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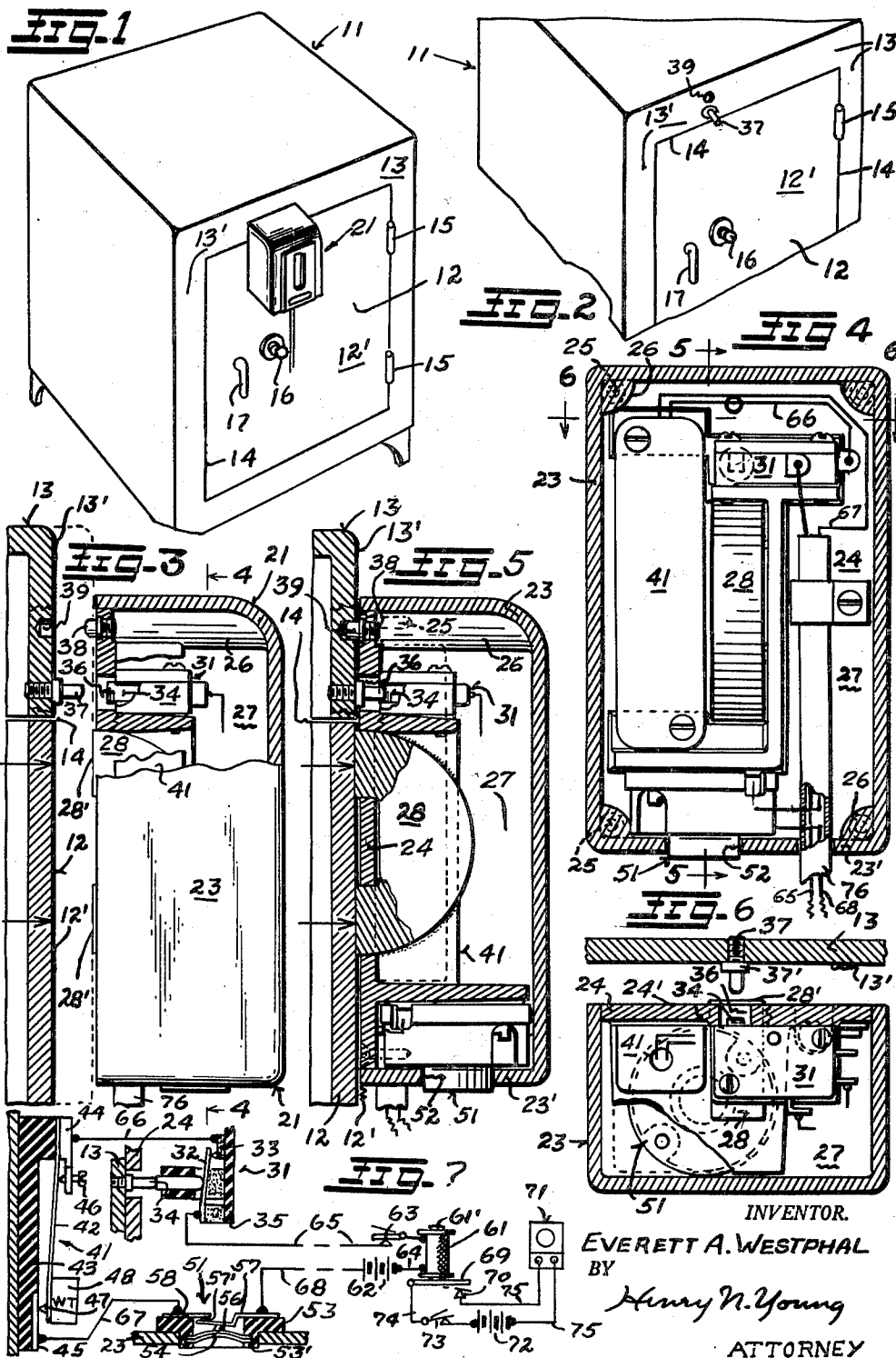
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PROTECTIVE ALARM SYSTEM

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## PROTECTIVE ALARM SYSTEM

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2 Claims. (Cl. 340—276)

The invention relates to a burglar alarm system for use in connection with closure doors for safes and vaults and other containers, the controlled alarm signal being remote from the protected container.

As is well known, the burglarizing of containers of articles having monetary or other value may result in appreciable losses, and the general purpose of the present system is to provide for automatically activating an alarm signal by and upon various types of tampering with a container to provide for access to its contents as well as to signal an unauthorized opening of its door.

Another object is to provide an alarm system means of the character described in which an electric control circuit for a signal is normally closed and is automatically opened to effect an actuation of the signal by and upon a tampering with a protected container.

A further object of the invention is to provide an alarm signal control means which includes a control switch unit which is readily applicable to safes and the like as an attachment without requiring special internal constructions for such containers.

A more specific object is to provide a particularly simple and effective control-switch unit with circuit-opening devices which are automatically openable under different conditions including a dislodgment of the mounted unit from the safe or vibration-producing operations upon the safe or undue temperature conditions at the unit.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth or be apparent in the following description of a typical embodiment thereof, and in the accompanying drawings, in which:

Figure 1 is a perspective view of a safe having a control switch unit of the alarm system mounted on the safe at its door.

Figure 2 is a fragmentary perspective view of the safe having the switch unit removed therefrom and adapted for the cooperation of the switch unit with it.

Figure 3 is an enlarged and partly sectional elevation showing the switch unit disposed in spaced opposed relation to its operatively mounted position on the safe front.

Figure 4 is an elevation of the mechanism of the switch unit as viewed generally at the line 4—4 in Figure 3.

Figure 5 is a sectional view of the installed unit taken at the line 5—5 in Figure 4.

Figure 6 is a sectional view of the installation of Figure 5 taken generally at the line 6—6 in Figure 4.

Figure 7 is a wiring diagram of the alarm system and means.

For illustrative purposes, the present alarm system is shown as operatively associated with a relatively small floor-mounted safe 11 of rectangular outline and provided with a door 12 hingedly mounted in an opening of the front safe wall 13 which defines a continuous casing around the door opening. As is usual for safes and vaults generally, the outer door face 12' is planar and is flush with the casing face 13' at a crack line 14 when the door is fully closed, and hinges 15 attach the door to the front wall at a side of the doorway opening. The present

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safe 11 is shown as having its door provided at its exterior with a combination-release knob 16 and with a usual rockable handle 17 for actuation to retract the locking bolt (not shown) after its release by an appropriate manipulation of the knob 15 or some other releasing means. Since the burglarizing of a container such as the present safe 11 requires the opening of the safe door, or a mechanical or torch cutting of an opening through the door or a wall, the present alarm system provides a means for signaling any opening of the door and/or any vibrations produced in the safe structure by a drilling or sawing or hammering of safe parts for the purpose of rendering the door openable or providing another access opening through a wall, and/or heat produced by an applied cutting torch or by a fire adjacent the container.

It will now be acted that the present alarm system includes a switch unit 21 having a casing 22 unitarily mounting a plurality of signal control switches to be hereinafter described, with said switches controlling a suitable common alarm which may be of a sound-producing and/or signal-light and/or some other type. The casing 22 essentially comprises a hollow rectangular member 23 having an open side which is normally closed by a plate member 24 which is fitted within the side walls of the member 23, has its outer face 24' in flush relation with the coplanar edges of the casing sides, and is secured in position by screws 25 extending through the corners of the plate 24 in threaded engagement with opposed fillets 26 provided in the corners of the space 27 of the member 23. For reasons which will hereinafter become apparent, the casing members 23 and 24 are of a nonmagnetic material which may be either metallic or nonmetallic; in practice, the casing members or portions 23 and 24 might be of a non-ferrous aluminum alloy while the screws 25 are of brass.

A horseshoe magnet 28 is fixedly mounted on the inner side of the closure plate 24 of the switch-unit casing 22 intermediately thereof with its pole ends preferably, but not necessarily, extending through the plate in a line which is longitudinal of the casing and having mutually coplanar end faces 28' thereof disposed in a plane at or slightly outwardly of the plane of the flat outer face 24' of the plate 24. The magnet 28 is arranged to be utilized for securing the switch unit 21 on a safe or the like in spanning relation to the crack line 14 at the juncture of the door and casing faces 12' and 13' respectively, at least that portion of one of said safe faces at the mounting location of the unit being of magnetic material to provide for a magnetic clinging of the positioned unit thereto. In the present unit, the magnet 28 comprises a permanent magnet which is operative to mount the unit 21 on the front of the door 12 to extend across the crack line 14 with an end portion of the casing 22 overlapping the opposed face portion of the outer door casing face 13'. It will be understood that the magnetic mounting means for the unit 21 might comprise a plurality of magnets, and that the magnets used might be electro-magnets under control of an appropriate circuit portion within the unit.

As is particularly brought out in Figures 3 to 5 and in the diagrammatic showing of Figure 7, a switch 31 is provided by the unit 21 adjacent one end thereof, and includes a spring arm 32 of electrically conductive material having one end fixed and arranged for its deflection to engage a circuit-closing contact 33 by the movement of a reciprocable and electrically non-conductive plunger or switch button 34 transversely against it, said spring arm and contact and plunger being suitably mounted on a body 35 of electrically non-conductive material fixed within the casing 22. Essentially, the outer end of the plunger 34 is engageable for closing the switch 31 when a present unit 21 is mounted on and opposite the closed door with the door and casing faces 12'

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and 13' in the relation illustrated in Figures 5 and 7, it being noted that the switch means now described may have other structures for closing a circuit by the use of the plunger 34 or an element corresponding thereto and extending freely in a transverse opening 36 provided in the plate 24 of the casing 22. It will be understood that, in case the securing magnet means of the unit is electro-magnetic, the solenoid means thereof might be included in the circuit controlled by the switch 31.

While the switch-closing plunger 34 might extend through the plate opening 36 and sufficiently beyond the plane of the magnet pole faces 28' to provide for the disposal of the plunger to close the switch 31 by reason of its engagement with the casing face 13' while the unit 21 is mounted on the front of the closed door, such an engagement of the plunger with a flat area of the safe front would not prevent a sliding movement of the mounted unit 21 over said front. Although a socket might be provided in the safe front for receiving the outer plunger end for securing the magnetically held unit against a sliding movement thereof on the safe front, such an arrangement would permit such damaging lateral impact of the extending plunger against a side of the opening 36 that the plunger might become bent and jammed in switch-closing position to thereafter maintain a closed condition of the switch 31 and so permit a dismounting of the switch unit without effecting an actuation of the controlled signal. Accordingly, a switch-closing pin 37 preferably extends fixedly from the doorway casing 13 to longitudinally and displaceably engage the plunger 34 through the opening 36 provided in the plate 24 opposite the outer end of the plunger 34, the pin 37 being shown as threadedly engaged in the door casing, and preferably providing an annular base collar 37' which is only slightly smaller than the pin-receiving opening 36 in the plate 24.

Understanding that the switch-closing pin 37 is operative to prevent a sliding displacement of a magnetically mounted switch unit 21 along the container faces engaged by it, means are also provided for preventing a swinging displacement of the operatively mounted unit 21 in its place about the axis of the pin 37. As particularly shown, a projection 38 extends outwardly from the outer face 24' of the casing closure plate 24 at the opposite side of the opening 36 from the magnet, said projection, in the present instance, comprising a stud which is threadedly fixed in the plate 24, and being engageable in a suitably positioned socket 39 provided in the safe casing at the same distance from the pin 37 as is the projection 38 from the switch-controlling plunger 34. The mutual relation of the pin 37 and the stud 38 is essentially such that the simultaneous engagement of the stud 38 in the socket 39 while the switch-actuating pin 37 extends through the opening 36 prevents a swinging of the mounted unit in its set position, it being noted that the collar 37' of the pin 37 maintains the centered relation of the pin to the opening 37 while the pin displaces the plunger 34 to close the switch 21. By positioning the stud 38 in the longitudinal line of the casing 22, the stud is arranged to act as a guard against a sawing off of the pin 37 in the front plane of the door.

The switch unit casing 22 also contains a normally closed vibration-responsive switch 41 which is adapted to normally close thereat an electric circuit which includes it and is automatically openable in response to mechanical vibrations impressed on the switch unit 21 while the same is the safe 11. As is brought out in Figure 7, the switch 41 is mounted on the inner side of the plate 24 and essentially comprises a flat reed 42 of electrically conductive material mounted on a base 43 for normally connecting electrically conductive elements 44 and 45 which are arranged for their inclusion in the signal control circuit of the present system. The member

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44 clampedly engages one end of the reed 42 against the base 43, and mounts an adjustment screw 46 which laterally engages the reed 42 adjacent and beyond its secured end portion for adjusting a contact point 47 provided on and adjacent the free end of the reed, which also carries a weight member 48 at the opposite side thereof from the contact 47. The contact 47 normally engages the switch element 45 for closing a circuit through the switch unit 41, with the screw 46 so adjusted that vibrations of the mounted unit 21 caused by hammering or drilling upon the associated safe structure may, through the action of inertia upon the weight member 48 of the vibration-responsive switch 41, momentarily break the contact at the point 47 and so open thereat the circuit including this switch.

A temperature-controlled switch 51 is also preferably provided by the switch unit 21, said switch being shown as mounted at an opening 52 provided through one end 23' of the casing section 23. By reference to the generally diagrammatic showing of Figure 7, the switch 51, which may hereinafter be referred to as a thermo-switch, comprises a body 53 of electrically non-conductive material having a tubular portion 53' extending in the opening 52 and carrying a bimetallic disc 54 comprising engaged disc elements of materials having different coefficients of expansion and normally bowed inwardly in the body portion 53'. The inner disc element has a greater coefficient of expansion than the outer disc element, and an electrically non-conductive member 56 centrally connecting the disc elements normally engages and deflects an electrically conductive spring arm 57 to provide a connection between the arm and a switch contact 58 provided on the body 53. The present thermo-switch 51 is essentially such that a heating of the bimetallic disc 54 sufficiently beyond a normal temperature thereat will cause a snap-action reverse bowing of the disc 54 to open the switch, it being understood that such a switch-opening operation may be effected by heat produced by a cutting torch applied to the safe adjacent the unit 21 and particularly if the thermo-switch 51 is disposed directly above the knob 16, as in Figure 1, it being further understood, however, that the switch 51 is independently openable by the heat generated by a fire consuming the structure containing the safe.

It will now be noted that the switches 31 and 41 and 51 are connected in series in a circuit including the helix 61 of an electro-magnetic switch, and an energizing battery 62 and a hand-switch 63 which are disposed at points which are preferably inaccessible from the location of the safe. As particularly shown, one terminal of the battery 62 is connected by a conductor wire 64 to a terminal of the helix 61, the switch 63 is interposed in a wire 65 extending from the other helix terminal to the arm 32 of the switch 31, the contact 33 of the switch 31 is connected by a wire 66 to the member 44 of the switch 41, the member 45 of the switch 41 is connected to the member 57 of the switch 51 by a wire 67, and the arm 57 of the switch 51 is connected by a wire 68 to the other terminal of the battery 62. The helix 61 is that of an electromagnetic switch in which a hinged armature switch arm 69 is arranged to be held in open-switch position relative to a contact 70 solely while the helix is energized to temporarily magnetize the core 61' of the helix; the switch arm 69 is constantly urged to a closed-switch position, as by a spring means or gravity, the latter being indicated for the present arrangement in which the circuit controlled by the switch arm is that of the operating circuit for a suitable signal 71.

The electromagnetic switch assembly, 61-69-70, comprising the helix 61 and switch arm 69 and contact 70, is included in a circuit for actuating the signal 71, and the signal 71 may comprise an electrically actuated buzzer or bell or lamp or other form of signal. The circuit of the signal 71 may be electrically energized in

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any suitable manner; as indicated, the signal circuit includes a battery 72 which has one terminal connected to the armature 69 through a switch 73 by a conductor wire 74 and has its other terminal connected to the contact 70 by a wire 75 having the signal 71 interposed therein. The switch 73 is arranged to be manually closed or opened, and must be closed if the signal 71 is to be actuated by a closing of the signal circuit including the contact 70.

It will now be noted that the described switch unit 21 comprising the primary control means of the present alarm system is installed on a safe front to close the contact switch 31 of the unit while the unit switches 41 and 51 are closed and the hand switches 63 and 73 of the control and signal circuits are both open. When conditions at the mounted unit are mechanically static, a manual closing of the switch 63 will energize the helix 61 whereby its core 61' may then support the armature 69 in spaced relation to the contact 70 of the signal circuit; while the raising of the armature 69 might be effected magnetically solely by reason of the energizing of the solenoid 61, it will usually be preferable that a manual lifting of the fully lowered armature be required to position it for its magnetic support from the solenoid core to thereby avoid a restoration of the closed condition of the signal circuit if the opened unit switch 21 or 41 or 51 is reclosed during a period of tampering with the unit or safe. The signal circuit switch 73 would now be closed, whereby, when the circuit of the solenoid 61 supporting the armature 69 is opened at any switch of the unit 21, or by a cutting of the connecting cable 76 providing a wire 65 and/or 68 of the connections between the control unit 21 and the solenoid 61 for a dropping of the armature 69 to engage the contact 70, the signal 71 would be actuated as an alarm.

From the foregoing description taken in connection with the accompanying drawings, the advantage of the present alarm system and means will be readily understood by those skilled in the art to which the invention appertains. While I have shown and described an arrangement which I now consider to be a preferred embodiment of my invention, I desire to have it understood that the showings are primarily illustrative, and that such changes and developments may be made, when desired, as fall within the scope of the following claims:

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What I claim is:

1. In a combination with a container having a swinging door member for closing disposition with respect to a wall opening defined within a door casing member having its outer face generally flush with the outer face of the door member at a common crack line between them when the door fully closes the opening, at least one of said members providing an area of magnetic material adjacent said crack line, a normally inactive alarm signal, an electrical control circuit for said alarm signal including a switch, a control unit including a casing constantly and fully enclosing said switch of said control circuit and including a base plate provided with a transverse opening, a magnetic means in said casing operative for mounting said control unit on the magnetic area of a first said container member with its base plate in spanning relation to said crack line to dispose said base plate opening opposite the second container member, and a switch-control pin member mounted on the second said container member in fixed extending relation thereto and extendable through said base plate opening for cooperation with said switch of the control unit to close said switch assembly solely while the door member is fully closed.

2. A structure in accordance with claim 1 wherein a complementary pin-and-socket means is cooperative between the casing base plate and the container member providing the switch control pin for preventing a rotation of the unit about the axis of the control pin.

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