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ALARM LATCHING CIRCUIT

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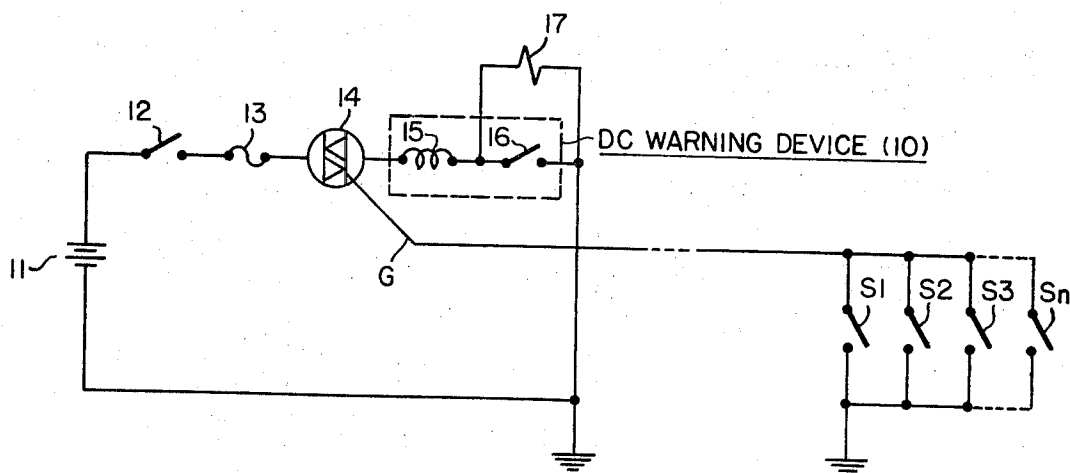


FIG. 1

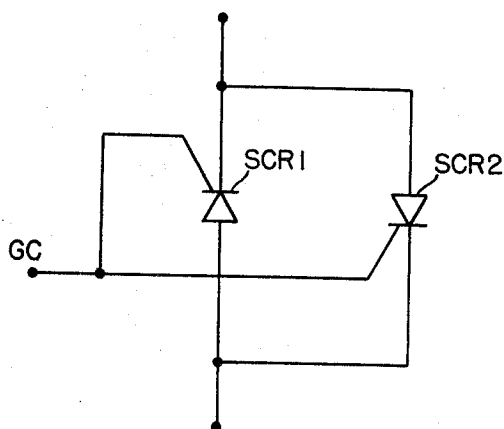


FIG. 2

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ALARM LATCHING CIRCUIT

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3 Claims

ABSTRACT OF THE DISCLOSURE

A remote control circuit for a D.C. actuated alarm apparatus has been provided which includes a coil, an armature actuated in response to energization of the coil, a normally closed set of spring biased breaker points serially coupled to the coil and opened by the actuation of the armature. An impedance bridges the points for maintaining circuit continuity regardless of the condition of the points. An alarm condition sensing means completes the circuit in response to the alarm condition. A normally non-conductive triac semi-conductor has its main conduction path serially coupled with the coil and its gate electrode coupled to the alarm condition sensing device for triggering conduction of the triac and actuating the coil in response to said circuit completion.

BACKGROUND OF INVENTION

This invention relates to control apparatus for a warning device and in particular to a remote control circuit for a direct current actuated magnetic alarm apparatus.

When considering the manufacture of a production item having a relatively low selling price, such as a door bell, obviously one of the most important considerations would be the production costs of such an apparatus. In this connection, simplicity of operation, long life, and ease of manufacture all have a direct bearing on the ultimate cost of the article and must be carefully considered before a decision to produce large numbers of such items is made. A D.C. bell or buzzer device requires at the very least a source of power; for example, a battery, and a coil, an armature activated by the coil, and a set of spring biased breaker points periodically opened by the energization of the coil for returning the points back to a closed condition, again permitting energization of the coil. If a remote control were required, then perhaps a switch operated by a sensing device would be actuated in response to an alarm condition and such actuation would energize a relay at the device to close the circuit and provide a warning by energizing the bell. However, the requirement for a relay in a production time, many times proves too costly and other means are sought out. In addition to the cost of the item, a relay may be relatively bulky, require more power to operate, than is desirable, and not last as long as a solid state switching device. Other disadvantages further include the problems of mounting the relay within the housing and in many cases, polarity considerations must be taken into account before the final electrical connections are made with some relays and generally with most semi-conductor switches.

It is therefore an object of the present invention to provide a system which obviates one or more of the disadvantages of the described prior arrangements.

It is another object of the present invention to provide a system utilizing a simply installed and relatively inexpensive switching device.

It is another object of the present invention to provide a simplified remote control circuit for a direct current actuated electro-magnetic alarm apparatus.

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SUMMARY OF THE INVENTION

There has been provided a remote control circuit for a direct current actuated electro-magnetic alarm apparatus including a coil and armature actuated in response to energization of the coil. Normally closed spring biased breaker points serially coupled to the coil are opened by the actuation of the armature and an impedance is coupled across the points for maintaining circuit continuity regardless of the opened or closed condition of the points. An alarm condition sensing device provides a complete circuit in response to an alarm condition and a normally non-conductive triac semi-conductor has its main conduction path serially coupled with the coil and its gate electrode coupled to the alarm condition sensing device for triggering conduction of the triac and actuating the coil in response to said circuit completion.

For a better understanding of the present invention together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings, while its scope will be pointed out in the appended claims.

FIG. 1 is a schematic drawing of the circuit of the present invention.

FIG. 2 is a schematic drawing of the essential make-up of a triac.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a D.C. warning device 10 which may be any suitable bell or buzzer arrangement which operates from a direct current source. A source of D.C. energy; namely, a battery 11 energizes a circuit including a main power switch 12, a fuse 13, a normally non-conductive triac 14, an inductive coil 15, and a set of normally closed breaker points 16 completes the circuit to ground. Resistor 17 is included in order to maintain continuity of the circuit regardless of the opened or closed condition of the breaker points 16 and its function will be explained later in the discussion. A set of remote switches S1 through Sn are located at various points in a specific area or as required and the closure of any one of these switches S1 through Sn causes an energization of the circuit as follows. The triac 14 has a gate electrode G, shown in the drawing, and conducts in the direction of the forward current depending upon the bias condition of the gate G. Under the conditions set forth in the drawing, a grounding of gate G causes the triac to conduct energizing the coil 15 which in turn operates an armature in the warning device 10 which strikes a bell, gong or other suitable noise making apparatus. In addition the armature opens breaker points 16 which deenergizes coil 15 and allows breaker points 16 to close and again cause energization of the coil 15 provided the triac 14 is still conducting. Since the triac 14 is a semi-conductor device, it requires some stable bias to provide a reliable operating point. In this case the battery 11 provides a bias across the triac 14 and the resistor 17 maintains a bias level for the triac 14 such that once it is conducting, it remains conducting unless the main current path is interrupted as for example by opening the switch 12. For this reason, the resistor 17 is placed across the breaker points so that regardless of their opened or closed condition, the triac always carries sufficient holding current as established by the resistor 17 so that it remains conductive as long as its forward bias condition still exists. Resistor 17 may also be used for supervisory purposes.

It is conceivable that a silicon controlled rectifier can take the place of the triac 14. However, there are reasons why this is not provided in this disclosure as described in accordance with FIG. 2. The drawing shows the basic or essential make-up of a triac. It includes two SCR's coupled in parallel in an inverse fashion with common

gates. Under these conditions, the triac can conduct and block current in both directions in accordance with the condition of the common gate GC. If a positive bias is placed across SCR 1 and it is steadily increased, eventually an avalanche occurs and SCR 1 goes into a high conduction state. The bias required to drive SCR 1 to a conducting state is inversely related to the potential applied to the gate GC. As the gate current increases, the bias required to drive SCR 1 into conduction decreases.

Once the SCR has been triggered in the forward direction, the gate GC has no effect whatsoever on the operation of the SCR and it will continue to conduct until the current is removed from its direct path as shown in FIG. 1 by opening switch No. 12. On the other hand, if a forward bias were placed on the SCR 2, as for example, a negative polarity in the forward direction of SCR 1, then the gate condition being the same as for SCR 1 will permit SCR 2 to conduct with SCR 1 off: From this it can be seen that the triac shown in FIG. 2, consisting of two silicon controlled rectifiers adds protection to the circuit shown in FIG. 1 by providing a path around SCR 1 in the event there is a transient in the reverse direction which SCR 1 is not able to handle.

As is the case with most inductive devices, a sudden break in circuit continuity causes a reverse current to flow and even in the smallest devices, these currents may be well beyond the limits of operation of many semiconductor switches. For this and other reasons the triac is used because the reverse emf produced in the coil 15 bypasses SCR 1 through SCR 2. If, for example, a single silicon controlled rectifier were used, then the reverse current might tend to damage semiconductor. There are, however, heavy duty devices which would be able to handle higher current. However, the cost of such an item is rapidly increased as the power ratings go up and as such it is undesirable for a relatively inexpensive warning device. The triac on the other hand can be manufactured closely to the typical operating characteristics of the circuit and not be effected by the high inverse current produced by the collapse of the coil field, because SCR 2 provides the reverse current path.

The characteristics of the triac semiconductor provides the means for applying the device to the apparatus shown in FIG. 1. Triac 14 acts as a latch or stick circuit, and can be used for maintaining activation of the warning device 10, as long as power from the battery continues to flow through the main conduction path of the triac. In other words, the only way to deenergize the warning device is to open the contacts 12 and remove energy from the circuit as previously noted. In many applications, a stick relay would normally be used, however, such a relay requires either an external source of power to maintain its energized state or a larger battery, both alternatives are not particularly desirable, whereas the insertion of the triac into the circuit achieves the purpose at less cost. The reason for requiring a latch circuit, is that in the event any of the remote switches S1 through Sn become closed, the device remains energized until interfered with by an observer. This requires that unless the warning is noticed, it will continue to operate, and if any of the particular switches S1 through Sn later open, the alarm condition is maintained by continued energization of the warning device 10. Certain check out procedures may be required after activation of the warning in accordance with the practices of those maintaining the apparatus.

Another advantage of the system as shown in FIG. 1 is that the triac 14 may be connected without regard to polarity considerations since the bias is established by battery 11 and the triac conducts in the desired direction

because the main path directly through the triac 14 will be always forward biased because of the inverse relationship of the SCR's which make up the triac. This eliminates the chances of an inadvertent reverse connection.

There has therefore been provided a control circuit for a D.C. warning device which is relatively low in cost, quite simple to manufacture and because of the semiconductor construction requires little power, a limited space requirement and is generally free of maintenance problems.

While there has been shown what is at present considered to be the preferred embodiment of the invention it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is therefore aimed in the appended claims to cover all such changes and modifications that fall within the true spirit and scope of the invention.

What is claimed is:

1. A remote control circuit for a direct current actuated electro-magnetic alarm apparatus including:

- (a) a coil for actuating said alarm apparatus when a current equal to at least a predetermined magnitude is passed through said coil;
- (b) normally closed breaker points serially connected to the coil and opened in response to the passage of a current equal to at least said predetermined magnitude through said coil;
- (c) an impedance element connected in parallel with the breaker points and having an appropriate impedance value for:

- (1) maintaining circuit continuity regardless of the opened or closed condition of the breaker points;
- (2) reducing the current in said coil below a holding value thereof when said breaker points are open; and
- (3) absorbing at least some of the inductive energy which results from the opening of said breaker points;

- (d) alarm condition sensing means for completing a circuit in response to the alarm condition; and
- (e) a normally non-conductive triac semiconductor having its main conduction path connected serially with the coil and with its gate electrode coupled to the alarm condition sensing means for triggering conduction of the triac and actuating the coil in response to said circuit completion.

2. A remote control circuit of claim 1 wherein said impedance is a relatively high supervisory resistor and said alarm condition sensing device comprises a switch activated in response to an alarm condition for grounding the gate of the triac.

3. The remote control circuit of claim 1 wherein said direct current actuated electro-magnetic alarm apparatus comprises: an audible warning bell or buzzer.

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