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C. PRINCIPALE

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ALARM CIRCUITS

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Fig. 1.

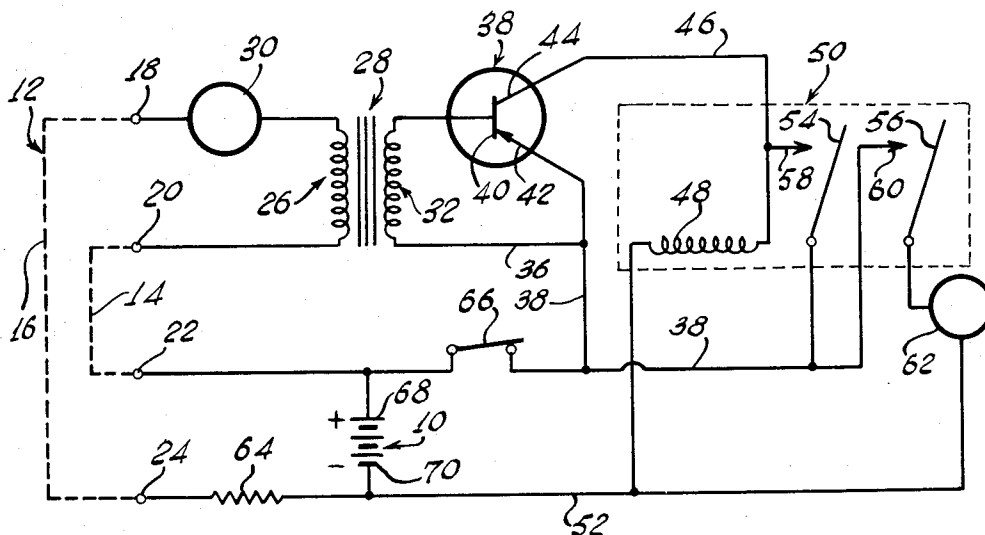
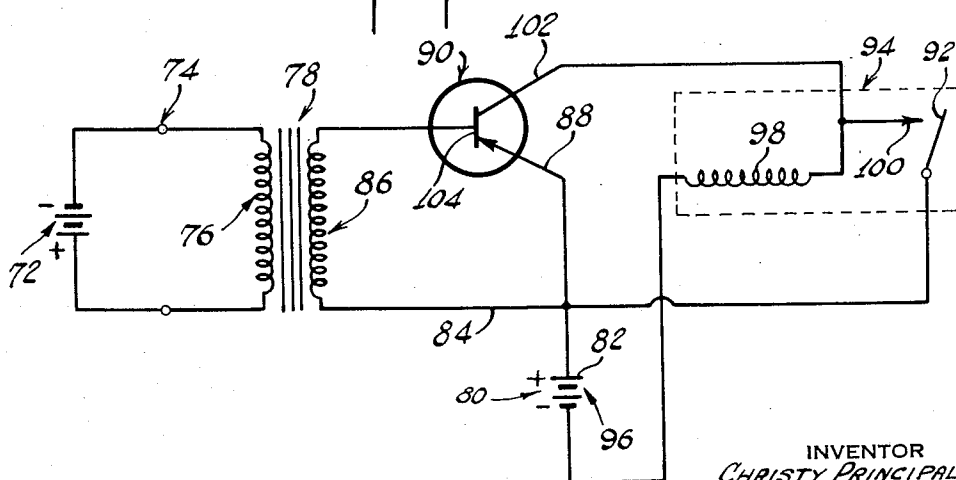


Fig. 2.



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3,014,207 ALARM CIRCUITS

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This invention relates to alarm circuits.

In the usual arrangements of an alarm circuit for protecting an area against access thereto, a conductor is strung across certain openings, such as windows, doors and the like, and a power source is connected to that conductor to cause a substantially constant current of low amperage to flow in the conductor. In that circuit is positioned a relay which remains energized so long as no break or short circuit of the conductor occurs. A break or short circuit of the conductor causes deenergization of the relay which then initiates energization of another circuit which may then ring a bell or otherwise produce a warning signal.

The difficulty presented by such circuits resides in the fact that such a relay, being mechanical even though energized by an electric circuit, reacts to mechanical vibrations with resulting jarring of the armature loose, and the production of a false alarm on excessive, and even slight vibration of positive impact.

It is the object of the invention to provide an electrical circuit involving elements by which the mechanical defects of a relay are eliminated completely, so that mechanical vibration at the area being protected, or of the parts of the circuit, will not result in a false alarm.

It is an object of the invention to provide a circuit in which an electrical source capable of supplying a substantially constant potential functions to maintain a current flow in a protective circuit, and yet, on a change of an electrical characteristic of the circuit by a break or short circuit, an electronic device, upon which a constant potential is maintained during normal operation, causes initiation of an alarm producing signal with resultant giving of an alarm.

It is an object of the invention to provide a circuit where a direct current power source causes current to pass through a winding of a transformer and a protective circuit, so that, upon a break in or short circuit of the protective circuit, the diminishing lines of force from the transformer winding cause the build up of a potential on one of the members of an electronic device so as to cause a current to flow in a circuit in which the electronic device has blocked any appreciable current to flow up to that time, and thereupon will energize the alarm circuit and cause an alarm to be given.

Other objects of the invention will be set forth hereinafter, or will be apparent from the description and the drawings in which are illustrated embodiments exemplifying the invention.

The invention, however, is not intended to be restricted to any particular construction, or any particular arrangements of parts, or any particular application of any such construction or arrangements of parts, or any specific method of operation or use, or any of the various details thereof, even where specifically shown and described herein, as the same may be modified in various particulars, or may be applied in many varied relations, without departing from the spirit and scope of the claimed invention, of which the exemplifying embodiments, herein shown and described, are intended only to be illustrative, and only for the purpose of complying with the requirements of the statutes for disclosure of an operative embodiment, and not to show all the various forms and modifications in which the invention might be embodied.

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On the drawings, in which the same reference characters refer to the same parts throughout, and in which are disclosed such practical constructions,

FIGURE 1 is a diagrammatic showing of a circuit for an alarm device embodying features of the invention; and FIGURE 2 is a diagrammatic showing of a modified alarm circuit embodying features of the invention.

On the drawing, a circuit is shown which may be utilized as a burglar alarm circuit, and into which features of the invention have been embodied. While the circuit shown is designated for use as a burglar alarm circuit, it is to be understood that certain of its elements permit its use as a detecting means for a protective device, as, for instance, the circuit for a fire alarm, wherein a substantially continuous current flow from a substantially constant potential source is used.

While, in the illustrated circuit of FIG. 1, a battery 10 is shown, there may be utilized any substantially constant potential source in which the polarities and the available potential remain substantially constant at all times throughout the effective operation of the circuit. A protective circuit 12 is shown. This protective circuit may be of any well known constituents and construction. For instance, tin foil or other material may be stretched across windows, door openings, and the like, so that, in the usual manner, an attempt to make an entry into the area being guarded will cause a break or short circuit so as to cause interruption of current flow in the effective portion of the circuit to be discussed.

In the example shown, two conductors 14 and 16 are extended from terminals 18, 20, 22 and 24. From terminals 18 and 20 conductors 14 and 16 are extended to the primary winding 26 of a transformer 28. An ammeter 30 may be interposed in the circuit for the usual purposes of determining if and to what degree the circuit is energized by battery 10.

Generally, conductors 14 and 16 are closely parallel to each other where they are extended to guard entry to an area. Thus, not only will interference by breaking either conductor at any point cause interruption of the current flow from battery 10 through winding 26, but also the positioning of a metallic member across any closely adjacent portions of conductors 14 and 16 will short circuit the protective circuit, and cause interruption or almost complete failure of current flow from battery 10 through winding 26.

In the diagrammatic showing, a secondary winding 32 for the transformer is shown separate and distinct from primary winding 26. However, for some purposes other types of transformer construction may be utilized, as, for instance, in some cases the relationship of windings of an autotransformer may be utilized. In the circuit shown, conductors 34 and 36 lead from winding 32 to an electronic device such as a transistor 38. One conductor from secondary 32 may be connected to the base 40 of transistor 38. The other conductor 36 may be a common lead 38, connecting secondary winding 32 to battery 10 and emitter 42 of transistor 38. The collector 44 of the transistor may be led through a lead 46 back to the other side of battery 10 through the coil 48 of a relay 50 and lead 52.

Relay 50 may have a pair of armatures 54 and 56. Common lead 46 may extend to a terminal 58 which cooperates with armature 54 which is connected to common lead 36.

Terminal 60, which may be connected to common lead 38, may cooperate with armature 56 which may be connected to a bell signal 62 or other alarm device, and then to common lead 52 which is connected to coil 48 and to the other side of battery 10.

Between battery 10 and protective circuit 12 may be

interposed a resistor 64 for the purpose of reducing the amperage of the current passing through the protective circuit in the usual manner. A switch 66 may be interposed in common lead 36 so that, after the alarm circuit has been energized in the manner to be discussed, it will be possible to deenergize relay coil 48 and thus reset the apparatus for further and repeated operation.

Preferably, the positive pole 68 of the battery is connected to emitter 42, and to secondary winding 32 of the transformer. Collector 44 is connected through coil 48 of the relay, to the negative pole 70 of the battery. When the protective circuit is energized by closing switch 66, a constant value current will flow through the protective circuit, and also through primary winding 26. Thus, the magnetic lines of force in the transformer will remain constant, and no current will be induced in secondary winding 32. A constant potential will thus be impressed upon base 40 and emitter 42 from the positive pole of the battery, and a like constant negative potential will be impressed upon collector 44 from the negative pole of the battery.

However, if now a break or short circuit should occur in the protective circuit, current flow through primary winding 26 will be cut off, with failure of the lines of force produced by current flow in the primary winding. As the lines of force decrease with failure of current in the primary winding, a current will be induced in secondary winding 32, and that current will be opposite in phase and potential to the current potential derived from battery 10, and that potential will go to peak at a point intermediate in the decrease from maximum to minimum of the lines of force in the primary winding. This will result in a change in the potential impressed upon the base of the transistor so that a positive current will be caused to flow from emitter 42 to collector 44, and through coil 48.

When coil 48 is thus energized, it will lift both armatures 54 and 56 to engage their respective terminals 58 and 60. Engagement of armature 54 with its terminal 58 will then constitute a holding circuit for coil 48, which, so energized, will continue to hold armature 56 to pass current through the circuit for bell 62, and will keep the alarm going until switch 66 is actuated to deenergize relay coil 48.

No moving parts have been used for the energization of relay coil 48. The whole operation depends upon the reduction of the lines of force through primary winding 26 of the transformer, with resultant induction of a positive voltage by secondary winding 32, which then biases transistor 38. The transistor which, up to that time, had blocked any flow of current from battery 10 to coil 48, now triggers the passage of a substantial current through coil 48, and thus energizes it to establish a holding circuit to cause a continuous current to flow in the bell ringing circuit.

In FIG. 2, there is shown an alternative method of setting up this construction. In such case, two separate batteries are used. Battery 72 is connected in series with protective circuit 74 and the primary winding 76 of transformer 78. Another battery 80 has its positive pole 82 connected, by a common lead 84, to one side of secondary winding 86, to the emitter 88 of a transistor 90, and to the armature 92 of a relay 94. The negative pole 96 of the battery is connected, through coil 98 of relay 94, to a fixed contact 100 associated with armature 92, and to collector 102 of the transistor. An alarm circuit (not shown) may be controlled by armature 92 and its terminal contact 100.

It has been found important to have the proper poles of the battery connected to the primary winding of the transformer, as well as to have the proper poles of battery 80 connected to emitter 88, and, through coil 98, to collector 102, in order to make this apparatus function. It appears to be obvious that the induced voltage in the secondary winding, on a break in the circuit of

the primary winding, is sufficient to neutralize the positive charge on base 104 of the transistor, and thus to produce a negative bias sufficient to cause current to flow from the emitter to the collector, and then through the coil of the relay, to energize it, at least for an instant, so that the circuit to be held by armature 92 and fixed contact 100 will be energized.

Many other changes could be effected in the particular constructions, and in the methods of use and construction, and in specific details thereof, hereinbefore set forth, without substantially departing from the invention intended to be defined herein, the specific description being merely of embodiments capable of illustrating certain principles of the invention.

What is claimed as new and useful is:

1. In an alarm apparatus, including a conductor forming part of a protective circuit, an inductance connected in series with said conductor, means for maintaining a substantially constant electrical current through the conductor and the inductance, a secondary circuit inductively coupled with said inductance, an electronic device having one of its poles biased by connection to a leg of the secondary circuit, and a third circuit including a relay for causing current to flow to produce a warning signal, a leg of the relay being connected to other elements of the electronic device, the secondary circuit comprising means to impress a potential upon said one pole on failure of current flow in the inductance to cause current to flow in the third circuit for energizing the relay.

2. In an alarm apparatus, including a conductor forming part of a protective circuit, an inductance connected in series with said conductor, means for maintaining a substantially constant electrical current through the conductor and the inductance, a secondary circuit inductively coupled with said inductance, an electronic device having one of its poles biased by connection to a leg of the secondary circuit, a third circuit including a relay, a leg of the relay being connected to another pole of the electronic device, and a bell-ringing circuit, the secondary circuit comprising means to impress a potential upon said its pole of the electronic device to cause an amplified current to flow from said another pole through the relay to energize the bell-ringing circuit on failure of current flow in the inductance.

3. In an alarm apparatus, including a transformer, a protective circuit, a substantially constant potential source of electrical energy, means for connecting a transformer winding in series with the source and the protective circuit, an electronic device, means for connecting the source to a pole of the device through the other transformer winding, and a third circuit including other elements of the electronic device and a relay, the electronic device comprising means for causing current to flow in the third circuit upon failure of current flow in the protective circuit and to cause the relay to produce a warning signal.

4. In an alarm apparatus, including a transformer, a protective circuit, a substantially constant potential source of electrical energy, means for connecting a transformer winding in series with the source and the protective circuit, an electronic device, means for connecting the source to a pole of the device through the other transformer winding, a third circuit including other elements of the electronic device and a relay, and a bell-ringing circuit, the third circuit providing means to energize the relay for causing current to flow in the bell-ringing circuit on failure of current flow in the protective circuit and to cause the relay to produce a warning signal.

5. In an alarm apparatus, including a transformer, a protective circuit, the primary circuit of the transformer including a substantially constant potential source of electrical energy and the protective circuit, a transistor, the secondary circuit of the transformer being connected to a pole of the transistor and a substantially constant potential source of electrical energy, and a third circuit

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including other elements of the transistor and a relay, the transistor comprising means for causing current to flow in the third circuit on failure of current flow in the protective circuit and to cause the relay to produce a warning signal.

6. In an alarm apparatus, including a transformer, a protective circuit, the primary circuit of the transformer including a substantially constant potential source of electrical energy and the protective circuit, a transistor, the secondary circuit of the transformer being connected to a pole of the transistor and a substantially constant potential source of electrical energy, a third circuit including other elements of the transistor and a relay, and a bell-ringing circuit, the third circuit providing means to energize the relay for causing current flow in the bell-ringing circuit on failure of current flow in the protective circuit and to produce a warning signal.

7. In an alarm apparatus, including a transformer, a

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protective circuit, the transformer primary, a substantially constant potential source of electrical energy, and the protective circuit being series connected, the transformer secondary being connected to a substantially constant potential source of electrical energy, a transistor connected normally to block any appreciable current flow through the transformer secondary, and an alarm circuit, the alarm circuit being connected to a source of electrical energy but being normally blocked by the transistor, the transformer providing means for biasing the transistor to cause an actuating current to flow through the alarm circuit on failure of the protective circuit.

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