March 15, 1960 R. G. WATSON 2,928,271

AUTOMATIC LOCK

Filed April 29, 1957 2 Sheets-Sheet 1

Fig. 1

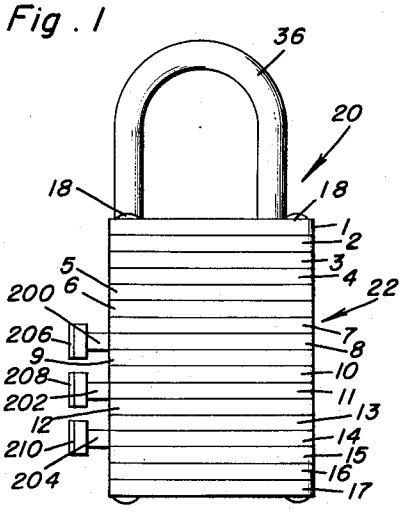


Fig. 2

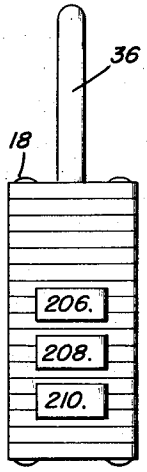


Fig. 3

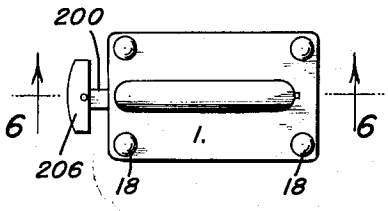


Fig. 4

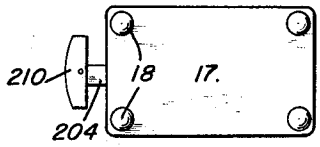
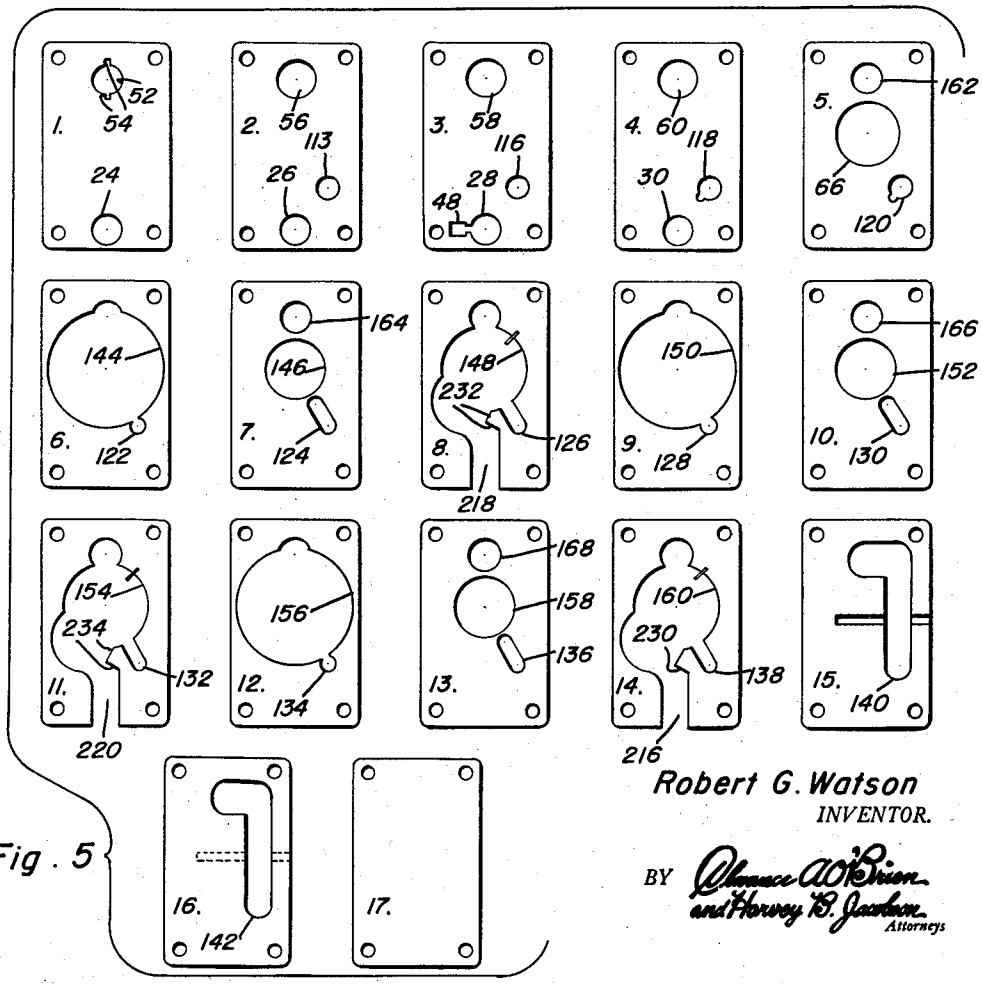


Fig. 5



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Fig. 6

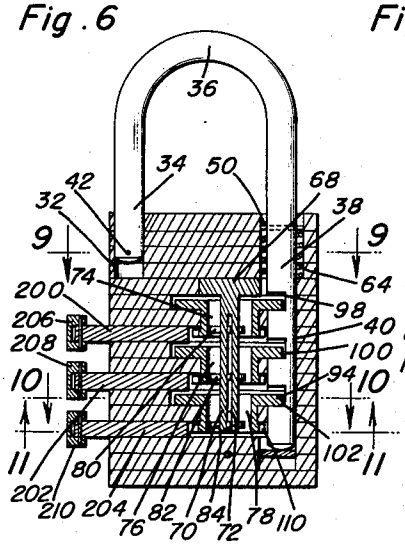


Fig. 7

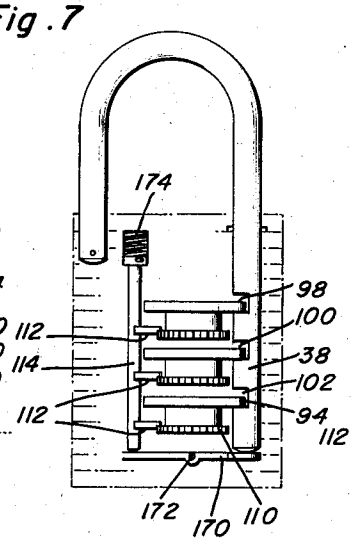


Fig. 8

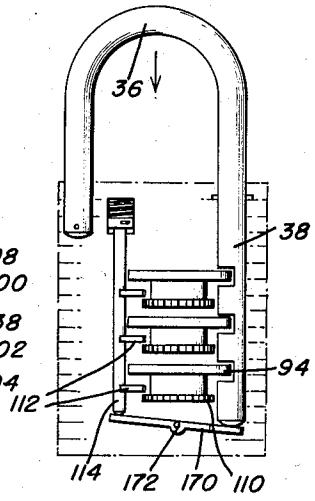


Fig. 9

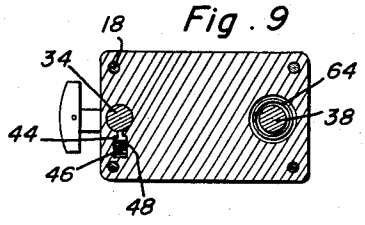


Fig. 10

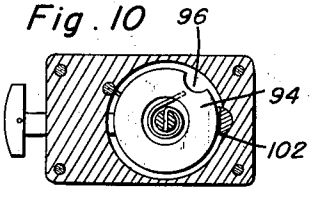


Fig. 11

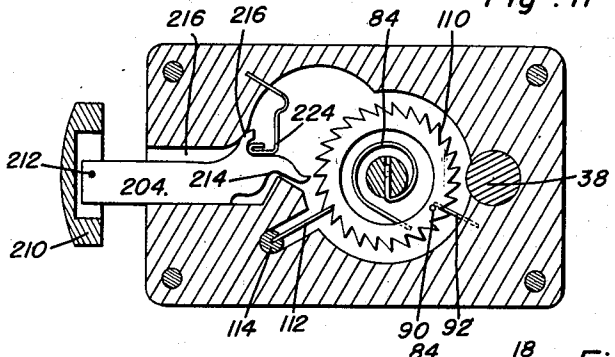


Fig. 13

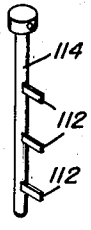
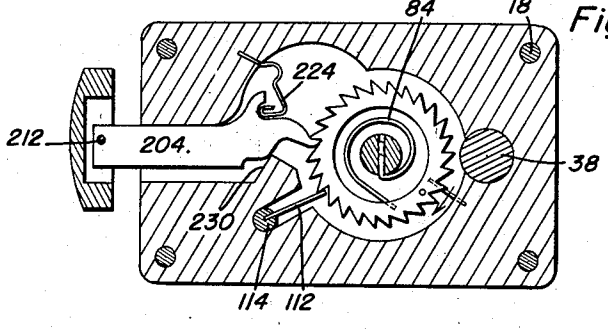


Fig. 12



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AUTOMATIC LOCK

Robert G. Watson, Pittsburgh, Pa.

Application April 29, 1957, Serial No. 655,730

5 Claims. (Cl. 70—25)

This invention relates to a class of locks, and more particularly to a new concept of combination lock construction.

The primary object of the present invention resides in the provision of a push button operated combination lock which is simple and convenient to use and substantially foolproof in operation.

A further object of the present invention resides in the provision of a push button actuated combination lock which has means for resetting the ratchets thereof so that even after tampering the device can be easily operated and opened by an authorized person knowing the combination.

The construction of this invention features a combination lock employing a housing constructed of a series of superimposed plates each having recesses and openings therein for reception of the component parts of the invention. Utilized in the invention are a series of drums mounted on a shaft and pawls slidably mounted for selective engagement with the ratchets to operate the ratchets to release the long leg of a U-shaped shackle engaged by flanges on the drums on which the ratchets are mounted.

Still further objects and features of this invention reside in the provision of an automatic lock that is simple in construction, which can be opened without requiring visual inspection of the lock so as to be especially adapted for uses in poor lighting arrangements, and which is easy and fast to use.

These, together with the various ancillary objects and features of the invention, together with the numerous other advantages thereof are attained by this combination lock, a preferred embodiment of which has been illustrated in the accompanying drawings, by way of example only, wherein:

Figure 1 is a side elevational view of the push button lock comprising the present invention;

Figure 2 is an end elevational view of the lock;

Figure 3 is a top plan view of the lock;

Figure 4 is a bottom plan view of the lock;

Figure 5 is an exploded plan view illustrating the construction of the various plates utilized in forming the housing of the invention;

Figure 6 is a vertical sectional view as taken along the plane of line 6—6 of Figure 3;

Figures 7 and 8 are schematic views illustrating the manner in which the shackle may be utilized to release the ratchets from the stops;

Figure 9 is a sectional detail view as taken along the plane of line 9—9 in Figure 6;

Figure 10 is a sectional detail view as taken along the plane of line 10—10 in Figure 6;

Figure 11 is an enlarged sectional detail view as taken along the plane of line 11—11 in Figure 6, illustrating in particular the manner in which the pawls are associated with the ratchets;

Figure 12 is a view similar to that of Figure 11 illustrating the pawl in an inwardly depressed position and

showing the cam action provided by the plate in moving the pawl tangent to the ratchet wheel after engagement with one of the teeth of the ratchet wheel so as to cause the ratchet wheel to rotate; and

Figure 13 is a perspective view of the rod and associated stops.

With continuing reference to the accompanying drawings wherein like reference numerals designate similar parts throughout the various views, reference numeral 20 generally designates the automatic lock comprising the present invention. This automatic lock 20 includes a housing 22 of novel construction and including a plurality of vertically superimposed plates indicated by reference numerals 1 through 17. Each of the plates are provided with apertures in the corners thereof for reception of rivets or other suitable fasteners 18 for holding the plates in their assembled state.

The plates 1 through 4 are provided with openings 24, 26, 28, and 30 therein forming a bore generally designated at 32 for reception of the shorter leg 34 of a shackle 36 having a longer leg 38 received in the openings of various sizes formed in the plates 1 through 16 and cooperating to form a bore 40.

The short leg 34 carries a depression 42 and it is noted that a spring pressed detent 44 urged by a spring 46 is provided. The ball detent 44 and the spring 46 are mounted in an opening 48 in plate 3 which communicates with the opening 28.

The long leg 38 carries a pin 50 which is adapted to extend through the opening 52 provided in the plate 1 and which opening is provided with extensions as at 54. The openings 56, 58, and 60 are of larger size than the opening 52 for reception of a spring 64 seated therein and engageable with the pin 50 for urging the leg 38 into an outer position with respect to the casing 22.

The plate 5 is apertured as at 66 for the reception of the head 68 of a shaft which is non-rotatably fixed in the plate 5. The head 68 is preferably integrally formed with the shaft 70 which is slotted as at 72 and which extends downwardly through various other of the plates.

Drums 74, 76, and 78 are mounted on the shaft and it is noted that springs 80, 82 and 84 are secured to the shaft 70 and to the drums for urging the drums to an initial position. Each of the drums carry lugs as can be seen best in Figures 11 and 12 and as indicated at 90 for engagement by stops 92 when the springs have served to rotate the drums to the initial position.

The drums 74, 76, and 78 are substantially identical in construction. As can be seen best in Figures 10 and 11, as well as Figure 6, each of the drums is provided with a flange as at 94 having a recess 96 therein through which the long leg 38 can pass, and it is noted that the flanges of the drums are adapted to seat in notches 98, 100, and 102. When the drums are aligned so that the notches and the recesses coincide, the shackle can, of course, be removed from the housing.

Providing the means for rotating the drums are ratchets integrally formed with the drums as indicated at 110. The ratchets may be provided with any number of selected teeth and stops 112 are provided for engaging each of the ratchets of the three drums. These stops are mounted on a rod 114 which extends through suitable openings in plates 2 through 16.

These openings are indicated by reference numerals 113, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, and 142, and it is noted that some of these openings cooperate with the central openings in the plates 5 through 14 which are indicated by reference numerals 66, 144, 146, 148, 150, 152, 154, 156, 158 and 160. The central openings are, of course, for the reception of the shaft and associated drums. It is noted that plates 5, 7, 10, and 13 have openings 162, 164, 166, 168, there-

in separate from the central openings for the reception of the long leg 38 and forming a portion of the bore 40. The central openings of the other plates receive the long leg 38.

Mounted below the long leg is a lever 170 pivoted as at 172 and engageable at one end by the long leg 38 and engaging the rod 114 at the other end thereof. The rod 114, of course, carries the stops 112 and hence when the lever 170 is pivoted by depressing the long leg 38, the rod 114 is lifted lifting the stops out of engagement with the ratchets permitting the ratchets to be rotated by the springs to their initial position with the lugs 90 engaging the stops 92. A spring 174 is mounted in the openings 114, 116, 118 and 120 urging the rod into a downwardly extending position with the stops 112 engaging the ratchets.

Pawls indicated at 200, 202, and 204 have push buttons 206, 208, and 210 pivoted thereto as at 212, see Figures 11 and 12. These pawls are substantially identical in construction and include cam surfaces as at 214 thereon as well as retaining surfaces 216 which serve not only to retain the pawls 204 within the openings 216, 218, and 220 provided in the plates 14, 8 and 11, respectively, for the pawls which communicate with the central openings in these plates but also to permit return springs 224 for the pawls to urge the pawls away from the ratchets. The cam surfaces 214 cooperate with cam surfaces 230 in the plate 14 and similar cam surfaces 232 and 234 in the plates 8 and 11 for off-setting the path of travel of the pawl as it is pushed inwardly so that the pawl once it has engaged with one of the teeth of the ratchet will move in a path tangent to the ratchet so as to rotate the ratchet as from the position as is shown in Figure 11 to the position as is shown in Figure 12. The stops 112 will then serve to retain the ratchet and hence the corresponding drum in that position.

In use, the shackle 36 is depressed so as to cause the lever 170 to pivot so as to reset the ratchets. This is effected by the action of the springs connected to the shafts and to the drums. Then, depressing each of the push buttons of the pawls 200, 202, and 204 a predetermined number of times determined by the position of the recess 96 in the flange of the drum thereof, the drum is rotated until the position where it is in alignment with the notches in the long leg 38 allowing the entire shackle to be removed. It is noted that the detent cooperates with the recess 42 only in preventing undesired and unnecessary vibration of the shackle 36.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A combination lock comprising a housing having a pair of bores therein, a U-shaped shackle receivable in said bores, said shackle having a long leg and a short leg, said long leg having notches therein, a shaft fixedly mounted in said housing, a plurality of drums rotatably mounted on said shaft, said drums including flanges receivable in said notches, said flanges having recesses therein through which said long leg can pass, said drums including ratchets, and pawls for operating said ratchets slidably mounted in said housing and extending outwardly of said housing, springs terminally engaging said shaft and said drums to urge said drums to an initial position, a rod slidably mounted in said housing, stops on said rod engageable with said ratchets to limit rotation of said ratchets by said springs in one position of said rod, spring means normally urging said rod into said one position, a pivoted lever in said housing engaged by said rod, said long leg being engageable with said lever to pivot said lever to lift said rod from said one position against the action of said spring means to move said stops from engagement with said ratchets.

2. A combination lock comprising a housing having a pair of bores therein, a U-shaped shackle receivable in said bores, said shackle having a long leg and a short leg, said long leg having notches therein, a shaft fixedly mounted in said housing, a plurality of drums rotatably mounted on said shaft, said drums including flanges receivable in said notches, said flanges having recesses therein through which said long leg can pass, said drums including ratchets, and pawls for operating said ratchets slidably mounted in said housing and extending outwardly of said housing, said housing comprising a plurality of superimposed plates, and means holding said plates together, some of said plates having cam surfaces formed therein, said pawls engaging said cam surfaces and being deflected by said cam surfaces substantially tangent to the respective ratchet with which the pawls are associated, springs terminally engaging said shaft and said drums to urge said drums to an initial position, a rod slidably mounted in said housing, stops on said rod engageable with said ratchets to limit rotation of said ratchets by said springs in one position of said rod, spring means normally urging said rod into said one position, a pivoted lever in said housing engaged by said rod, said long leg being engageable with said lever to pivot said lever to lift said rod from said one position against the action of said spring means to move said stops from engagement with said ratchets.

3. A combination lock comprising a housing having a pair of bores therein, a U-shaped shackle having a short leg and a long leg respectively received in said bores, said long leg having a plurality of notches therein, a plurality of ratchet means rotatably mounted in said housing and each such means including a circumferential flange portion extending into a corresponding one of said notches and each of such flange portions having a notch therein to pass said long leg in one position of each of said ratchet means, means for manually actuating each ratchet means, spring means normally urging each ratchet means to a predetermined position, stop means for normally holding the position of said ratchet means against the action of said spring means, said stop means including a rod slidably mounted in said housing and being resiliently urged to one position in which said ratchet means are held against the action of said spring means, a lever pivotally mounted in said housing and engaging said rod, said lever being positioned within said housing in the path of movement of said long leg when the same is bottomed within said housing to be pivoted thereby to move said rod and release the stop means from the ratchet means.

4. In a laminated lock structure, a plurality of stacked plates forming a housing and means for holding said plates together, certain of said plates having registered holes therein providing a pair of bores in said housing, a U-shaped shackle having a long leg and a short leg received in respective bores, said long leg having a plurality of notches therein, a plurality of ratchet means rotatably mounted in said housing and each including a toothed ratchet wheel and including circumferential portions extending into a corresponding one of said notches and normally prevent withdrawal of said shackle, each of such portions having a recess therein to pass said long leg such that with all of the recesses aligned with said long leg, said long leg may be withdrawn from said housing, certain of said plates being provided with side openings therein extended substantially radially with respect to said ratchet wheels, a pawl for each of said ratchet wheels and each having a shank received in one of said side openings and slidable therewithin toward and away from an associated ratchet wheel, each pawl having an enlarged inner end portion of dimensions greater than the width of said side openings to prevent complete

withdrawal of said pawls therethrough, each of said plates having said side openings therein being provided with an inwardly directed cam extending laterally inwardly at the inner end of each such side opening, said enlarged end of each pawl being engageable with a corresponding cam when the pawl is moved toward said ratchet wheel to deflect said enlarged end into tangentially moving, engaged relationship with an associated ratchet wheel, and spring means normally urging said pawls away from said ratchet wheels.

5. The assembly defined in and by claim 4, spring means normally urging said ratchet wheels to an initial position, stop means for normally holding the position of each of said ratchet wheels, said stop means including a rod slidably mounted in said housing and being resiliently urged to one position in which said ratchet wheels are held against the action of said spring means, a lever pivotally mounted in said housing and engaging said rod and being positioned in the path of movement of said long leg when the same is bottomed within said housing to be pivoted thereby to move said rod and release the stop means from the ratchet wheels.

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