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PROTECTIVE ALARM SYSTEM

Filed July 10, 1957

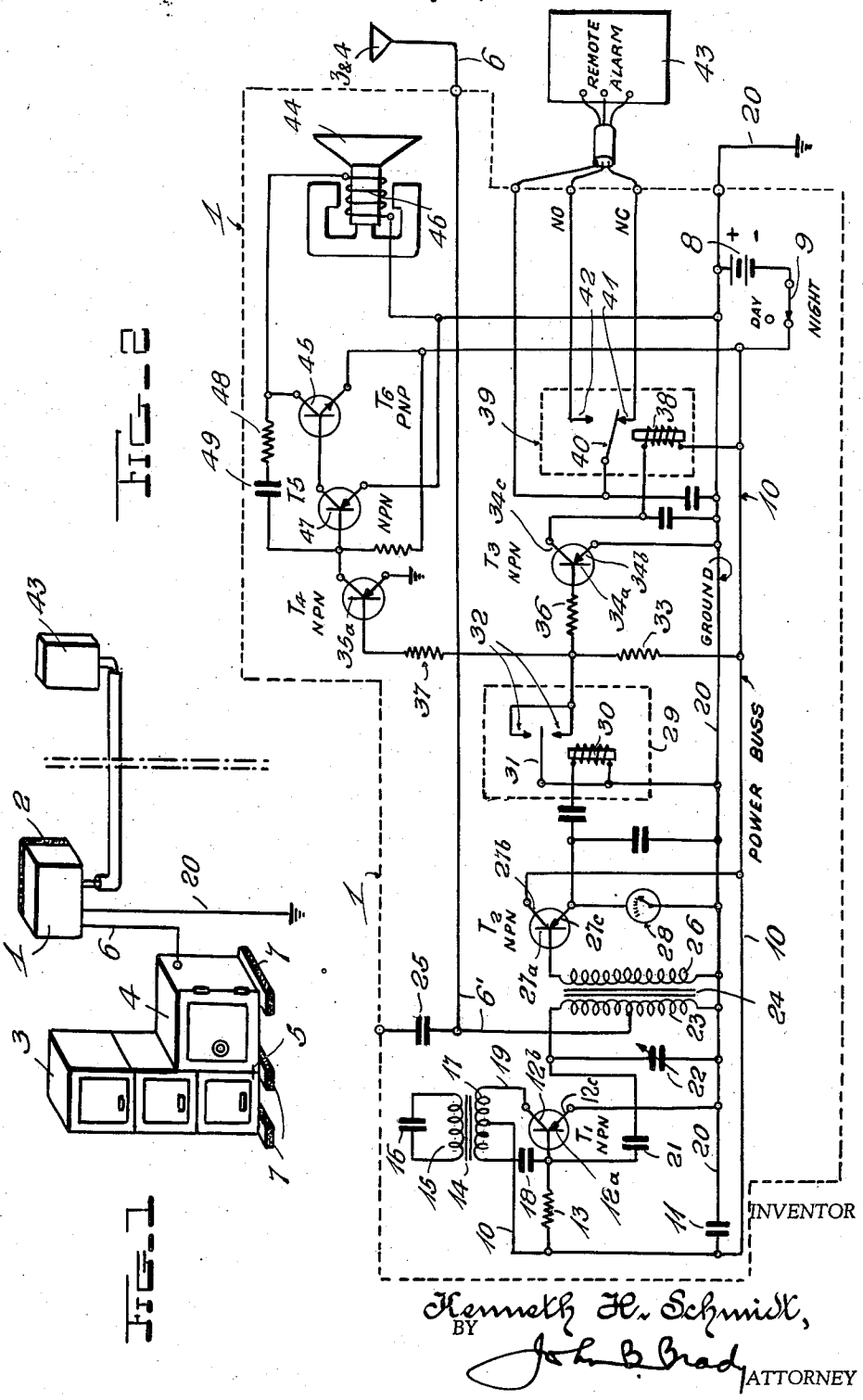


FIG. 2

FIG. 1

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PROTECTIVE ALARM SYSTEM

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My invention relates broadly to security alarm systems and more particularly to an alarm system of compact arrangement for installation in small offices and the like, for the protection of safes, file cabinets and other equipment.

My invention relates to that class of security alarm systems set forth in my copending application Serial Number 670,999 filed July 10, 1957, now Patent No. 3,005,191, for Security Alarm System, and my copending application Serial Number 670,998, filed July 10, 1957, now Patent No 2,943,304, for Security Alarm System With Remotely Operative Test Circuit.

One of the objects of my invention is to provide a small and economical security alarm system particularly for use in small offices.

Another object of my invention is to provide a security alarm system having an alarm indicator in the immediate location of the protected area for sounding a local alarm and a control circuit capable of simultaneously controlling a remotely located alarm indicator.

Another object of my invention is to provide a security alarm system in which an audio alarm oscillator circuit in the immediate vicinity of the protected area can be used both as an alarm and a convenient method and apparatus for checking the system's sensitivity and operation without sounding the principal remotely located alarm indicator.

A further object of my invention is to provide a security alarm system in which the alarm system control circuits and local alarm are enclosed in an electrically conductive case which constitutes an antenna system member and thereby provides self-protection for the system.

Still another object of my invention is to provide a security protective circuit incorporating a transistor relaxation oscillator controlling an audio indicator.

Other and further objects of my invention reside in a composite alarm and test system as set forth more fully in the specification hereinafter following by reference to the accompanying drawings, in which:

FIG. 1 is a schematic view showing a typical office installation of the compact security alarm system of my invention and particularly showing the attachment of a remotely located alarm indicator;

FIG. 2 is an electrical wiring schematic diagram of the composite security alarm system of my invention.

My invention is directed to a construction of a composite security alarm circuit and test circuit whereby the condition and sensitivity of the alarm circuit may be checked at the immediate installation position either with or without the actuation of the remote principal alarm.

The objects to be protected, such as safes, file cabinets and alarm system housing, are electrically connected in series and form the antenna system of the security alarm system. The system operates on an electromagnetic principle. The housing for the security alarm system itself serves as an antenna for activating the alarm circuits enclosed thereby.

An oscillator circuit by means of the resonant antenna system radiates radio frequency (RF) energy into the area surrounding the antenna system, thus setting up an electromagnetic field of stored RF energy. An ultrasensitive alarm relay circuit connected to the antenna resonating circuit through a detector circuit is balanced

for the particular antenna system. The presence of any additional body or object in the electromagnetic field will cause a positive voltage at the input to the detector circuit, since the amount of RF energy stored in the field has been changed, thus causing it to conduct and energize the alarm relay circuit due to the current change.

The alarm relay controls two individual transistorized alarm control channels which are connected in parallel. The channel which forms the test circuit and local alarm indicator circuit is a relaxation oscillator circuit in which two complementary transistors, that is, a PNP transistor operative with negative voltage applied and an NPN transistor operative with positive voltage applied, coact in a positive feedback circuit to establish oscillations and operate an audio device or alarm. The operation of the audio device and thus the oscillations are governed by current supplied to the transistor relaxation oscillator circuit from a transistor coupling amplifier which connects the oscillator circuit to the alarm relay output circuit. When the alarm relay is energized the current to the relaxation oscillator circuit from the coupling amplifier becomes the opposite polarity as that to which the base of the transistor oscillator is biased and oscillations are established through the relaxation oscillator circuit which operate the audio device. The theory of operation of the relaxation oscillator circuit is explained more fully in my copending application Serial Number 670,971, filed July 10, 1957, for Transistor Relaxation Oscillator.

The other alarm channel which is the control circuit for operating a remotely located alarm, consists of an NPN transistor amplifier connected in series with the coil of a slave relay which controls the excitation of the remotely located alarm. When the alarm relay is energized the biased base of the transistor amplifier realizes a positive voltage change. The transistor amplifier conducts energizing the slave relay which results in the energizing of the remote alarm indicator.

The oscillator circuit, antenna tuning circuit, detection circuit, balanced alarm relay circuit, remote alarm control circuit, local audio alarm indicator and its relaxation oscillator control circuit, as well as the battery supply for the system, are all contained in an electrically conductive housing which is internally connected into the balanced antenna system. This provides electronic protection for all the circuits in the system as well as for the local alarm itself, since any approach to or touching of the housing will add capacity to the antenna system resulting in a system unbalance, thus sending in an alarm. With this arrangement when the system is in operation there is no way to disable the system or turn it off without initiating an alarm.

Referring to the drawings in more detail, reference character **1** designates the electrically conductive housing which encases the security system's circuitry and local alarm as set forth more fully above. This housing is mounted in the immediate location of the objects under protection and is insulated from ground by insulation block **2**.

The antenna system is composed of the objects to be protected, such as file cabinet **3** and safe **4**, electrically connected in series by conductor member **5** and connected to the antenna tuning circuit in housing **1** by antenna connecting coaxial conductor **6**. The objects connected in the antenna system are insulated from ground by insulating blocks **7**. As will be discussed later, housing **1** is internally connected into the antenna system.

The security alarm system is self-powered by a battery **8** in the potential range of 1.5 volts which supplies all the necessary B— voltage for operating the security alarm system. Day-Night switch **9** is connected in series with the battery power supply and when in the Night position

supplies B— bias voltage for the transistors in the various circuits by means of power buss **10**.

After being filtered by by-pass capacitor **11**, power buss **10** supplies bias voltage for the base **12***a* of oscillator transistor T_1 by means of base bias resistor **13**, and supplies power for oscillator transformer **14**. The secondary winding **15** of oscillator transformer **14** and tank capacitor **16** form the oscillator tank circuit and determine the RF output of the oscillator circuit. Primary winding **17** of the oscillator transformer is connected to the transistor base member **12***a* by coupling capacitor **18** and transistor collector member **12***b* by conductor **19**. Transistor emitter **12***c* is connected to ground buss **20**.

The oscillator output from transistor base **12***a* is coupled by means of coupling capacitor **21** to the antenna tuning circuit which consists of tuning capacitor **22** connected in parallel with primary winding **23** by detector transformer **24**. The antenna system is connected to the tapped primary winding **23** of the detector transformer by internal antenna connecting conductor **6'**. The circuitry and alarm housing **1**, is connected to conductor **6'** by desensitizing capacitor **25**, thus making the housing of the local alarm and the security system circuitry an antenna system member surrounded by an electromagnetic field produced by the oscillator RF output. Thus when the Day-Night switch **9** is in the Night position it is impossible for a person to even approach the housing containing the heart of the system and the local alarm without setting off the alarm. Desensitizing capacitor **25** may be removed or reduced in value if it is desirable to make the antenna system more sensitive.

Detector transformer secondary winding **26** and detector transistor T_2 comprise the detection circuit. Transistor T_2 is an NPN type transistor which operates with positive voltage applied to its base **27***a*. Collector **27***b* is connected to power buss **10**, emitter **27***c* is connected through tuning meter **28** to ground, and base **27***a* is connected to the output of detector transformer secondary winding **26**. When an intruder enters the antenna system's electromagnetic field, the balance of the tuned circuit is disturbed since capacity has been added to the antenna system and transistor base member **27***a* will realize a positive voltage change thus causing transistor T_2 to conduct. The balanced circuit of alarm relay **29** which is connected to the output of the detection circuit will realize the resulting current change and since alarm relay **29** is an ultra-sensitive relay which responds to current changes of the magnitude of two micro-amperes the alarm relay will be energized due to the current flow through alarm relay coil **30**.

Alarm relay movable contact member **31** is connected to ground buss **20** while fixed contact points **32** are connected together and are common to two parallel alarm control circuit channels. Each channel is coupled to the output of the alarm relay, and thus contact points **32**, by an NPN transistor amplifier, both having base bias resistor **33** in common. When the antenna system is unbalanced by an intruder the result is that alarm relay movable contact member **31** makes contact with alarm relay fixed contact point **32** thus grounding one end of common base bias resistor **33**. Since the other end of this resistor is connected to power buss **10** the alarm relay effectively removes resistor **33** from the transistor bias circuit thus changing the bias voltage to both NPN transistors T_3 and T_4 and causing both to conduct since they both realize a positive voltage change at base members **34***a* and **35***a*, respectivley. In the conducting state base member **34***a* is connected to ground through voltage drop resistor **36**, and base **35***a* is connected to ground through voltage drop resistor **37**.

Emitter **34***b* of transistor T_3 is connected to ground buss **20** while collector **34***c* is connected to one end of energizing coil **38** of slave relay **39**. When transistor T_3 conducts current flows in relay coil **38** and slave relay **39** is energized. This causes slave relay movable contact member **40** to move from normally closed (NC) fixed contact point **41** to normally open (NO) fixed contact point **42**, thus closing the circuit between an alarm indicator and its power supply both of which are remotely located in housing **43**.

This remotely located alarm indicator **43** need not be utilized if the office or installation where the system is used is small or it is not desirable or necessary to utilize a remotely located alarm indicator. The connections are always available if later it is desirable to have a remote alarm indicator.

The local audio alarm indicator **44** is excited by a transistor relaxation oscillator circuit comprised of complementary transistors T_5 and T_6, that is, T_5 is an NPN transistor and T_6 is a PNP transistor. The oscillator output at collector **45** of transistor T_6 is connected to coil **46** of audio alarm **44** and is also connected to the input to the oscillator circuit at base **47** of transistor T_5 through a feedback circuit consisting of resistor **48** and capacitor **49**. This series feedback circuit from the output to the input maintains oscillations when the relaxation oscillator circuit is energized. The oscillator is activated by biasing transistor T_5 from transistor T_4 to oscillatory condition which controls transistor T_6 that in turn energizes coil **46** of the audio alarm **44**. For a more detailed explanation of the audio alarm reference is made to my copending application Serial No. 670,971, filed July 10, 1957, for Transistor Relaxation Oscillator.

The parallel channels provide very substantial protection for the objects being safe-guarded by sounding both a local alarm and the remote alarm as hereinbefore explained.

While I have described my invention in certain of its preferred embodiments I realize that modifications may be made and I desire that it be understood that no limitations upon my invention are intended other than may be imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is as follows:

1. In a security alarm system, a balanced antenna system containing an electrically conductive protective casing radiating an electromagnetic field, a detecting circuit, an alarm control relay connected with said circuit, said detecting circuit being connected with said balanced antenna system to control said alarm control relay, an alarm control oscillator circuit, a local alarm, a slave relay, a remote alarm, said alarm control relay being arranged to simultaneously control excitation to said alarm control oscillator circuit for driving said local alarm and excitation to said slave relay under an unbalance of condition of said balanced antenna system, said slave relay being connected in parallel with said alarm control oscillator circuit and controlling excitation to said remote alarm, a self-contained power source, said electrically conductive protective casing enclosing said power source together with said detecting circuit, said alarm control relay, said alarm control oscillator circuit, said local alarm and said slave relay for forming a self-protecting system.

2. A security alarm system comprising a balanced antenna system consisting of an equipment enclosing electrically conductive protective casing and objects under protection, a detecting circuit within and electrically connected with said casing, an alarm control relay within said casing and controlled by said detecting circuit, an alarm control relay having normally open contacts closable upon a change in the output of said detecting circuit, a common circuit component, said relay contacts being connected in shunting relationship with said common circuit component, a power source disposed with said casing, a pair of branch circuits connected to the power source and to said common circuit component, one of said circuits including a local alarm and the other of said circuits extending to a remote alarm and operating simultaneously upon the shunting of said common circuit component by said alarm control relay for actuating both of said alarms un-

der conditions of unbalance of said balanced antenna system, the said local alarm and the circuits connected therewith all being disposed within said electrically conductive protective casing connected in said balanced antenna system.

3. A security alarm system comprising a balanced antenna system consisting of an equipment enclosing electrically conductive protective casing and objects under protection, a transistorized oscillator for generating a radio frequency electromagnetic field radiated from said electrically conductive casing and the objects under protection, a detecting circuit within and electrically connected with said casing, an alarm control relay within said casing and controlled by said detecting circuit, an alarm control relay having normally open contacts closable upon a change in the output of said detecting circuit, a common circuit component, said relay contacts being connected in shunting relationship with said common circuit component, a power source disposed with said casing, a pair of branch circuits connected to the power source and to said common circuit component, one of said circuits including a local alarm, and the other of said circuits extending to a remote alarm and operating simultaneously upon the shunting of said common circuit component by said alarm control relay for actuating both of said alarms under conditions of unbalance of said balanced antenna system, the said local alarm and the circuits connected therewith all being disposed within said electrically conductive protective casing connected in said balanced antenna system, said power source also being connected to said transistor oscillator, said detecting circuit and said alarm control relay, said branch control circuits, said relay and said detecting circuit being disposed within said casing.

4. A security alarm system comprising a balanced antenna system consisting of an equipment enclosing electrically conductive protective casing and objects under protection, a transistorized oscillator for generating a radio frequency electromagnetic field radiated from said electrically conductive casing and the objects under protection, a detecting circuit within and electrically connected with said casing, an alarm control relay within said casing and controlled by said detecting circuit, an alarm control relay having normally open contacts closable upon a change in the output of said detecting circuit, a common circuit component, said relay contacts being connected in shunting relationship with said common circuit component, a power source disposed with said casing, a pair of branch

circuits connected to the power source and to said common circuit component, each of said branch circuits including an amplifier powered by said power source, one of said circuits including a local alarm, and the other of said circuits extending to a remote alarm and operating simultaneously upon the shunting of said common circuit component by said alarm control relay for actuating both of said alarms under conditions of unbalance of said balanced antenna system, the said local alarm and the circuits connected therewith all being disposed within said electrically conductive protective casing connected in said balanced antenna system, said power source also being connected to said transistor oscillator, said detecting circuit and said alarm control relay, said branch control circuits, said relay and said detecting circuit being disposed within said casing.

5. A security alarm system comprising a balanced antenna system consisting of an equipment enclosing electrically conductive protective casing and objects under protection, a detecting circuit within and electrically connected with said casing, an alarm control relay within said casing and controlled by said detecting circuit, an alarm control relay having normally open contacts closable upon a change in the output of said detecting circuit, a bias resistor connected to ground said relay contacts being connected in shunting relationship with said bias resistor, a power source disposed with said casing, a pair of branch circuits, each of said branch circuits including an amplifier connected to the power source and the bias resistor, one of said circuits including a local alarm and the other of said circuits extending to a remote alarm and operating simultaneously upon the shunting of said bias resistor of said alarm control relay for actuating both of said alarms under conditions of unbalance of balanced antenna system, the said local alarm and the circuits connected therewith all being disposed within said electrically conductive protective casing connected in said balanced antenna system.

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