

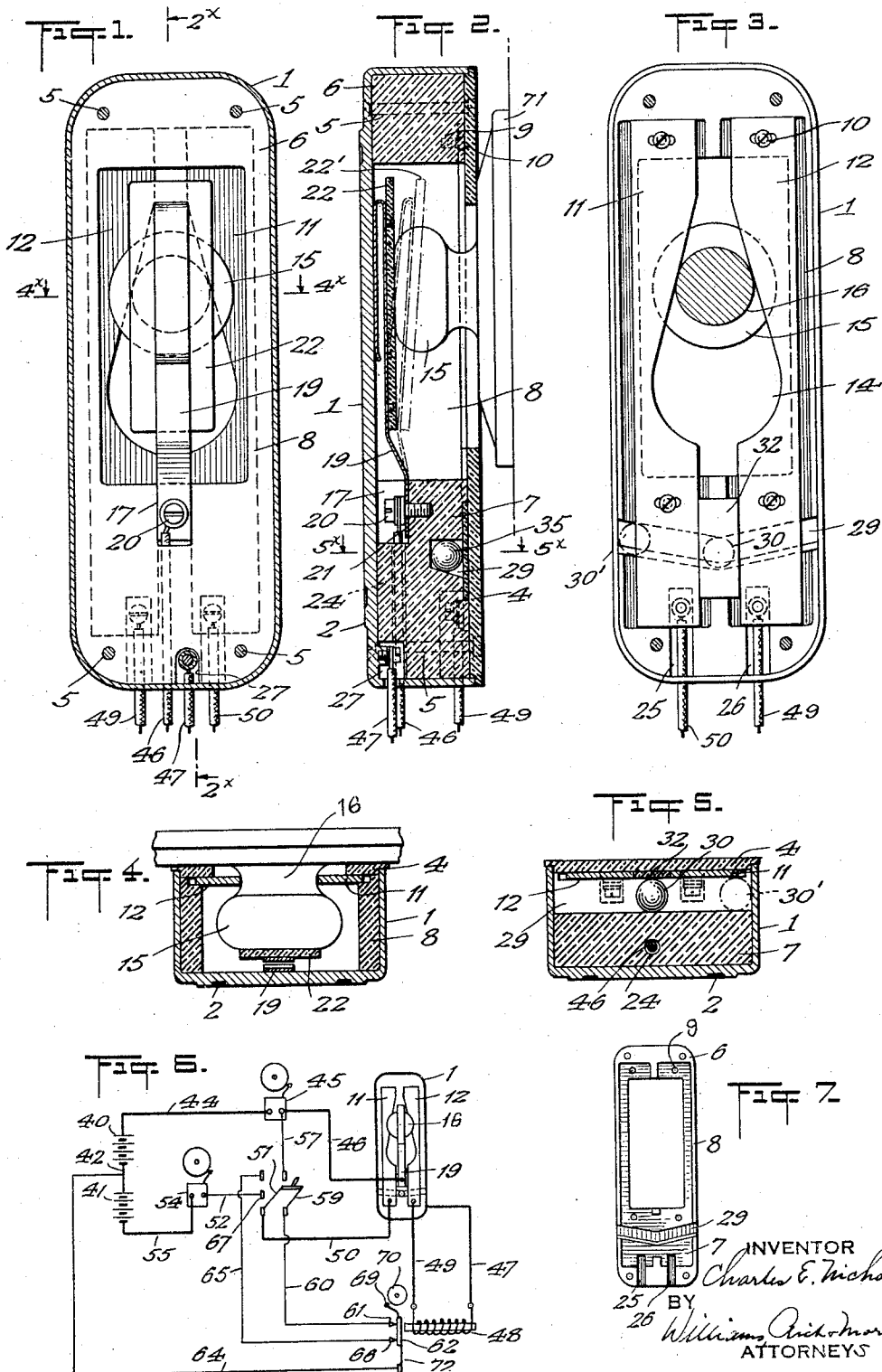
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C. E. NICHOLAS

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ELECTRIC SWITCH

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INVENTOR
Charles E. Nicholas
BY
William A. Nicholas
ATTORNEYS

UNITED STATES PATENT OFFICE

CHARLES E. NICHOLAS, OF LOS ANGELES, CALIFORNIA

ELECTRIC SWITCH

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This invention relates to electrical alarms and electrical alarm circuits for use in connection with doors or other closures such as the doors of buildings, safes or vaults and is particularly adapted for use on safes having dial combination locks.

One embodiment of my invention herein disclosed is a device particularly designed to be hung on the knob of the dial of a combination lock and is so constructed that any attempt to remove the device or any movement of it will so operate on an electrical circuit in which it is connected as to actuate the alarm. Another embodiment is the circuit in which said device is connected, the circuit also being an important part of the invention.

The signal devices used may be of any type capable of being operated electrically such as lights, bells or horns, or any other desired type of visible or audible signal.

An embodiment of my invention is shown in the accompanying drawing in which:

Fig. 1 is a front elevation, the top of the casing being removed.

Fig. 2 is a vertical sectional view along the line 2*-2* of Fig. 1.

Fig. 3 is a rear elevation with the insulating back removed.

Figs. 4 and 5 are horizontal sectional views along the line 4*-4* of Fig. 1 and 5*-5* of Fig. 2, respectively.

Fig. 6 is a schematic diagram showing my electrical circuits and certain other features of the system.

Fig. 7 is a detail drawing of the internal insulating block on a reduced scale.

An important part of my invention is the provision of a device designed to hang over the knob of a door to be protected, for example, the dial knob of a safe and which I shall for convenience designate generally as the contact box. In this contact box are various elements which make electrical contacts under certain circumstances to actuate a signal by opening or closing the circuits of the electrical system which is also a part of my invention.

the contact box having a metal cover 1, which may be formed by casting, stamping or otherwise, and may have any suitable design formed on its surface as by embossing, as illustrated at 2. This cover has a back 4, of dielectric material, which is removably secured by means of bolts 5. Between the cover 1 and the back 4 is located an insulating block having an upper part 6 provided with holes through which the bolts 5 pass. It is also provided with tapped holes 9 to accommodate the screws 10. The lower part 7 of the insulating block fills the lower portion of the cover 1 and is constructed in a manner hereinafter described. As the block is moulded in one piece, it has side members 8 (see Fig. 7).

Referring to Fig. 3, conducting strips 11 and 12 are adjustably secured to the ends 6 and 7 of the insulating block. These conducting strips are cut away on thin proximate faces to form an opening 14 which is wide at the bottom and gradually decreases in width toward the top.

The opening 14 is of such size and shape that the contact box can be slipped over the dial knob 15 of a safe and dropped down until the conducting strips 11 and 12 rest on the neck 16 of the knob 15, thus forming an electrical contact through strip 11, knob 15 and strip 12. Strips 11 and 12 being adjustable, the opening 14 can be changed to accommodate variations in the size of knobs. Formed in the lower end 7 of the insulating block is a recess 17 in which is fastened a conducting spring 19 by means of the screw 20. This spring 19 carries on its back a strip of insulation 22, to prevent electrical contact between spring 19 and the knob 15. Extending vertically in the bottom 7 of the insulating block are openings 24, 25, 26, and 27 to permit the insertion of circuit wires.

Referring particularly to Figs. 2, 3 and 5 there is formed in one face of the insulating block a groove or raceway 29. This raceway is lower at its central point than at the ends, as shown in Fig. 3, and its bottom slopes downwardly in the direction of the insulating back 4, as shown in Fig. 2. The ends of the raceway are closed by the sides of metal

cover 1 and its rear side is substantially closed by the contacting strips 11 and 12 and by a small piece of insulation 32 inserted between the bottom edges of strips 11 and 12.

5 In the raceway 29 is a metal ball 30 which is free to roll in the raceway under the influence of gravity.

Having thus described the construction of the contact box, I shall now explain how it is utilized in my alarm circuit. In Fig. 6 I show a source of electric current which may comprise the batteries 40 and 41, or may consist of a single battery having an intermediate tap 42. This source of current supplies both

15 the control circuit and the alarm circuits. The control circuit is indicated in heavy lines (Fig. 6) and comprises battery 40, wire 44, alarm 45, wire 46, spring 19, cover 1, wire 47, magnet 48, wire 49, strip 12, knob 16, strip 11, wire 50, switch blade 51, wire 52, alarm 54, wire 55, battery 41 and connection 42.

I have shown two alarm circuits, but any number may be used. The first circuit is as follows: battery 40, wire 44, alarm 45, wire 57, switch blade 59, wire 60, contact 61, armature 62, wire 64 and battery connection 42.

The second alarm circuit is battery 41, wire 55, alarm 54, wire 52, switch blade 51, wire 65, contact 66, armature 62, wire 64 and battery connection 42.

It will be noted that when the contact box is not attached to an object the control circuit is open in the box at two points, first, between the spring 19 and the cover 1, as is shown in Fig. 2 by the released position of spring 19, shown in dotted lines at 22'; second, between strip 11 and strip 12, as these strips are insulated from one another. When the contact box is hung upon the knob, as shown in Fig. 2, the first circuit opening is closed by the contact of spring 19 with cover 1 resulting from the pressure of the knob 15 against the insulating strip 22. The second circuit opening is closed by the contacts made by strips 11 and 12 with the knob 15, as is shown in Figs. 3 and 4.

It, therefore, appears that as the control circuit is closed at two points when the contact box of my protective device is hung over the knob of a combination lock dial, conversely the removal of the contact box from the knob will open the circuit at two points. The control circuit may also be opened and closed through the switch blade 51 (Fig. 6). This switch blade is part of an ordinary double-pole-single-throw switch to which I have added an intermediate contact 67. When the control circuit is closed through the contact box and by the engagement of blade 51 with contact 67, current flows through the coil of the magnet 48, energizes that magnet and attracts the armature 62. I have provided a means whereby a signal is given upon the contacting of the switch blade 51 with the contact

67 provided that the control circuit is closed, energized and ready to operate. This means consists in attaching a clapper 69 to the armature 62 which will strike a bell 70 when the armature 62 is attracted by the magnet 48 and drawn out of contact with the contacts 61 and 66. It will readily be seen that unless the control circuit is closed and unless there is current flowing sufficient to operate the system, no signal will be given by the bell 70. This signal, therefore, is a complete test of the operativeness of the alarm as soon as the blade 51 makes connection with the contact 67 and before the complete closing of the switch connects the alarm circuits which operate the alarms 54 and 45.

I shall now explain how my system assures that there can be no tampering with the lock of a safe without giving an alarm. It is obvious that the same protection is afforded to any lock to which an adaptation of the embodiment herein disclosed may be attached. The batteries, alarms and multipole switch are placed in any desired location, preferably concealed. The contact box is attached to a length of four wire cable so that it may be conveniently located near the object to be protected. The cable contains the wires 46, 47, 49 and 50. After the safe or other door has been closed and locked, the contact box is attached to the dial or other knob by inserting the knob through the aperture between the strips 11 and 12 and the contact box is lowered as far as it will go. This closes the circuit at two points, as has previously been described. The contact box hangs in a vertical position so that the metal ball 30 rests at the lowest point of the raceway 29. The switch 51-59 is then closed until the blade 51 makes connection with the contact 67, and if the control circuit is in working order and supplied with current, the magnet 48 will attract the armature 62 which will cause the striker 69 to tap the bell 70. This shows that the system is in working order and the switch may then be completely closed.

Anyone desiring to operate the dial of the lock must either remove the contact box or tip it to one side or the other in order to see the indication on the stationary ring 71 (Fig. 2) with which the numbers of the combination must be registered to unlock the safe.

If the contact box is lifted a fraction of an inch, the contact through the strip 11, knob 15 and strip 12 is broken. If the box is further lifted, the spring 19 will be released and the contact broken between said spring and the metal cover 1, which assures the opening of the circuit even though the strips 11 and 12 or the wires thereto have been short circuited.

If the contact box is not raised but is tilted to either side, the metal ball 30 will roll in the raceway 29, either to the right or left, and make contact with the metal box 1 as shown in Figs. 3 and 5 at 30' and through either strip 11 or strip 12 and the metal box 1 complete a

shunt circuit across the magnet 48 which will deenergize it.

An attempt to disconnect the alarm 54, or the alarm 45, or any other alarm in the control circuit, will open the control circuit and likewise deenergize the magnet 48. Any other attempt to open the circuit as by cutting the wires forming part of the control circuit, will have the same effect.

When the magnet 48 is deenergized and the armature 62 is therefore released and, under the influence of its spring 72, makes contact with the contacts 61 and 66, the two alarm circuits previously described are closed. Upon the closing of these circuits the alarms will be actuated by the current from the batteries 40 and 41, or other source of current supply. It will thus be seen that if one alarm is disconnected, the other will immediately be caused to ring, and by placing the several alarms so that it is not possible to disconnect them simultaneously, the operation of an alarm is assured.

Cutting or short circuiting the cable of the contact box will also sound the alarm as any one of the following operations will either open the control circuit or shunt the magnet 48; cutting wires 46, 47, 49 or 50; crossing either wires 46 or 47 with wires 49 or 50. Any metallic connection between the metal cover 1 and the safe will likewise shunt the magnet 48 when the contact box is in operative position and the knob 15 is in contact with strip 12.

In order that the current through the magnet 48, which must also flow through the coils of the alarms in the control circuit, as the bells 54 and 45, shall not actuate the alarms, it is only necessary to choose alarms, an electromagnet, and current potential such that the current passing through the coil of the magnet shall be less than the current required to operate the alarms. It will readily appear to those skilled in the art how this may be done by the choice of a magnet having suitable resistance and alarms designed to operate at a certain voltage.

My circuit arrangement is such that the alarms will continue to sound in the case where the contact box is tipped or displaced and then immediately returned to its normal position. This is accomplished by reason of the fact that a shunt circuit is completed across the magnet 48 as soon as the armature 62 contacts with points 61 and 66. This shunt circuit is as follows: starting from wire 47, box 1, spring 19, wires 46 and 57, switch 59, wire 60, contact 61, armature 62, contact 66, wire 65, switch 51, wire 50, strip 11, knob 16, strip 12 and wire 49. This shunt circuit precludes any current from the batteries passing through the magnet coil and the alarm circuits established through the armature 62 will continue to actuate the alarms.

While I have shown an embodiment of my

invention adapted to a specific use, it is obvious that many modifications may be made without departing from the spirit of the invention.

What I claim is:

1. Circuit closing means for an electric alarm device adapted to be loosely hung on a metallic knob comprising a metallic casing, a pair of conductive plates insulated from said casing and spaced apart with their adjacent edges convergently disposed upwardly and forming with each other an upwardly diminishing aperture adapted to receive said knob at its lower end and bridging of which is effected by engagement of the shank of the knob with said edges of said plate upon lowering the casing thereof.

2. Circuit closing means for an electric alarm device adapted to be loosely hung on a metallic knob, comprising a metallic casing, conductive plates therein, insulated from said casing and from each other and forming with each other an upwardly diminishing aperture whereby the device may be slipped over said knob and lowered until the edges of said plates both engage the neck of said knob.

In testimony whereof, I have signed this specification.

CHARLES E. NICHOLAS.