

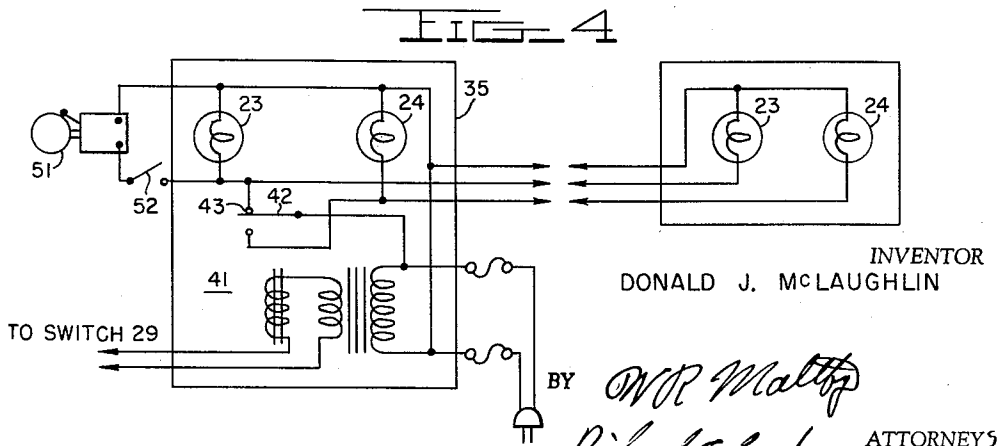
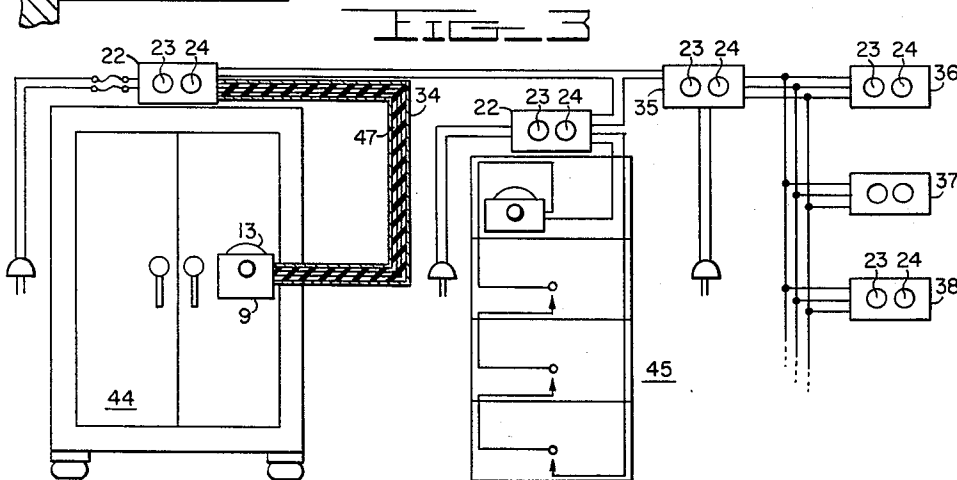
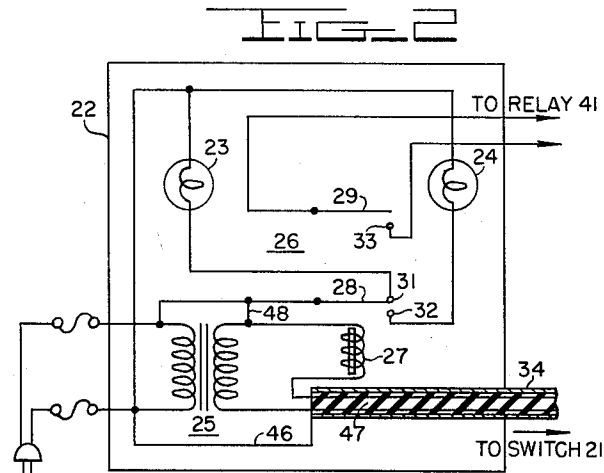
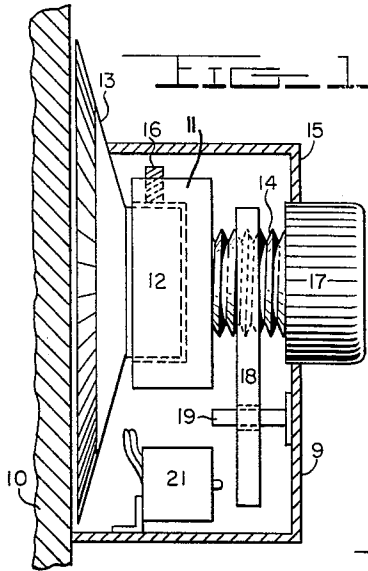
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COMBINATION LOCK PROTECTIVE SYSTEM

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1

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COMBINATION LOCK PROTECTIVE SYSTEM

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to protective systems and more particularly to means for associations with a combination lock to control a warning system.

A combination dial lock is not declared securely locked until the combination is completely cleared. In order to completely clear the dial combination, the dial is usually turned a certain number of turns in one direction after the lock has been locked. The usual procedure is to rotate the dial at least five times in the same direction, this insures that the tumblers are randomly displaced and not in position for opening the lock.

The device of the present invention comprises a mechanical unit connected with a combination lock such as the combination dial of a safe. Rotation of the dial moves a lever arm which operates a circuit breaker or micro-switch to control a green light through a relay to indicate a securely locked safe. When the safe is in an unlocked condition or if the tumblers have not been cleared by rotating the dial in one direction a number of turns after closing the door(s), a red light indicates that the safe is not secure. The lights can be connected with a master indicator which will indicate whether or not all safes in a particular area are secure or in event the safes are tampered with as by a burglar, an alarm associated with the main office indicator will be sounded to give a warning.

An object of the present invention is to provide a device for indicating the locked condition of a device having a combination lock.

Another object of the present invention is to provide a simple mechanism associated with the dial of a combination lock to indicate when the lock is securely locked.

Still another object of the present invention is to provide a mechanism which can be associated with a permanently attached combination lock dial to operate a warning device if the dial is revolved as for opening.

A still further object of the present invention is to provide an electrical means for giving a warning if the wires of the system are tampered with or cut.

Other and more specific objects of this invention will become apparent upon a careful consideration of the following detailed description when taken together with the accompanying drawings, in which;

Fig. 1 is a sectional view of the warning control mechanism of this invention shown with the dial of a combination lock;

Fig. 2 illustrates an electrical circuit for the indicator unit of this invention;

Fig. 3 illustrates in block diagram two different safes with mechanical control mechanisms attached to the dial indicator of each combination lock, the electrical wiring for the warning lights at the safe, in a master indicating area, and in remote positions; and

2

Fig. 4 is a wiring diagram of the circuitry of the master indicator unit and an associated remote indicator.

Referring now to the drawings in detail, Fig. 1 illustrates a mechanical device within a cover box 9 secured to the door 10 of a safe in such a manner that the upper portion of the combination dial 13 will appear above the top plate thereof. The mechanical device comprises a sleeve or coupling 11 secured to a knob 12 of the combination dial 13 by the use of a set screw 16. The sleeve or coupling 11 has a threaded shaft 14 extended outwardly therefrom and passes through a hole in a side 15 of cover box 9 which encloses the working parts to prevent access from the outside. The threaded shaft has a knob 17 secured thereto for the purpose of turning the dial of the safe to actuate the combination. Positioned within the cover box, a threaded arm 18 is engaged by the outwardly extending threaded shaft 14 and held for axial movement in any desired angular position with respect to the thread shaft by a guide pin 19 secured to the inside of the side plate 15. As the knob 17 is rotated in one direction (clockwise), arm 18 will travel toward the safe combination dial 13 and the lower end of the arm will engage a normally open circuit breaker or micro-switch 21 secured to the lower side of the cover box. The micro-switch must be positioned such that the arm will not move beyond the micro-switch to prevent damage thereto, for this purpose the knob 17 may be provided with a slip clutch whereby the shaft will cease to rotate after the arm operates the micro-switch.

Fig. 2 illustrates an electrical circuit which controls the warning lights within a warning light box 22. The box contains a 115 v. primary, 6.3 v. secondary transformer 25, a 6.3 v. relay 26 which controls a red light 23 that indicates an insecurely locked combination lock or one that has been tampered with, and a green light 24 which indicates a securely locked safe. As shown, a fused power source of 115 v. received through a normal plug-in supplies the current to the lights through the relay contacts. The power source is also connected across the primary winding of transformer 25 to supply current through the 6.3 v. secondary and the coil of the relay in order to operate the contacts of relay 26 which in turn controls the red and green lights.

Relay 26 comprises an energizing coil 27 which controls a combined double pole, single throw switch 28 and a single pole, single throw switch 29. When the coil is de-energized switch 28 contacts pole 31 to complete a circuit from the source to the red light and when the coil is energized, switches 28 and 29 contact respectively pole 32 which completes a circuit from the source to the green light, and pole 33 which completes a series circuit to the coil of relay 41 of a master indicator in order to operate a switch for the red and green lights of the master indicator, which will be described later in greater detail. The red light indicates an open or insecurely locked safe whereas the green light indicates a securely locked safe.

Relay 26 is energized by completing the circuit through the secondary winding of transformer 25 which is connected with the coil 27 and to the micro-switch 21 through a metal sheathed cable 34. The circuit through the coil of the relay that controls relay switch 28 is completed by operation of the micro-switch 21 by rotating the knob 17 of Fig. 1 and the shaft 14 in one direction until the arm 18 moves along the shaft to actuate the micro-switch and complete the circuit to the relay coil 27.

Energization of coil 27 operates switches 28 and 29 of the relay 26 of Fig. 2. Switch 28 breaks the circuit from the source to the red light and completes an electrical circuit to the green light to indicate a securely locked safe. Switch 29 completes a series circuit through contact pole 33 to other switches 29 of other like safe indicator units

3

22 as shown in Fig. 3 and then to the coil of a relay within a master indicator 35 which will be described later. Thus whenever knob 17 has been turned clockwise enough times to advance arm 18 to switch 21, the green light is lit to indicate the lock secure. Then if knob 17 is turned counterclockwise enough to back arm 18 away from switch 21, the red light goes on indicating the lock is insecure.

The circuit for the master indicator 35 and any remote master indicators is shown in Fig. 4. The master indicator contains the same basic circuitry and elements as the safe indicator units described above, except relay 41 is a single pole-single throw type. The circuit for red light 23 is completed through the switch 42 and pole 43 of the de-energized relay and the source. The relay 41 is energized by a completed series circuit through each switch 29 and pole 33 of each relay in separate safe indicator units 22 when the coil of each relay is energized by operation of the micro-switch of each respective safe to close switch 29. Energization of the coil of relay 41 of the master indicator will complete the circuit from a main power source for the green light 24 which will indicate that all safes connected in the circuit are securely locked. A number of safe indicator units can be connected to various safes of a series so that the master indicator will indicate if any safe is insecurely locked.

Any number of remote master indicator units such as units 36, 37 and 38 of Fig. 3 may be connected respectively in parallel with the red and green light circuits of the master indicator 35 so that an indication of the condition of the safes can be noted at different points throughout an area.

Each individual safe associated with the master indicator will have associated therewith a separate safe indicator unit 22 which has its own power supply for the respective red and green lights. The coil of the relay that controls the green light switch of the master indicator is connected in series with the switch 29 of the respective relays of each separate indicator unit whereby all safes must be securely locked and their respective relays energized by operation of the micro-switch associated with the dial of each respective safe. When all safes are securely closed the master indicator will show a green light as well as the remote indicator units in parallel with the main office master indicator.

Fig. 3 illustrates in block form two different safes, each having a light indicator connected in series with the master indicator and the associated remote master indicators. The two safes 44 and 45 illustrate two different types of safes which can be used with a control means 9. Each safe has the control means 9, as shown in Fig. 1, associated with the combination dial to control the warning lights in light box 22. Safe 45 is of the drawer type and consequently has one of the wires from the micro-switch in series with a switch associated with each drawer. The micro-switches for each drawer are positioned within the latch receptacle in the frame under the drawer within which the drawer latch drops when the drawer is closed. The circuit to the relay, as explained above, will not be completed to operate the light switches until each drawer is closed thereby insuring a securely locked safe. In regards to the door type safe 44, to insure closing of the door before the lock is locked, a normally open switch can be positioned along and within the hinged edge of the door in series with the micro-switch 21 to break the circuit to the relay unless the door is closed to operate the normally open switch. This prevents anyone from locking the combination and controlling the light circuit with the doors remaining open.

In operation of the device, for instance when all the safes are securely locked, the dial of any safe to be opened is turned counterclockwise at least five times and then the dial is turned through the regular combination to open the safe. When the dial has been turned counterclockwise and away from the micro-switch, the micro-

4

switch is opened, this de-energizes coil 27 of relay 26 opening the circuit of the green light through release of switch 28, at the same time switch 28 contacts pole 31 to close the circuit from the main power source to the red light to indicate an unsecured safe. Operation of the dial while opening the safe will not advance arm 18 to a position where switch 21 will be again closed. Upon de-energizing the coil of relay 26, contact 33 which completes the series circuit to the master indicator is broken and in turn de-energizes the coil of relay 41 of the main office master indicator 35 to operate the switch 42 of the relay opening the circuit of the green light and closing the circuit to the red light. This indicates at the master indicator as well as at the individual safe that a safe has been opened. The other safes can be opened in a like manner and the red light of each respective safe will indicate that each respective safe is insecurely locked. Since the red light of the first opened safe operates the lights of the main office master indicator, any subsequently opened safe will not affect the main office master indicator.

It can be seen from the foregoing disclosure that all safes must be securely locked before the master indicator and the remote indicators will indicate all safes securely locked.

On securing the safes, the door of each safe must be closed and the combination dial must be rotated in a specific direction sufficiently to move the threaded arm for engagement with the micro-switch. On closing the micro-switch, the circuit to the coil of the indicator unit 22 is closed to energize the coil 27 of the relay 26 which operates the switches that close the circuit to the green light and open the circuit to the red light. Upon closing all safes and turning the dials sufficiently to operate all micro-switches to energize all relays, the series circuit through switch 29 and pole 33 of each respective relay operates the relay 41 of the master indicator to complete the circuit to the green light at the main office master indicator to indicate that every safe has been securely closed.

The device is not only used to indicate a securely closed safe but also as a warning against burglars. As shown in Fig. 2, there is a connection through wire 46 from one side of the source to the metal sheath 47 of the cable 34 which goes from the safe indicator unit to the micro-switch 21 in the cover box about the dial of the safe. The other side of the source through wire 48 is connected with one side of the circuit for the coil of the relay. This circuit through wires 46 and 48 can be completed by cutting the cable which makes a contact between the sheath 47 and one of the wires to the micro-switch. The contact causes a short circuit which will blow one of the fuses in the main power source. When the fuse blows, the coil of the relay 26 is deenergized breaking the circuit to the green light of the safe indicator unit and also the series circuit to the master indicator. The coil of relay 41 of the master indicator will de-energize to automatically close the circuit to the red light to provide an indication that something is wrong at some safe. A bell 51, having a switch 52 in the circuit for normally closing the circuit, is wired in parallel with the red light to sound an alarm as well as to have a visual indication by the lights of the master indicator. Switch 52 is used to control the bell when the safes are normally open and the alarm is not necessary.

The invention is not limited to the number of times that the combination dial must be turned to move the threaded arm against the microswitch to operate the green light nor is it limited to the position of the micro-switch for counterclockwise or clockwise rotation of the screw to operate the micro-switch. It is obvious that the micro-switch could be positioned at any convenient position for left or right hand threads on the threaded shaft. The important thing is that the combination dial be allowed to turn a sufficient number of times to clear the tumblers before operating the micro-switch.

The present invention has been described as being used with combination locks which have been previously installed. It will be obvious to carry forth the teaching of this invention in adapting the control mechanism within the housing of the combination lock at the time the lock is manufactured to eliminate the necessity for any outside structure associated with the knob of the combination lock. The same principle will be followed by operating a switch with a lever mechanism associated with the combination.

Obviously many modifications and variations of the present invention are possible in the light of the above teaching. It is therefore understood, that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A mechanical device associated with a combination dial lock, said mechanical device comprising a threaded shaft adapted to be rigidly coupled to a combination dial lock, an outer knob secured to said threaded shaft, an arm engaging said threaded shaft for axial movement along said shaft as the shaft is rotated by said knob, and a normally open micro-switch positioned in the path of travel of said arm to control an external warning light indicator circuit, said light circuit including a first signal light of one color operative when said micro-switch is in a normally open position and when the micro-switch is activated by said arm said first signal light is made inoperative and a second signal light of a different color in said light circuit is made operative to indicate a safely locked lock.

2. A warning control device associated with a combination dial lock, said control device comprising a cover box adapted to be secured over said lock, a threaded shaft within said cover box adapted to be rigidly coupled at one end to the dial of said combination lock, an outer knob secured to the other end of said threaded shaft and extending through a side of said cover box, an arm threaded at one end engaging said threaded shaft for axial movement along said shaft as the shaft is rotated by said knob, a guide associated with said arm for angularly positioning the arm with respect to said shaft, and a normally open micro-switch, said micro-switch being positioned in the path of travel of said arm to control an external warning light indicator circuit, said light circuit including a first signal light of one color operative when said micro-switch is in a normally open position and when the micro-switch is actuated by said arm said first signal light is made inoperative and a second signal light of a different color in said light circuit is made operative to indicate a safely locked lock to indicated the condition of the lock.

3. In combination a warning light indicator unit and a light control unit associated with the combination dial of a safe, said warning light indicator unit comprising a power source, a transformer, a relay, a red light to indicate an insecurely locked safe, a green light to indicate a securely locked safe, electrical circuitry appropriately connected to said power source to operate the above elements, and a mechanical control means adapted to be associated with the combination dial of a safe to control a switch means electrically connected with the coil of said relay, said relay adapted to complete a circuit to said red light when in one position and adapted to complete a circuit to said green light when in another position, said positions being controlled by said switch means according to the security condition of the safe.

4. In combination a warning light indicator unit and a light control unit associated with the combination dial

of a safe, said warning light indicator unit comprising a power source, a transformer, a relay, a red light to indicate an insecurely locked safe, a green light to indicate a securely locked safe, electrical circuitry appropriately connected to said power source to operate the above elements, said light control unit comprising a threaded shaft adapted to be coupled to the knob of a combination dial, a cover box with a hole in one side thereof adapted to be secured over said combination dial, an outwardly extending knob secured to said threaded shaft and extending through the hole in said cover box, said cover box permitting the upper portion of said combination dial to extend above the cover box, a threaded arm engaging said threaded shaft for axial movement along said shaft as the shaft is rotated, a normally open micro-switch positioned in the path of travel of said arm and operable thereby by rotating said dial a sufficient number of times, said micro-switch adapted to control a circuit to said relay whereby closing said micro-switch energizes said relay to complete a circuit to said green light to indicate a securely locked safe, and a circuit through said relay adapted to control said red light to indicate an insecurely locked safe when the micro-switch is open and the relay is de-energized.

5. In combination a warning light indicator system comprising a master indicator unit, a warning light indicator unit and a light control unit associated with the combination dial of a safe, said warning light indicator unit comprising a power source, a transformer, a green light which indicates a secure safe, a red light to indicate an insecure safe, and a relay having a double pole single throw switch to control said lights and a single pole single throw switch which controls a series circuit to said master indicator unit, said first mentioned switch normally completing the circuit to said red light when the coil of said relay is de-energized and completing the circuit to said green light when the coil is energized to actuate the switch, said light control unit comprising a cover box adapted to be secured to the door of a safe over the knob of the combination dial wherein the upper portion of the numbered dial extends above the top plate of said cover box, a threaded shaft adapted to be coupled to the knob of the combination dial, an outer knob secured to the other end of said threaded shaft for rotating the dial through the correct combination when adapted thereto, an arm extending from said shaft and angularly positioned with respect to said shaft pin secured to the back plate of said cover box and extending through a hole in said arm, and a normally open circuit breaker positioned in the line of travel of said arm whereby said circuit breaker is electrically connected to the coil of said relay for energizing the coil and operating the switches when the circuit breaker is closed by rotating the shaft a certain number of times to move the arm against the circuit breaker.

6. The combination as claimed in claim 5 wherein a normally open switch in series with said micro-switch is adapted to be controlled by the door of the safe upon closing the door to insure against locking said combination lock before the door is closed.

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