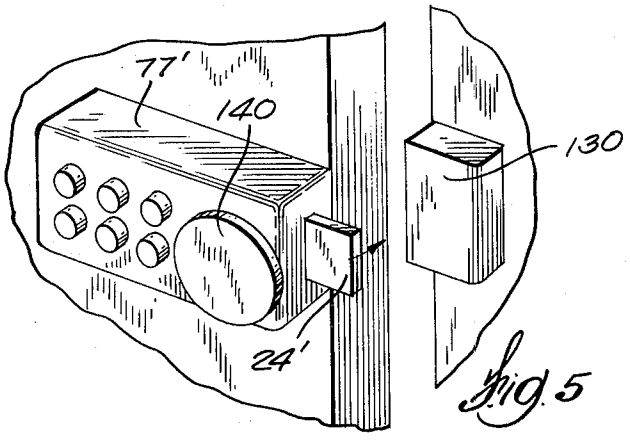


Fig. 5

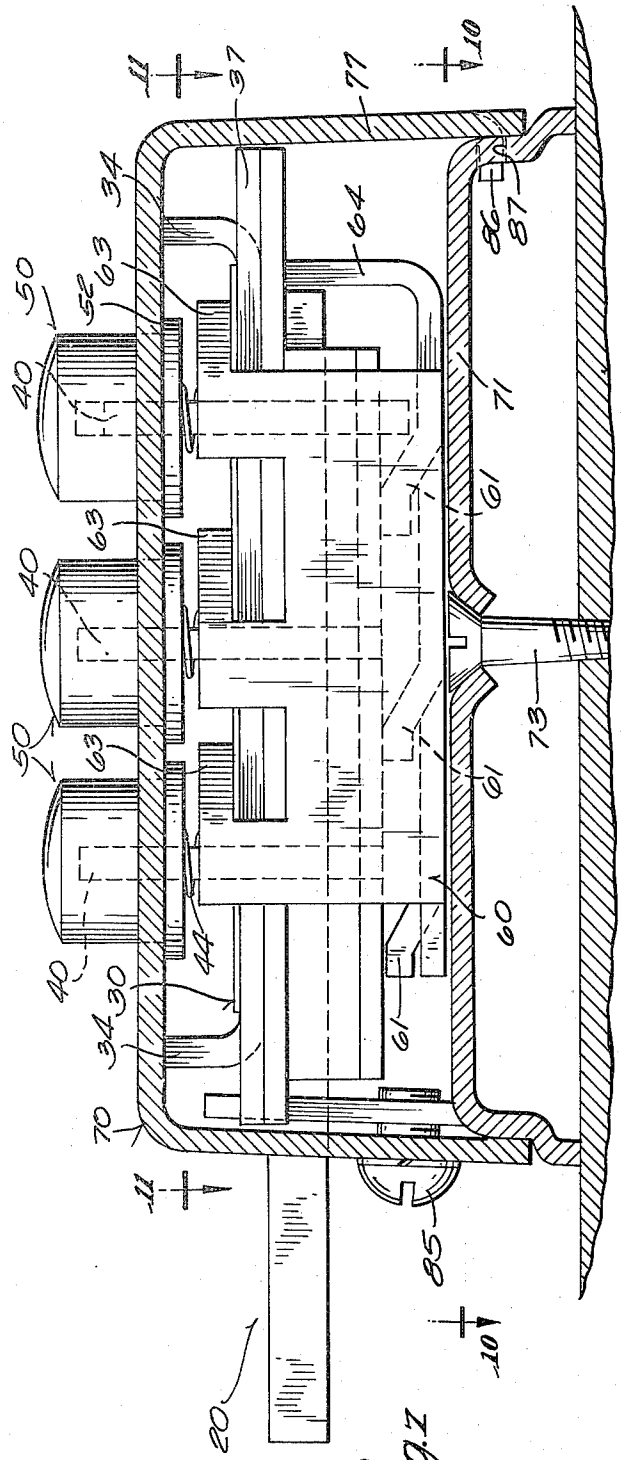


Fig. 7

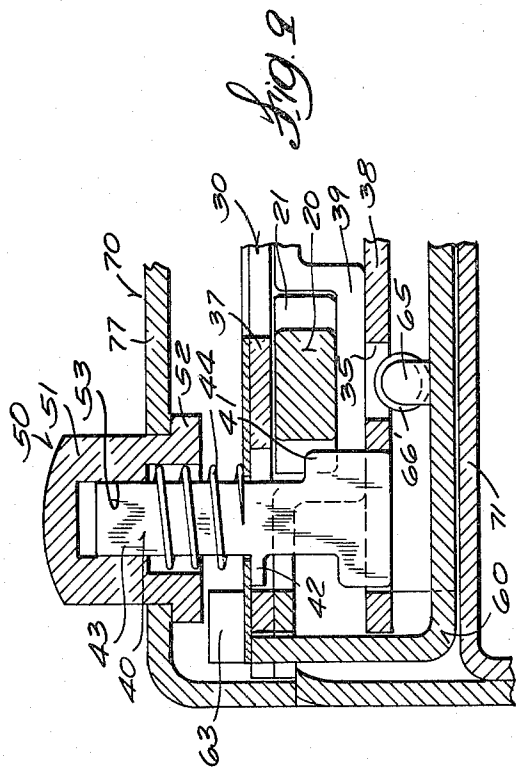


Fig. 9

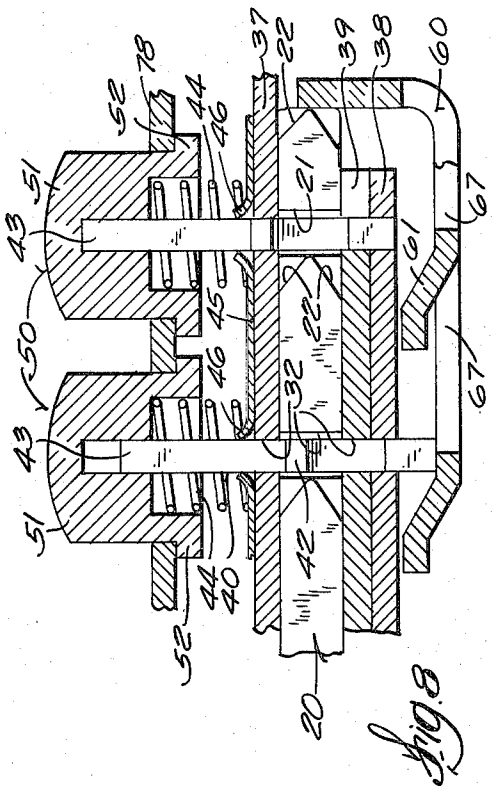


Fig. 8

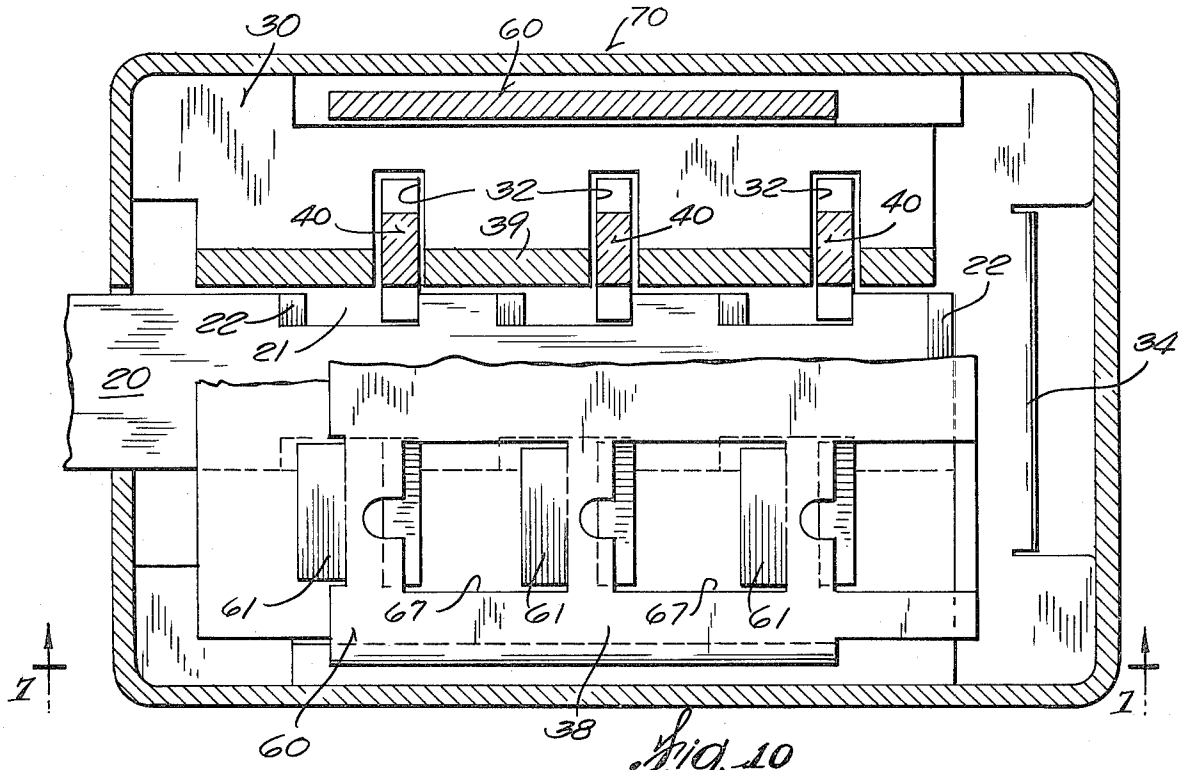

30
60
70
32
32
40
40
40
39
22
22
21
20
34
61
67
61
67
61
7
7
60
38

Fig. 10

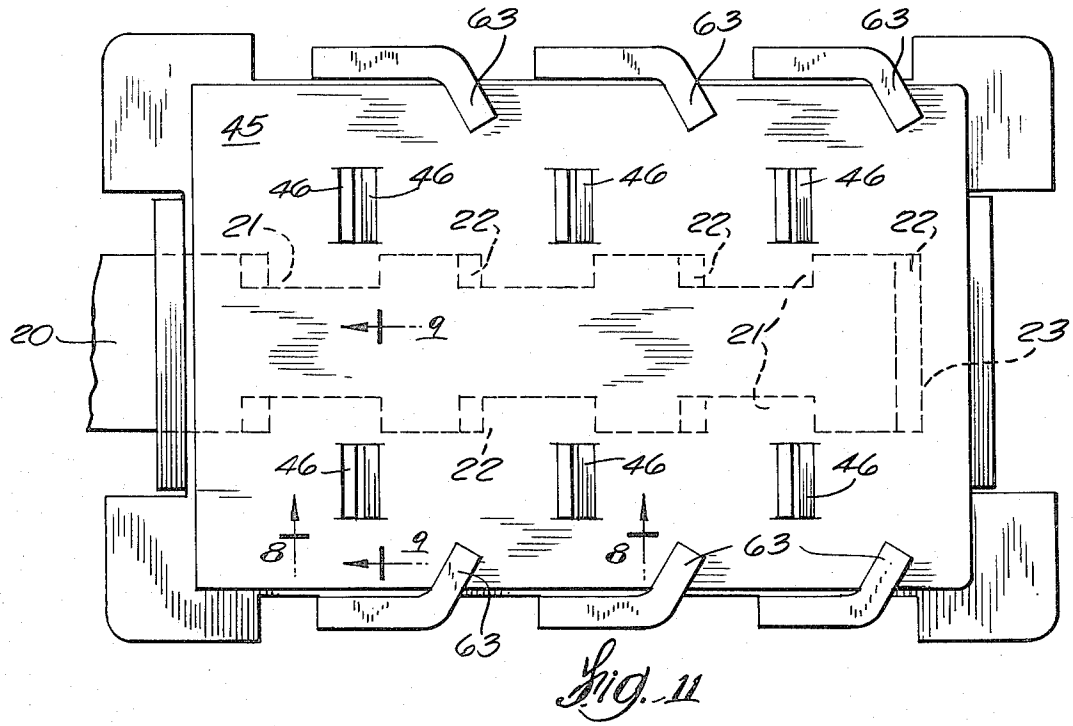

63
63
63
45
46
46
46
46
21
22
22
22
20
9
21
23
46
22
46
46
8
9
8
63
63

Fig. 11

PUSH BUTTON LOCK

BACKGROUND OF THE INVENTION

Locks actuated by push buttons have been known in the past. For instance, see U.S. Pat. Nos. 1,662,489; 109,457; 1,430,332; 1,499,963; 2,406,332 and 2,637,195.

SUMMARY OF THE INVENTION

The bolt of my lock is a close fit in a bolt channel extending longitudinally through the main frame of my lock mechanism. Tumbers operating in channels intersecting the bolt channel control movement of the bolt in the channel. Push buttons are employed to set the tumblers manually and a cam plate is employed to reset all of the tumblers to starting positions. The cam plate is operated by pressing the bolt home. By removing the cover of the mechanism the tumblers are exposed. The cam plate can be set to permit tumbler removal. By turning a tumbler 180° with respect to the bolt the respective tumbler may be changed from one which locks the bolt when it is actuated to one which locks the bolt when it is unactuated, or vice-versa. This operation may be performed by the user. Thus, it will not be known by a stranger whether the combination required to operate a particular lock requires the actuation of one tumbler, two tumblers, three tumblers, four tumblers, five tumblers, or all six tumblers. If extra tumblers are actuated the lock cannot be opened even if the correct tumblers are actuated. This increases the complexity of the task of a stranger attempting to break in. The number of combinations available is the sum of the number of combinations available with any particular number of push buttons and the number available with other numbers of push buttons.

The housing which encloses my lock is provided with a slot for the bolt both in the cover section and in the base section. Thus, the housing cannot be disassembled while the bolt is locked into the housing.

DESCRIPTION OF DRAWINGS

FIG. **1** is an exploded view of the parts of my lock.

FIG. **2** is a perspective view of my push button lock arranged as a security chain.

FIG. **3** is a perspective view of my push button lock arranged as a padlock.

FIG. **4** is a perspective view of the push button lock of my invention applied to a window lock.

FIG. **5** is a perspective view of my lock arranged to serve as a dead bolt for a door.

FIG. **6** is a perspective view of the bolt which is a part of my lock in all of its forms.

FIG. **7** is a longitudinal cross-sectional view of my lock.

FIG. **8** is a fragmentary cross-sectional view on line **8—8** of FIG. **11.**

FIG. **9** is a cross-sectional view on line **9—9** of FIG. **11.**

FIG. **10** is a cross-sectional view on line **10—10** of FIG. **7.**

FIG. **11** is a cross-sectional view on line **11—11** of FIG. **7.**

DESCRIPTION

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely

exemplify the invention which may be embodied in other specific structure. While the best known embodiment has been described, the details may be changed without departing from the invention, which is defined by the claims.

The basic mechanism of my lock does not vary whether it is arranged for use as a termination for a door security chain (FIG. **2**), a padlock (FIG. **3**), a window lock (FIG. **4**), or a door dead bolt (FIG. **5**) although in the FIG. **5** version a manual operating part is provided.

The basic operating mechanism is shown in FIG. **1** and FIG. **6,** and is shown in assembled relationship in FIGS. **7** through **11.**

In general, my lock consists of a bolt **20** which has some of the characteristics of a key, a frame or body **30** in which the moving parts are mounted, a number of tumblers **40** (six as illustrated) which secure or release the bolt, a push-button **50** for each tumbler, a cam plate **60** to reset the tumblers, and a housing **70** to enclose the frame and working parts.

The embodiments shown include a door security chain (FIG. **2**) in which a chain **90** on the bolt has a slide **91** on its free end to secure it to a chain rail anchorage **100**; a chain padlock (FIG. **3**) in which the end of the chain **90** is attached to loop **110** on housing **70**; a window lock (FIG. **4**) in which the end of chain **90** is attached to loop anchorage **120**; and a door bolt (FIG. **5**) in which the end **24'** of bolt **20** is plain and a conventional manual actuating knob **140** moves the bolt in and out of a striker **130.** As shown the parts are surface mounted, but they could be recessed into a door and frame with a flat striker. Each embodiment varies only in externals. The operating mechanism constituting my invention is the same in each.

The bolt **20** (FIG. **6**) is a flat bar provided with recesses **21** along the sides to receive the tumblers. A double ramp **22** is provided at front end **23** of bolt **20** and at the rear of each recess **21** but the last on each side to position tumblers **40** accurately, as will appear. End **24** extends out of housing **70** even when bolt **20** is fully inserted, and secures the chain **90** or striker **130** to the lock.

The frame or body **30** is assembled from flat top plate **37** and bottom plate **38** and a central plate **39** bent to define a bolt channel **31** extending longitudinally through the frame. A tumbler channel **32** for each tumbler begins with an opening in the top plate **37,** continues as a slot in the side of bolt channel **31,** and terminates as an opening in the bottom plate **38** of frame **30.** (FIGS. **1** and **8**).

Frame **30** is also provided with positioning ears **33** bearing on the bottom of housing **70,** positioning flanges **34** bearing on the top of the housing, and end positioning ears **36** bearing on the ends of housing **70** for accurate positioning of frame **30.** Opposed notches **35** in plate **38** (FIGS. **1** and **9**) respectively anchor the ends of cam plate springs **66** and **66'** (later described) which bear on spring base **65** of cam plate **60.**

Mounted slidably in each tumbler channel **32** is a tumbler **40** sliding axially of the tumbler on a path intersecting the edge of the bolt channel **31.** Each tumbler has a side projection **41** on one side positioned to lie in a bolt recess **21** to engage the bolt when the tumbler is in its rest, or reset, position and to be free of the bolt recess when the tumbler is moved axially to its operated position by its push button **50.** Each tumbler has

a second projection 42 on the other side from projection 41 positioned to lie in a bolt recess 21 to engage the bolt when the tumbler is in its operated position and to be free of the bolt recess when the tumbler is in its rest, or reset, position. The lock combination is set by arranging tumblers 40 in their respective channels 32 so that either projection 41 or projection 42 is on the side toward bolt channel 31 to interact with bolt 20. For that purpose cam plate 60 is movable to a position in which tumbler insertion openings 67 overlie tumbler channels 32 in frame bottom plate 38. A tumbler 40 may then be pushed out of channel 32 enough to be grasped and completely removed, turned 180°, and replaced with the other projection 41 or 42 interacting with the bolt.

The upper end 43 of each tumbler fits freely in recess 53 of push button 50. The lower end 47 of each tumbler is exposed to the cam plate to be reset to rest position by its cam 61. In the rest position (FIG. 9) end 43 is farthest up in recess 53, while in the operated position end 43 is only partially in recess 53 (left side of FIG. 8 and right side of FIG. 7).

Spring 44 acts between spring plate 45 and the inside flange of button recess 53 to keep body 51 of button 50 raised and its flange 52 against housing top 78 (FIGS. 7–9) unless depressed by a user momentarily. Spring plate 45 has opposed spring leaves 46 at each tumbler channel 32 which are integral with plate 45 and bear laterally on end 43 of tumbler 40 to frictionally hold the tumbler in its rest position or its operated position.

Cam plate 60 has a cam 61 for each tumbler 40 and a tumbler insertion opening 67 for each tumbler (two openings 67 are at the end of the plate as shown in FIG. 1). Side flanges 62 embrace frame 30 between ears 33 to guide and limit cam plate movement axially of the frame. and fingers 63 struck from the top of flange 62 are bent during assembly to overlie spring plate 45 to retain the parts in assembled relationship. End actuating flange 64 projects across the end of bolt channel 31 and is pushed by end 23 of bolt 20 to cause cams 61 to reset tumblers 40 to rest position. Spring base 65 receives the ends of opposing springs 66 and 66′. The other ends of the springs push against the ends of slots 35 (FIG. 9). The cam plate thus has three positions, a first position with springs 66 and 66′ in equilibrium in which the cam plate underlies each tumbler 40 leaving space for tumbler movement, a second position with spring 66′ compressed in which a cam 61 pushes each tumbler 40 to reset or rest position, and a third position with spring 66 compressed in which the tumblers are exposed for resetting the combination. The third position is not attainable until frame 30 is removed from housing 70.

Housing 70 includes a base 71 and a cover 77. Base 71 may be mounted on a door or window closure or frame surface (FIGS. 2, 4 and 5) by means of at least one screw hole 72 and screw 73 or may be secured to chain 90 by loop 110 (FIG. 3). End flanges 74 are pierced at 75 to receive bolt 20 and at 76 to receive screws 85. Cover 77 has a top 78 provided with button openings 79, sides 81, and ends 82 provided with bolt opening 83 and screw holes 84 for screws 85 to assemble housing 70. The cover is provided with a tongue 86 and the base with a mating slot 87 at the end remote from bolt opening 83 (FIG. 7). These can only be disengaged after bolt 20 is removed and screws 85 are removed. Thus, the mechanism can only be exposed for resetting the combination by one who knows the old combination to remove bolt 20 from the housing.

FIGS. 2, 3 and 4 show arrangements of my lock in which end 24 of bolt 20 is pierced at 25 and linked to chain 90.

In FIG. 2 chain 90 ends in a slide 91, and security chain rail anchorage 100 is secured to the door or other closure, with housing 70 secured to the frame. Anchorage 100 consists of conventional base 101, screw holes 102, screws 103, rail 104 and notch 105 to admit the slide 91. The rail illustrated is a novel form but is not a part of the present invention.

In FIG. 3, chain 90 is attached to bolt 20 in the same way, but the end is linked to loop 110 on housing 70. The chain 90 might be any length as needed.

In FIG. 4, chain 90 is likewise attached to bolt 20 in the same way but the end is attached permanently to anchorage 120 by loop 124. Anchorage 120 has conventional base 121, holes 122 and screws 123. The lock housing 70 and anchorage 120 are respectively secured to a closure and a frame (a window and window frame as shown).

Of course, a variety of other terminations for chain 90 are possible. Anchorage 120 and housing 70 might both be on a boat and chain 90 could pass through an eye on a pier. Chain 90 could end in a snap fastener for attachment to a dog collar, or a dog collar could be permanently attached. Housing 70 could be permanently attached to a dog collar and the chain looped as in FIG. 3 so that only a person friendly with the dog could operate the lock. Other possibilities abound.

FIG. 5 shows an application without a chain 90. Bolt end 24′ is plain, and a striker comprising a metal housing open toward the bolt is fixed to the door frame across from housing 70 on the door. Of course, housing 70 could be on the frame and striker 130 could be on the door, and it would also be possible to recess housing 70 so that cover 77′ would expose only push-buttons 50 and manual knob 140. In that case the striker could be a flat plate apertured for bolt end 24′, as is also conventional. Knob 140 may be connected to bolt 20 to move it in any conventional way, such as a cam, a pinion and rack, or a link. Movement can only occur if the tumblers are positioned to permit such movement.

OPERATION

Assuming first that my device is unlocked, the bolt 20 moves freely in bolt channel 31. As shown in FIGS. 2 and 4 it will fall to hang from chain 90. To lock up, bolt 20 is inserted in channel 31 through openings 83 and 75 in the housing cover 77 and base 71 respectively. As end 23 moves down the channel ramps 22 assure that all tumblers are aligned properly with projections 41 and 42 clear of channel 31. Then as end 23 reaches cam plate actuating flange 64 it moves the cam plate against spring 66′ to a position in which all tumblers 40 are reset by cams 61 to their rest positions and held there by spring leaves 46. In those positions some tumblers will have projections 41 in channel 31 occupying recesses 21 in bolt 20 and projections 42 in the side space of frame 30 beside channel 31. Others will be arranged the other way, and projection 42 in the rest position is above channel 31, while projection 41 is in the space beside channel 31. The first group of tumblers 40 thus secure the parts of the lock against separation, while the second group are unlocked initially but be-

come locked if a button **50** for one of that group is pressed, guarding the lock against operation by the wrong combination.

If the wrong combination is accidentally used, the lock may be reset again by pressing bolt **20** all the way home to move cam plate **60** again.

Pushing the correct buttons **50** moves those tumblers **40** having projections **41** in channel **31** and recesses **21**, so that projections **41** move below channel **31** clear of the bolt and are held there by spring leaves **46**. Bolt **20** may now be moved to release the lock.

By dissassembling housing **70**, with bolt **20** removed, the combination may be changed. Frame **30** is removed from the housing and cam plate **60** is pressed against the bias of spring **66** to bring openings **67** under cam channels **32** and cams **40**. A cam **40** can then be pressed at **43** and grasped at **47** and pulled from channel **32**, reversed, and re-inserted. This reverses the operation of projections **41** and **42** so that a tumbler formerly locked in rest position now locks in the operated or actuated position, and vice-versa.

Have described the best mode of my device now known, the following claims describe the scope of my invention.

I claim:

1. A push button lock comprising a bolt having a series of recesses in a side of the bolt, a lock body having a channel for axial movement of the bolt, channels for tumblers in the lock body crossing the channel for the bolt, a tumbler movable axially in each said channel, each said tumbler having a rest position and an operated position, each tumbler being provided with a projection adapted to fit into a said recess in said bolt in an engaged position of said tumbler and adapted to be free of the recess of said bolt in another position of said tumbler, the engaged position of the projection being such as to prevent axial movement of the bolt, said engagement occurring in one of the rest position of the tumbler or the operated position of the tumbler, but not both, each side of each said tumbler being provided with a said projection, the projection on one side of each said tumbler being positioned so that its engaged position coincides with the rest position of the tumbler and the projection on the other side of the tumbler being positioned so that its engaged position coincides with the operated position of the tumbler, said tumblers being reversible in their channels to predetermine which projection is engageable with said bolt; a sliding cam plate underlying all of the tumbler channels, the sliding cam plate being movable between a first position and a second position, said cam plate being provided with a cam for each tumbler channel, each said cam underlying said channel in the second position and being spaced from the channel in the first position, each cam being shaped to force the tumbler in said tumbler channel to its rest position when the cam underlies the tumbler channel, whereby operation of the slidable cam plate forces all tumblers to their rest position, the slidable cam plate having an extension into the end of the bolt channel to move the cam plate from the first position to the second position by engagement with the end of the bolt as the bolt moves to the extreme end of the bolt channel, whereby insertion of the bolt to the end of the bolt channel automatically resets all tumblers to their rest position and locks the bolt into the bolt channel.

2. The device of claim **1** in which the sliding cam plate is provided with openings adjacent the cams, said cam plate being slidable to a third position in which the openings are aligned with the tumbler channels, each said tumbler being removable through a said opening for reversal in the tumbler channel to change the combination of the lock.

3. The device of claim **1** in which the lock is provided with two mating housing members assemblable to form a complete housing, said respective housing members having respective walls in face contact with one another, and aligned openings in said respective walls aligned with the bolt channel for insertion of said bolt whereby to prevent disassembly of said housing members while said bolt is in said channel, said bolt sufficiently long to extend through said housing openings in any position of the bolt within the bolt channel.

4. The device of claim **1** in which each tumbler is operated by a push button, the push button being spring mounted to return to its normal position independently of the position of the tumbler.

5. The device of claim **1** in which each tumbler is held in either the rest or the operated position by a friction member.

6. The device of claim **1**, said bolt being attached at one end to a chain.

7. The device of claim **6**, said chain being attached to a slide, said slide being formed to slide on the rail of the anchorage of a door security chain.

8. The device of claim **6**, said chain being secured to a housing for said push button lock.

9. The device of claim **6**, said chain being attached to an anchorage, said anchorage having openings for fasteners to secure said anchorage to a surface selected from an opening frame and an opening closure.

10. The device of claim **9**, said anchorage comprising a pierced base and a loop securing said chain to said base.

11. The device of claim **1**, further comprising a striker for said bolt, and manual means for moving said bolt axially to and from engagement with said striker.

12. The device of claim **1**, said cam plate having side flanges beside said lock body and portions bent from the plane of said side flanges over said lock body to hold the parts in assembled relationship.

13. The device of claim **1**, said lock body having projecting ears touching said housing to position said body, said cam plate having portions engageable with said ears to limit movement of said cam plate.

14. A push button lock comprising a bolt having a series of recesses in a side of the bolt, a lock body having a channel for axial movement of the bolt, channels for tumblers in the lock body crossing the channel for the bolt, a tumbler movable axially in each said channel, each said tumbler having a rest position and an operated position, each tumbler being provided with a projection adapted to fit into a said recess in said bolt in an engaged position of said tumbler and adapted to be free of the recess of said bolt in another position of said tumbler, the engaged position of the projection being such as to prevent axial movement of the bolt, said engagement occurring in one of the rest position of the tumbler or the operated position of the tumbler, but not both, each side of each said tumbler being provided with a said projection, the projection on one side of each said tumbler being positioned so that its engaged position coincides with the rest position of the tumbler

and the projection on the other side of the tumbler being positioned so that its engaged position coincides with the operated position of the tumbler, said tumblers being reversible in their channels to predetermine which projection is engageable with said bolt, each tumbler being held in either the rest or the operated position by a friction member, the friction member comprising a flat plate of spring material over the tumbler channels, and opposed spring leaves struck from the spring material at each tumbler channel, said tumbler extending between said leaves and deflecting said leaves so that said leaves bear on the sides of said tumbler to retain said tumbler in any axial position.

15. The device of claim **14** in which a sliding cam plate underlies all of the tumbler channels, the sliding cam plate being movable between a first position and a second position, said cam plate being provided with a cam for each tumbler channel, each said cam underlying said channel in the second position and being spaced from the channel in the first position, each cam being shaped to force the tumbler in said tumbler channel to its rest position when the cam underlies the tumbler channel, whereby operation of the slidable cam plate forces all tumblers to their rest position, the slidable cam plate having an extension into the end of the bolt channel to move the cam plate from the first position to the second position by engagement with the end of the bolt as the bolt moves to the extreme end of the bolt channel. whereby insertion of the bolt to the end of the bolt channel automatically resets all tumblers to their rest position and locks the bolt into the bolt channel.

16. The device of claim **15** in which the sliding cam plate is provided with openings adjacent the cams, said cam plate being slidable to a third position in which the openings are aligned with the tumbler channels, each said tumbler being removable through a said opening for reversal in the tumbler channel to change the combination of the lock.

17. The device of claim **15** in which the lock is provided with two mating housing members assemblable to form a complete housing, said respective housing members having respective walls in face contact with one another, and aligned openings in said respective walls aligned with the bolt channel for insertion of said bolt whereby to prevent disassembly of said housing members while said bolt is in said channel, said bolt being sufficiently long to extend through said housing openings in any position of the bolt within the bolt channel.

18. The device of claim **15,** said cam plate havng side flanges beside said lock body and portions bent from the plane of said side flanges over said lock body to hold the parts in assembled relationship.

19. The device of claim **15,** said lock body having projecting ears touching said housing to position said body, said cam plate having portions engageable with said ears to limit movement of said cam plate.

* * * * *