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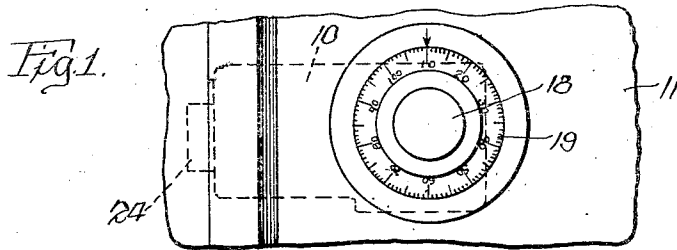
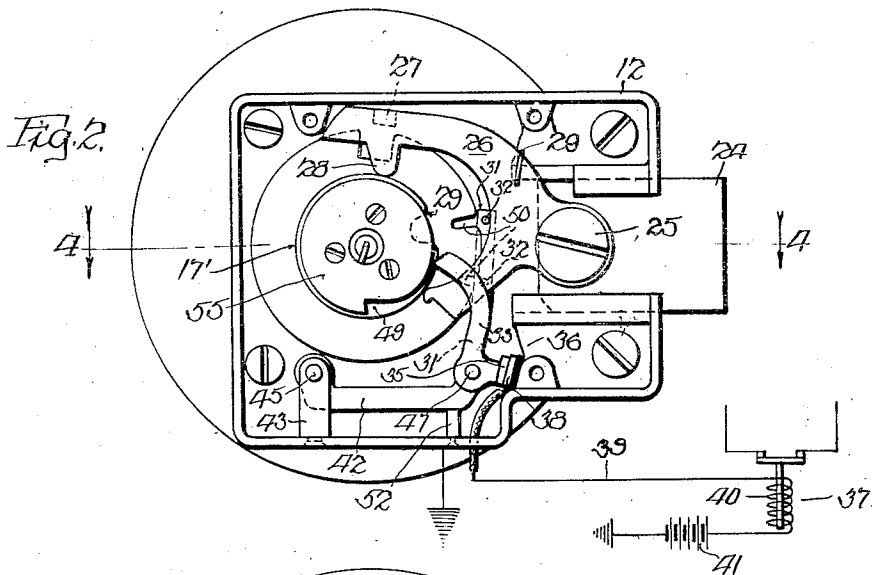
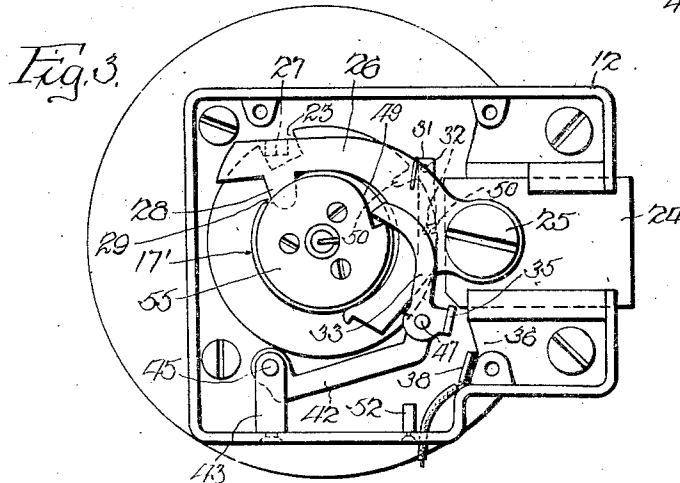
A. C. FINDLAY

2,053,901

COMBINATION LOCK

Filed March 7, 1932

2 Sheets-Sheet 1



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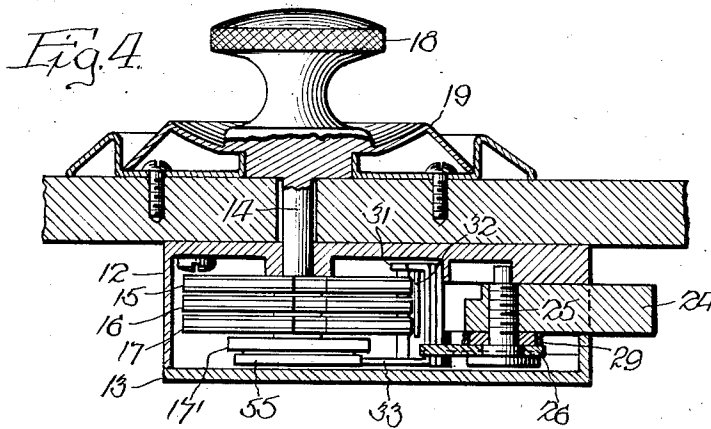
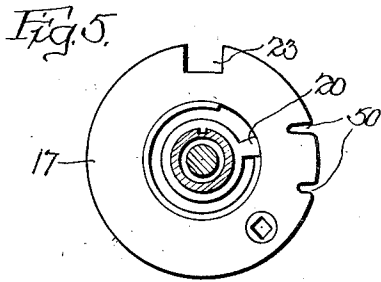
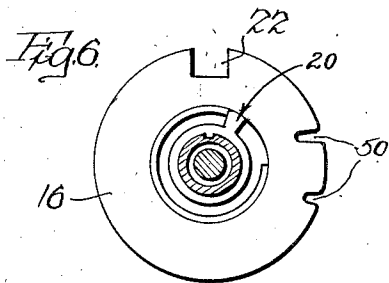
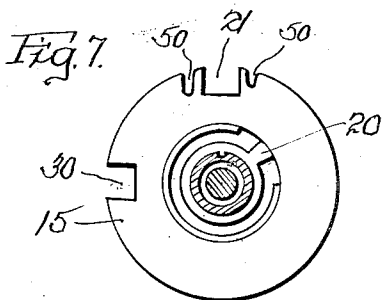
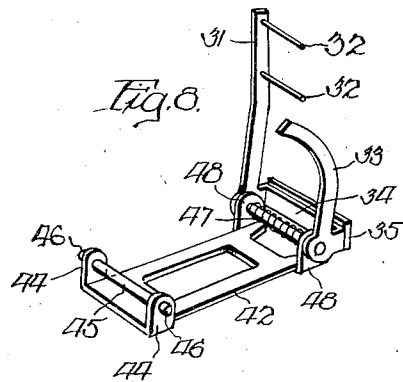
A. C. FINDLAY

2,053,901

COMBINATION LOCK

Filed March 7, 1932

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,053,901

COMBINATION LOCK

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7 Claims. (Cl. 177—314)

This invention relates to combination locks in general, and it has particular reference to combination locks in which an electric protective circuit or burglar alarm is embodied.

While the invention shall be described as particularly applied to combination locks embodied in safes, or the like, it will, nevertheless, be understood that the invention may be embodied in other types of locks, and elsewhere, and is not to be limited to this use solely.

In United States Letters Patent No. 1,711,780, granted to me on May 7, 1929, I have disclosed and claimed a lock mechanism having different settings at which the lock mechanism may be operated to withdraw the locking bolt to open position, and, when operated at one of the settings, to actuate an electric protective circuit whereby to operate an alarm or other protective means to protect against burglary or unauthorized access to a vault. The means for accomplishing this result, as shown in the preferred embodiment disclosed in my patent, comprises providing a second gating in one of the tumblers, which furnishes the second or additional setting or combination, and a notch in each of the other tumblers, which align with one another when the lock mechanism is operated at either setting, and at the second setting, with one of the gatings of the tumbler having two gatings, so that an arm may move to actuate the protective circuit. I have found, however, that inadvertent alignment of notches of certain tumblers with gatings of other tumblers may occur at times and permit this arm to move and actuate the protective circuit, which unnecessarily causes operation of the protective means accompanied by an undesirable disturbance. Such a disturbance becomes a nuisance, if the protective circuit is connected to a central system calling for the aid of private or public police protection, or if connected to an audible alarm or tear gas apparatus effecting discharge of tear gas in the building.

Accidental aligning of these notches may not be frequent when compared to the number of normal operations which the lock may be required to perform, but where thousands of installations are in use, it will readily appear that a number of such accidents may occur daily. I do not wish to imply that the structure shown in my prior patent is defective in any way. Quite to the contrary, it has found a very valuable use in giving protection against unauthorized or forced access to vaults or like compartments to be protected, but I find that this possible difficulty, if such should occur, can be very easily prevented.

An object of this invention resides, therefore, in providing means preventing the accidental alignment of these notches of certain tumblers with gatings of other tumblers so that at no time will the protective circuit operate as the result of the accidental positioning of the tumblers during the normal operation of the lock.

A further object of this invention is specifically to provide at least a pair of spaced notches in each tumbler and an arm controlling the protective circuit having a corresponding number of spaced entry pins adapted to drop into the notches when aligned to move the arm and permit operation of the protective circuit. It is desirable to space the notches in each tumbler at a distance greater than the width of the gatings so that the spaced pins cannot accidentally drop into operating position to cause operation of the alarm should notches of certain tumblers inadvertently align with the gatings of other tumblers.

In order to apprise those skilled in the art how to practice my invention, I shall now describe a preferred embodiment thereof in connection with the accompanying drawings, in which—

Figure 1 is an elevation of a portion of a safe door carrying a lock embodying the invention;

Fig. 2 is a rear elevation of the lock with the cover removed and showing the position of the parts when the locking bolt is in locking position;

Fig. 3 is a similar view showing the position of these parts when the locking bolt is in released position;

Fig. 4 is a horizontal sectional view taken on line 4—4 of Fig. 2;

Figs. 5, 6 and 7 illustrate the different tumblers of the lock mechanism and the relative positioning of the notches with respect to the gatings; and

Fig. 8 is a perspective view of the carriage carrying the arms, its entry pins and movable contact of the protective circuit.

Referring now in detail to the drawings, wherein I have shown a convenient embodiment of my invention, a door 11, of the ordinary type of safe, is provided with the well-known combination lock designated 10, said lock being embodied in the door and comprising a housing or casing 12 and a cover 13.

As is common to certain makes of combination locks, a rotatable shaft 14 is mounted to carry a plurality of loosely mounted tumblers 15, 16, and 17, and a bolt disc 17'. Shaft 14 may be provided in different lengths to allow for different thicknesses of doors through which it will

project, as shown in Fig. 4, and to receive a knob 18 and a dial 19, which has the usual graduated indications marked thereon. Should the dial be operated to one series of its various predetermined positions, cooperating devices 20 between

5 tumblers 15, 16 and 17 act to bring gatings 21, 22 and 23 into alignment, and thereby to effect withdrawal of a locking bolt 24 from its locking position to its open or released position.

10 A stud bolt 25 on locking bolt 24 pivotally carries an arm 26 having the usual fence 27 and cam 28. A spring 29, one end of which cooperates with arms 26, tends to swing arm 26 downwardly. Lug 28 rides the periphery of bolt disc 17' and

15 normally keeps fence 27 out of contact with the periphery of the tumblers. Upon rotation of bolt disc 17' to a predetermined position, a gating 29 will be brought under lug 28, but this lug will not be permitted to drop therein unless gatings

20 21, 22, 23 have been aligned to receive fence 27 by proper dialing of knob 18. If these gatings are aligned by proper dialing of knob 18 to receive fence 27, continued movement of bolt disc 17', after it receives lug 28 in gating 29, will

25 withdraw bolt 24 to the position shown in Fig. 3.

By providing two like gatings 21 and 30 in one of the tumblers, say in the innermost tumbler 15, it is obvious that I may have two different sets of combinations, as either gating 21 or 30 will align

30 with the gatings 22 and 23 of the remaining tumblers 16, 17.

The provision which I make for operating an electric protective circuit 37 consists of an arm 31 having entry pins 32 thereon, normally held

35 out of contact with the periphery of tumblers 15, 16 and 17 by a finger 33 normally riding the periphery of a disc 55 on shaft 14. Disc 55 is provided with a notch 49, which permits the end of finger 33 to drop inwardly to allow pins 32

40 momentarily to come into contact with the periphery of the tumblers. Fingers 33 may be associated with arm 31 in the manner shown in Fig. 8, so as to cause both of these parts to move in unison. An interconnecting part 34 carries

45 a movable contact 35 of a switch 36 in the electric protective circuit 37. This circuit 37 includes a stationary contact 38 of switch 36, a circuit connection 39 to a relay 40, a source of current 41, the other side of the circuit being

50 grounded, if so desired, as indicated in Fig. 2. Arm 31 may be carried upon a carriage 42 pivoted to posts 43, rigidly carried in the base of casing 12, this pivotal mounting of carriage 42 being

55 at the end opposite to that which carries arm 31 and finger 33. Upstanding lugs 44 may carry a pivot pin 45 having its ends 46 projecting beyond the lugs so as to be received in supporting posts 43. Arm 31 and finger 33, with their interconnecting portion 34, are carried as a unit in pivotal

60 relation upon a pin 47 mounted in corresponding upstanding lugs 48, there being a coil spring carried by pin 47, which normally tends to swing arm 31 and finger 33 inwardly about pin 47 whereby to keep the finger in contact with the

65 periphery of disc 55.

To operate the electric protective circuit 37, I provide notches 50 in tumblers 15, 16 and 17, which notches will align with each other simultaneously with the alignment of gating 30 with

70 gatings 22 and 23. At the time notches 50 align with each other, the gating 30 will align with gatings 22 and 23 to effect withdrawal of bolt 24 to unlocking position instead of gating 21 with gatings 22 and 23, and the finger 33 will drop

75 into groove 49 and bring pins 32 inwardly to

drop into notches 50. The continued movement of the tumblers after pins 32 enter notches 50 will cause the arm 31 to rise upwardly and break the circuit by lifting movable contact 35 out of engagement with contact 38. This position of the

5 parts is shown in Fig. 3 of the drawings.

While I may close the circuit by the movement of arm 31 upwardly when pins 32 enter notches 50, I prefer to open it as shown and described herein, for, in so doing, any tampering with the

10 wiring is more apt to break the circuit and thereby cause movement of relay 40 effecting operation of the protective means controlled by the circuit. Such protective means may be an alarm, tear gas, or other most desirable means of protec-

15 tion for the occasion.

Referring to Figs. 5, 6 and 7 of the drawings, it will be noted that notches 50 are provided in each of the tumblers 15, 16 and 17 and that the notches of each pair are spaced a certain distance apart,

20 preferably a distance greater than the width of the gatings. Notches 50 are positioned practically in the same location in each tumbler 16 and 17, but in tumbler 15, notches 50 are spaced on opposite sides of gating 21.

25

This arrangement tends to prevent the gatings of one or more tumblers from accidentally aligning with the notches 50 of the other tumblers or the gatings of the various tumblers from aligning with each other to provide a continuous opening for the admission of the alarm carriage so

30 that the arm may accidentally move upwardly to operate the alarm or other protective circuit provided. By providing two notches in each tumbler and spacing these notches a distance apart

35 greater than the width of the gatings and requiring the use of two correspondingly spaced pins 32, there is a tendency to eliminate accidental operation of the protective circuit 37, by the engagement of these pins in slots 50 of certain tumblers inadvertently aligning with gatings of other

40 tumblers, or the gatings 21, 22, 23 inadvertently aligning with each other.

Arm 31 and pins 32 may be arranged within housing 12 in any suitable manner, although I

45 have shown them supported by the carriage 42 pivotally carried by pin 45 upon lugs 43. Arm 31 and finger 33 may pivot independently of carriage 42 at pin 47 so that spaced pins 32 will not normally ride the periphery of the tumblers, 50 which might aid a person in detecting a combination or setting releasing bolt 24. Continued movement of the tumblers after the alignment of gating 30 with gatings 22 and 23 will lift arm 31 upwardly and cause carriage 42 to swing about

55 pin 45 so as to disengage contact 35 from contact 38. When carriage 42 is thereafter released, it will return to circuit closing position and rest upon a lug 52 fixed to the bottom of housing 12.

It will be understood that the apparatus I have

60 shown herein embodying my invention may vary considerably due to the fact that different makes of locks employ different constructions.

While I prefer embodying my invention in the device herein shown and described, the different

65 shapes and forms of locks may require different structures, this being all readily apparent to one skilled in the art, and consequently, the invention is to be limited only by the scope of the appended claims and by the prior art.

70

I claim:

1. In a permutation lock, a casing, a plurality of tumblers in said casing, means for moving said

75 tumblers into one of two predetermined positions, a locking bolt adapted to be released when said

tumblers are operated into either of said predetermined positions, a switch, means adapted to actuate said switch when said tumblers are operated in one of said predetermined positions, and means preventing the accidental movement of said tumblers into said switch actuating position when operating said tumblers into the other of said two predetermined positions.

2. In a permutation lock, a casing, a locking bolt in said casing, a plurality of tumblers for operating said bolt, said tumblers having gatings therein providing for at least two predetermined positions in which said tumblers may be moved to release said bolt, a pair of notches in each of said tumblers spaced apart a distance greater than the width of said gatings, and electrical contact and means adapted to actuate said contact when the notches of the different tumblers are aligned by the movement of the tumblers to one of said two predetermined positions.

3. In a permutation lock, a casing, a locking bolt in said casing, tumblers for operating said bolt, said tumblers having gatings therein providing for at least two predetermined positions in which said tumblers may be moved to release said bolt, notches in each tumbler spaced apart a distance greater than the width of said gatings, an electrical contact carrying member, a contact on said member, correspondingly spaced pins on said member adapted to enter said notches to actuate said electrical contact carrying member, said pins entering said notches when said notches are aligned by the movement of said tumblers into one of said two predetermined positions, and an electric protective circuit having a contact adapted to be engaged by said first contact, the operating relation between said contacts being effected by movement of said electrical contact carrying member when said pins enter said notches.

4. In a lock structure, a casing, a locking bolt in said casing, tumblers having gatings therein, means for aligning said gatings to effect opera-

tion of said locking bolt, notches in each tumbler spaced apart a distance greater than the width of said gatings, a member, pins on said member correspondingly spaced apart and adapted to enter said notches when said notches are aligned, an electric protective circuit including contact members and means adapted to actuate said contact members to operate said circuit when said pins enter said notches.

5. A lock including a locking bolt, tumbler mechanism having a plurality of settings, each of which allows said bolt to be withdrawn from its locking position, means for effecting either of said settings to withdraw said bolt from its locking position, protective means adapted to be actuated, when said tumbler mechanism is in one of said settings, for withdrawing said bolt, and means tending to prevent an accidental positioning of said tumbler mechanism which will actuate said protective means.

6. A lock including a locking bolt, tumbler mechanism having a plurality of settings including means adjacent the periphery of said tumbler mechanism adapted to withdraw said bolt from its locking position in each of said settings, and protective means adapted to be actuated, when said tumbler mechanism is in one of said settings for withdrawing said bolt, said protective means including mechanism tending to prevent an accidental positioning of said tumbler mechanism actuating said protective means.

7. A lock including a locking bolt, mechanism having two operating positions for releasing said bolt, means for effecting either of said two positions for releasing said bolt, theft protective means operable when said mechanism is in one of said positions, and means preventing the accidental movement of said mechanism into the position operating said theft protective means when said mechanism is operably moved into the other of said bolt releasing positions.

ALEXANDER C. FINDLAY.