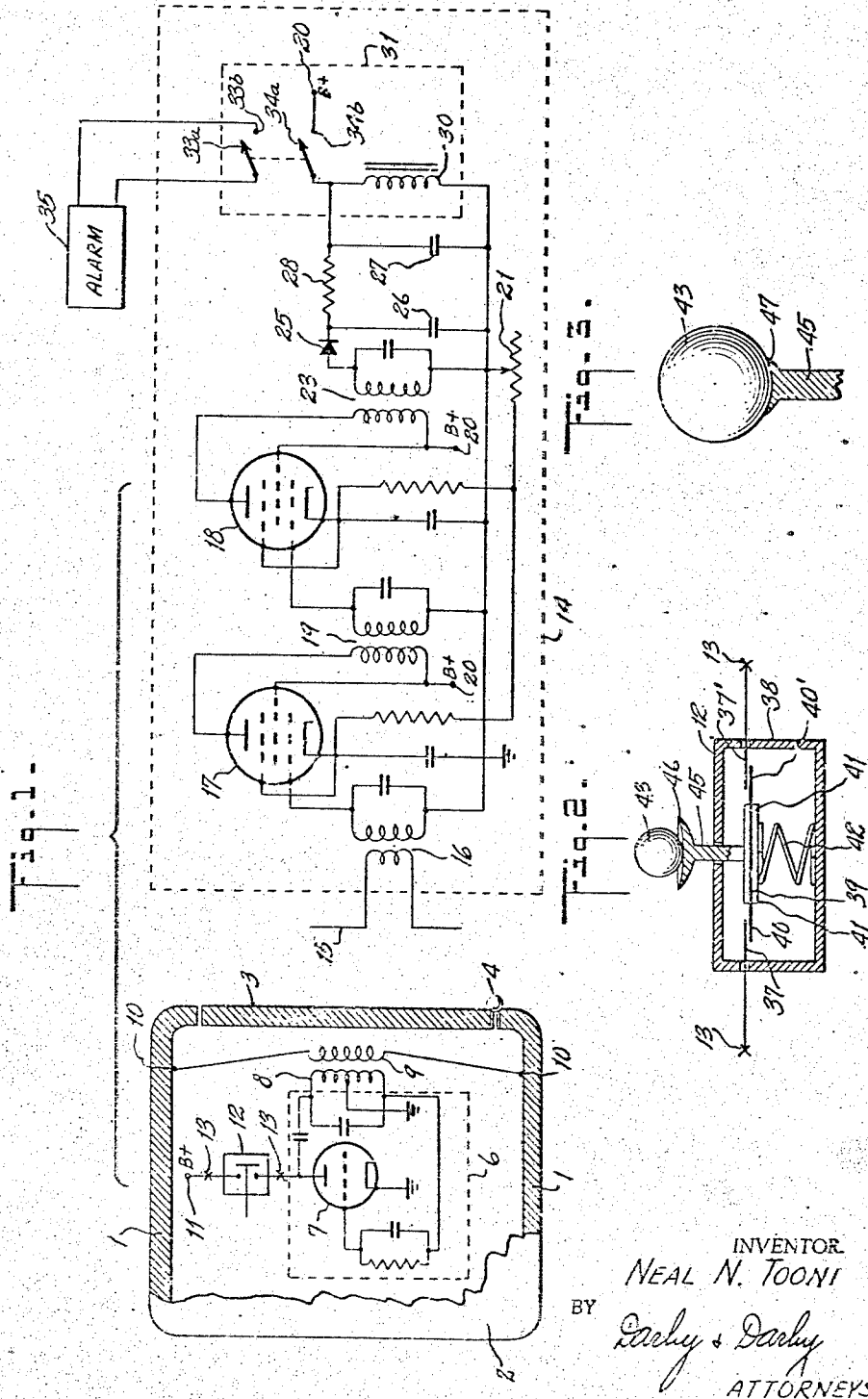


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SAFE ALARM SYSTEM
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SAFE ALARM SYSTEM

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This invention relates to an alarm system and more particularly to providing a completely metal or partially metal enclosure with an alarm system for safeguarding it from theft or tampering.

It has always been a problem to design a container in which valuables can be kept without fear of having them stolen. To solve this problem metal enclosures, or safes, have been built. As a precautionary measure, these safes are usually constructed with thick walls and doors and/or are provided with ingenious locking devices. Even with the added precaution taken, of building more structurally sound enclosures and in making their locking devices so-called "burglar proof," safes still continue to be burgled. In many instances the carefully designed enclosure is blown open by an explosive charge. Frequently, the safe is removed from its original surroundings and taken to a place where it can be opened by the thief without fear of interference or detection.

If the safe is provided with an alarm system, the alarm system furnishes an added measure of security since it can perform the functions of frightening the would-be thief and also notifying the police of an attempted theft. Such alarm systems have been utilized in the past. However, many of these prior systems use wires or cables connecting externally of the enclosure or safe. These external connections would warn the would-be thief that the safe is provided with an alarm and thereby afford him the opportunity of disabling it. Other alarm systems are actuated only by shorting or opening up the circuits of the system actuator within the safe, usually by means of cutting or crossing wire contacts. Such alarm systems would not be effective if the safe were removed to a remote location and opened there.

The present invention overcomes these disadvantages by providing an alarm system where no external wires, cables, connectors, etc. are required. The alarm system actuating device is enclosed entirely inside the safe and is enabled by any vibration of the safe such as would occur if the safe were moved or jostled. The alarm itself is at a point remote from the safe and is energized when the actuating device, which controls a radio transmitter, is enabled. Since there are no external connections a person attempting to tamper with or burgle the enclosure would not be aware of the presence of the alarm system.

It is therefore an object of this invention to provide a novel alarm system wherein the actuating mechanism for the alarm system is entirely self-contained within the enclosure.

It is a further object of this invention to provide a safe which cannot be moved or tampered with without energizing an alarm.

It is also an object of this invention to provide a safe equipped with an alarm system which is actuated when an unauthorized person attempts to force entry into the safe.

Other objects of this invention can be more fully ascertained by referring to the drawings, in which:

FIGURE 1 shows a schematic diagram of the alarm system;

FIGURE 2 shows one form of a switch which can be utilized as the actuating device; and

FIGURE 3 shows a modification of the switch of FIG. 2.

The objects of this invention are accomplished by providing an alarm system actuating device, in the form of a vibration sensitive switch which controls a radio-frequency transmitter, both the switch and the transmitter being entirely enclosed within the safe. The actuating device, which is enabled when an attempt is made to move or jostle the safe, energizes the transmitter which produces a radio-frequency signal. The output signal from the transmitter is coupled to the walls of the safe, which are used as the transmitter antenna, and the signal is thereby radiated to space. The transmitted signal is picked up by an antenna coupled to a radio receiver tuned to the frequency of the transmitted radio signal. After suitable amplification, the received signal is utilized to energize an alarm. In this manner, a totally hidden alarm system is provided.

Referring to FIGURE 1 of the drawings, an enclosure or safe 1, has a top wall (shown partially broken away) 2. The safe 1 is also fitted with a door 3 which swings on hinges 4. The construction of the enclosure 1 is usually solid metal, although a portion of it may be constructed of some non-metallic material such as concrete or granite, and the usual locking device (not shown) is always provided.

A transmitter, generally shown within dotted lines 6, in the form of a radio frequency oscillator, is suitably placed within the safe 1. This oscillator can be in its own self-contained unit. As shown, the transmitter 6 comprises a triode vacuum tube 7 with circuit elements connected to form a tuned-plate type oscillator. Series feed from the plate to the grid of triode 7 is provided to form a regenerative feedback path for the oscillator. The circuit shown is conventional in the art and any other type of suitable oscillator circuit may be used, for example, tuned-plate-tuned-grid, Hartley, or any other type capable of generating radio-frequency energy. Connected to the plate of triode 7 is a tuned output circuit 8, which may be adjustable, and which will determine the frequency at which the triode 7 will oscillate and thereby determine the frequency of the output signal.

A coil 9 is inductively coupled to the tuned output circuit 8 and the ends of the coil are fastened to the metal side walls of the safe at points 10. It should be noted that the ends of coil 9 can be connected to any suitable place on the safe from whence oscillations may be transmitted. When the transmitter 6 is energized, energy will be induced into coil 9 from the output circuit 8 and the outer walls of the safe 1 will function as the transmitter antenna. In this manner, energy can be radiated into space from the transmitter 6 contained inside the safe 1, without having the door 3 open or utilizing an external antenna.

The transmitter 6 is energized from a suitable source of B+ voltage 11 when an actuating device in the form of a switch 12 is enabled. The B+ source 11 can be any battery or other suitable voltage supply. In this particular instance, a battery is usually more suitable since it also can be self-contained within the safe. Switch 12, which will be described in detail, is shown schematically in FIGURE 1. The actuating device 12, which is designed to be enabled only when the safe 1 is moved or jostled, connects the plate of triode 7 to the source 11 of B+ voltage. The whole transmitter unit including the power supply source 11 and the switch 12 is designed for easy removal from the safe in order to facilitate servicing and replacement of parts.

The receiver unit, shown within the dotted lines 14, has an antenna 15 which receives the radio frequency signal radiated from the walls of safe 1 and delivers the received signal to a tuned resonant circuit 16 of the receiver. The receiver unit 14 and the antenna 15 may be located at any place within the radius of the transmitting range of the transmitter 6. Since only a single frequency

is used, the components of the receiver 14, for example, antenna 15, and the tuned circuits such as 16, may be designed specifically for the single frequency. It should also be noted that as the frequency of transmission is increased, the physical size of the components used decreases.

The received energy present in tuned circuit 16 is fed to the control grid of a conventional pentode amplifier 17. After amplification in amplifier 17, the signal is coupled by means of another tuned circuit 19 to a second pentode amplifier 18. Amplifiers 17 and 18 receive supply voltage for their plate and screen grid electrodes from a suitable source of B+ potential, 20. This source may be a battery, or since the receiver is housed externally to the safe, it may also be derived from a standard alternating current source after proper rectification. Potentiometer 21, which is in the cathode circuits of amplifiers 17 and 18 functions as a sensitivity control. Adjustment of potentiometer 21 establishes the quiescent bias for amplifiers 17 and 18 and therefore determines the operating point of the tubes.

The output circuit of amplifier 18 comprises a tuned resonant circuit 23 which is also tuned to the frequency of the signal transmitted from transmitter 6. This amplified signal voltage is supplied to the anode of a rectifier 25. The rectifier 25 may be of any suitable, conventional type such as a silicon or germanium diode, or a standard vacuum tube diode. The cathode of rectifier 25 is connected to a resistance-capacitance filter network comprising capacitors 26 and 27 and resistor 28. The output of the filter network is a D.C. voltage for an applied A.C. signal from tuned circuit 23.

The D.C. voltage output of the filter network is used to energize the coil 30 of a relay 31. The relay 31 has movable switch contacts 33a and 34a which engage respectively stationary contacts 33b and 34b when the relay coil 30 is energized by the D.C. current from the filter circuit. As shown, the relay is of the "holding" type in which the stationary contact 34b is connected to the source of B+ 20. The alarm, shown as 35, is energized by the closing of switch contacts 33a, 33b, which contacts, for example, can be used as the "on-off" switch for the alarm power supply (not shown). Any suitable type of alarm may be used, such as a bell, buzzer, gong or else connections may also be made to the central police burglar alarm system.

By utilizing this holding type of relay, only a momentary signal from the transmitter 6 is necessary to energize relay 31 and to keep the contact switches 33 and 34 in a closed position. In this manner, even if the thief discovers the presence of transmitter 6 inside the safe and disables it, it will be impossible for him to turn off the alarm system unless he discovers receiver 14 which contains relay 31, and then disables the relay.

FIG. 2 shows one form of the actuating device 12 which is utilizable with the transmitter 6. The actuating device 12, as previously explained, is designed to be placed in the circuit of the transmitter 6, at the points indicated by the crossmarks 13. In this embodiment, two metal contact fingers 37, 37' are fastened by suitable means to an insulated housing 38. Another contact member 39 having two protruding contact arms 40—40' is secured within an insulating member 41 in any suitable arrangement. Insulating member 41 rests upon a spring 42 and so long as spring 42 is depressed, contact arms 40—40' will not engage contact fingers 37—37'. The spring 42 is depressed by placing a suitable weight, such as that shown by spherically shaped object 43, upon a holder 45. The holder 45 has a slightly concave upper surface 46 with a radius of curvature greater than that of the object 43. In another embodiment of the actuating device 12, shown in FIGURE 3, the upper surface 47 of the holder 45 is also slightly concave. In this embodiment, however, the holder 45 is similar to a golf tee, the upper surface 47 having a radius of curvature less than the radius

of curvature of the object 43. The object 43 may be any suitable weight such as golf ball, marble, etc.

Any slight jar, bump or jostle to the safe 1, in which the actuating device 12 is housed, will dislodge the object 43 from its holder 45. This will allow the spring 42 to expand and contact will be made between the contact members 37—37' and 40—40', thereby completing the circuit from the power supply source 11 to the plate of oscillator tube 7. Once the object 43 has been knocked off its holder 45 the switch 12 cannot be disabled, without first opening the safe 1 and restoring the object 43 to its original position. The choice of the spring 42 and weight 43 will determine the amount of vibration necessary to actuate the switch 12.

FIGURE 2 shows only one form of switch which the actuating device 12 can assume. Other suitable forms of vibration sensitive switches, for example, mercury switches, inertia type switches, spring loaded contact switches, and other types of switches which are designed to be actuated upon mechanical shock excitation, can also be utilized.

The operation of the device shown in FIGURE 1 is as follows. The transmitter 6 is set in an "alert" condition by an authorized person when he opens the safe 1 and places a suitable object 43 upon holder 45. This disables actuating device 12 and disconnects the transmitter 6 from the power supply 11. It should be noted that transmitter 6 is inoperative except for the period when actuating device 12 is enabled. This prevents any excess current drain on the power supply 11. The safe 1 is then closed by the authorized person and the alarm system remains in an "alert" condition until the transmitter 6 is energized. When a bouncing, bumping, moving or jarring of the safe 1 occurs, the object 43 falls from its holder 45 and thereby enables actuating device 12 which connects the plate of triode 7 to the power supply 11. This actuates transmitter 6 and a continuous radio-frequency signal is radiated from the walls of the safe 1.

The radiated signal is picked up by the antenna 15 of the receiver 14, amplified by vacuum tubes 17 and 18, rectified and filtered to produce a D.C. voltage, which is then used to energize the coil 30 of relay 31. Energization of relay coil 30 closes contacts 33a and 34a of the relay thereby setting alarm 35 into operation. Since relay 31 is of the "holding" type, a signal of only momentary duration from the transmitter 6 sets the alarm 35 into continuous operation. Such an arrangement makes it impossible for the thief to silence the alarm system.

While the alarm as shown utilizes vacuum tubes, the device is of such a nature that it readily lends itself to transistorization. Utilizing transistors, the whole system can be made much more compact than when vacuum tubes are used. Also, the transmitter 6 and the receiver 14 may each be housed in its own sub-chassis. The transmitter unit 6 may be located at any suitable point within the safe 1, and the receiver unit 14 may be located at any other point within the radius of transmission of the transmitter.

While one embodiment of the invention has been shown, it is obvious that other forms could be used without departing from the scope thereof. It is intended that all matter and description contained in the above description or accompanying drawings shall be interpreted in an illustrative and not a limiting sense.

What is claimed is:

1. A safe alarm system comprising, a safe having electrically conducting metal walls, a radio transmitter for producing a radio frequency signal entirely housed within said safe, an actuating device to energize said transmitter when enabled, said actuating device enabled upon the occurrence of a vibration of the safe, an output circuit for said transmitter, a coil inductively coupled to said output circuit, means connecting the ends of said coil to walls of the safe, the metal walls of said safe serving as an antenna for the radio frequency signal produced by

5

said transmitter, a receiver for picking up the transmitted radio frequency signal, said receiver also having a relay, an alarm, means connecting said relay to said alarm to operate said alarm upon receipt of a radio frequency signal from the transmitter.

2. A safe alarm system as described in claim 1 wherein the relay is of the holding type.

3. An alarm system for a safe or other type of a protective container comprising an electrically conductive enclosure, an oscillator for generating radio frequency energy within said enclosure, means for supplying the radio frequency energy generated by said oscillator to the enclosure, said enclosure thereby serving as an antenna for radiating the radio frequency energy generated by the oscillator, an alarm, and means for operating said alarm in response to the radiated radio frequency energy.

4. An alarm system for a safe or other type of a protective container comprising an electrically conductive enclosure, an oscillator for generating radio frequency energy within said enclosure, means for supplying the radio frequency energy generated by said oscillator to the enclosure, said enclosure thereby serving as an antenna for radiating the radio frequency energy generated by the oscillator, means for energizing said oscillator when said enclosure is vibrated, an alarm, and means for operating said alarm in response to the radiated radio frequency energy.

5. An alarm system for a safe or other type of protective container comprising an enclosure which is completely electrically conductive, a transmitter within said enclosure for producing radio frequency oscillations, said transmitter having an output circuit coupled to said enclosure whereby said enclosure radiates the oscillations produced by said transmitter, a receiver, and an alarm system operated by said receiver in response to the oscillations radiated by said enclosure.

6

6. A safe alarm system as described in claim 5 wherein the means for energizing the transmitter comprises an actuating device which is in the normally disabled position and is enabled upon the occurrence of a vibration of the enclosure.

7. An alarm system for a safe or other type of protective container comprising an enclosure which is completely electrically conductive, a transmitter located within said enclosure for producing a radio frequency signal, an actuating device for energizing said transmitter when said device is enabled, said device being enabled upon vibration of said enclosure, an output circuit for said transmitter, means connecting said output circuit to said electrically conductive enclosure, said enclosure serving as an antenna for radiating the radio frequency signal produced by said transmitter, a receiver for receiving the radiated radio frequency signal, and an alarm device operated by said receiver in response to the radiated signal.

8. A safe alarm system as set forth in claim 7 wherein said receiver has a relay which is energized and operates said alarm device in response to the radiated signal.

9. A safe alarm system as described in claim 8 wherein the relay is of the holding type.

References Cited in the file of this patent

UNITED STATES PATENTS

1,018,444	Ritchel	Feb. 27, 1912
2,249,560	Howton	July 15, 1941
2,520,984	Williams et al.	Sept. 5, 1950
2,828,413	Bowers	Mar. 25, 1958
2,950,479	Pan	Aug. 23, 1960

FOREIGN PATENTS

713,542	Great Britain	Aug. 11, 1954
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