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2,810,902

FIRE AND INTRUSION DETECTOR SYSTEM

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FIG. 1

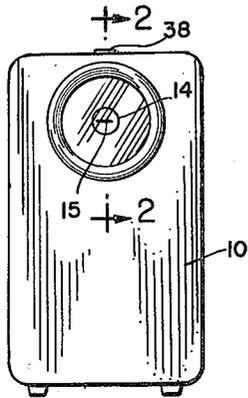


FIG. 2

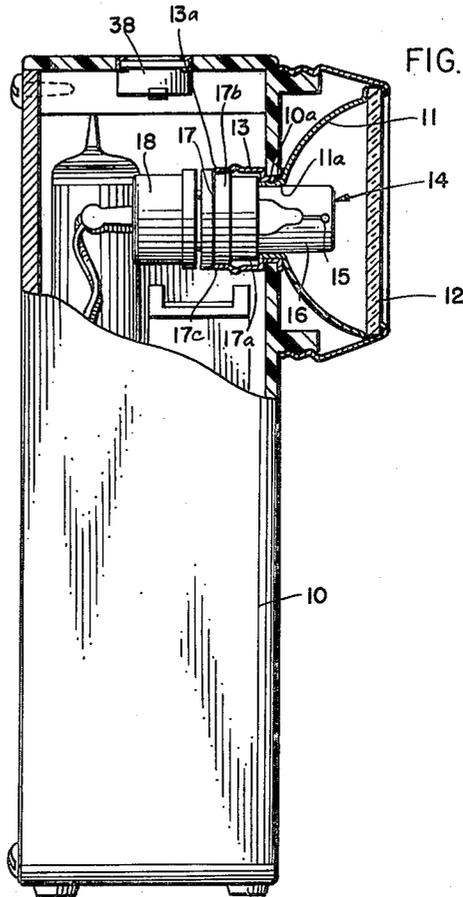
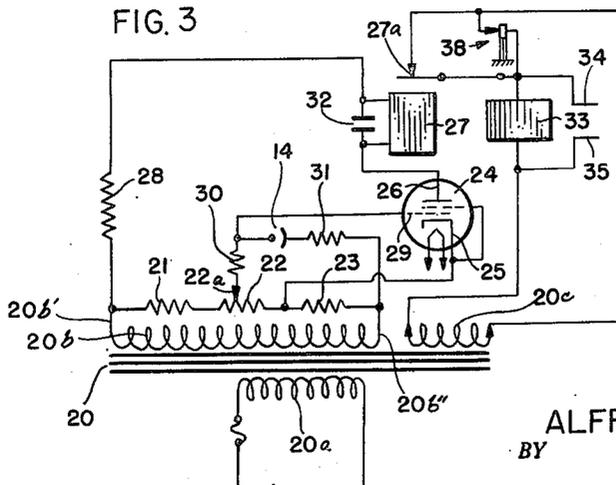


FIG. 3



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FIRE AND INTRUSION DETECTOR SYSTEM

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4 Claims. (Cl. 340—228)

This invention is concerned with an alarm system and more particularly with an alarm system utilizing a light sensitive pickup element.

The alarm system described and claimed herein provides a very sensitive light actuated circuit for use as both a fire and burglary-intrusion detector and is particularly designed for fur vaults, storerooms and the like.

One feature of the system is that it comprises a light sensitive element, a circuit responsive thereto for providing an alarm signal, a light reflective surface having a focal point and means for mounting the light sensitive element substantially at the focal point of the reflective surface. Another feature is that the reflective surface has a centrally located opening therein with a sleeve extending rearwardly therefrom, the light sensitive element being mounted in a bulb having a base portion which is inserted through the opening and is adjustably supported in the sleeve to position the light sensitive element at the focal point of the reflector. A further feature is that the base and sleeve have interengaging surfaces which limit the depth of insertion of the bulb through the opening in the reflector.

Yet another feature is the provision of such a system including thermo-responsive means for actuating the circuit to provide an alarm signal under predetermined temperature conditions.

Further features and advantages will readily be apparent from the following specification and from the drawings, in which:

Figure 1 is a front elevational view of the self-contained alarm unit;

Figure 2 is an enlarged side view, partially in section along line 2—2 of Figure 1; and

Figure 3 is a schematic diagram of the alarm circuit.

There are many places, such as fur vaults and storerooms which are normally completely, or nearly completely, dark. It is desirable to have an alarm system for such places which is extremely sensitive to light and also to temperature conditions to provide a signal in the event of fire, burglary or other intrusion.

Turning now to the drawings, Figures 1 and 2 show a self-contained alarm system housed in a small case 10, preferably of a plastic material. Mounted on the case 10 is a generally parabolic reflective surface 11 which has a focal point located within the space enclosed by protective lens 12. An opening 11a is located centrally of the generally parabolic reflector and a cylindrical sleeve 13 extends rearwardly therefrom through an opening 10a in the wall of the case.

A pickup unit, indicated generally as 14, includes an elongated light sensitive surface 15 carried within a transparent bulb 16 which has a base portion 17 provided with suitable male prongs for connection with a socket 18. The forward portion 17a of the base is relieved to permit the pickup unit to be inserted into the sleeve 13. Another portion 17b is of slightly greater diameter than the portion 17a to engage the sleeve, frictionally holding the unit in its adjusted position. A shoulder 17c is

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formed at the rear of the base and engages the rear end 13a of sleeve 13 limiting the depth of insertion of the pickup unit so that the elongated light sensitive surface 15 has a point which lies substantially on the focal point of the parabolic reflector. As will appear, this positioning of the pickup unit greatly increases the sensitivity of the system.

Turning now to Figure 3, the circuit of the alarm will be described. While specific values are assigned to the various components, it will be understood that modifications may be made by those skilled in the art. The system is energized from a suitable power source, as 110 volts A. C. connected to the primary winding 20a of power transformer 20. A high voltage secondary winding 20b has a resistive voltage divider comprising resistors 21, 820 ohms, 22, 10,000 ohms, and 23, 2200 ohms connected in series between terminals 20b' and 20b''. A control tube 24, which may be a 6AQ5 pentode, has a cathode element 25 connected to an intermediate point of the voltage divider between resistors 22 and 23. The plate 26 of tube 24 is connected through the coil of a relay 27 and a current limiting resistor 28, 1000 ohms, to terminal 20b' of the transformer secondary winding. The control grid 29 of the amplifier is returned through resistor 30, 44 megohms, to movable tap 22a of potentiometer 22. Connected between control grid 29 and terminal 20b' of the transformer secondary is the light sensitive pickup unit and a series resistor 31, 560,000 ohms.

In operation, with no light shining on pickup unit 14, the pickup unit has an extremely high resistance, of the order of several hundred megohms and accordingly, on alternate half cycles, when terminal 20b' and the plate of the amplifier are positive, the control grid 29 is positive with respect to cathode 25 and the tube conducts energizing relay 27 when holding the contacts 27a thereof open. A capacitor 32, 4 microfarads, is connected across the relay coil and prevents deenergization of the relay on the half cycles when plate 26 of the tube is negative. When light strikes the pickup unit 14, its impedance drops to less than a megohm and the control grid 29 of the amplifier is effectively connected to terminal 20b'' of transformer secondary winding 20b. Thus when the plate 26 of the tube is positive the control grid is highly negative and the tube does not conduct at any time, deenergizing relay 27 and permitting contacts 27a to close. These contacts complete a circuit from transformer secondary winding 20c to an alarm 33, such as a buzzer. If desired, connection may be made to terminals 34 and 35, across buzzer 33, to provide a remote alarm indication.

The sensitivity of the alarm may be adjusted to compensate for ambient light conditions by adjusting the variable tap 22a of potentiometer 22.

There may be situations where a smoldering fire might start which gives off no light or which creates a sufficient amount of smoke to mask the light sensitive pickup 14. Accordingly, a thermally operated switch 38 is mounted in case 10 and is connected in parallel with relay contacts 27a. This switch is normally open and is selected so that it closes at a predetermined temperature, completing the circuit of alarm 33.

The light sensitive surface 15 of the pickup unit is preferably a cadmium selenide crystalline composition which has an extremely high dark resistance, of the order of 5,000 megohms and a sensitivity of the order of 6 microamperes per foot candle at 25° C., with 100 volts applied to the crystal. Such cells also have an extremely high response to light in the infrared portion of the spectrum, detecting light having a wavelength of slightly greater than 8000 Angstrom units. The further provision of a parabolic reflector with the light sensitive surface

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15 mounted substantially at the focal point thereof greatly increases the sensitivity of the alarm. It has been found that with a reflector having a diameter of $1\frac{1}{16}$ inches the sensitivity of the system, as compared with the pickup unit without a reflector, shows a gain of over 250. With a $1\frac{3}{4}$ inch reflector the gain is of the order of 500. These gain figures are, of course, dependent on locating a point of the light sensitive surface as near the focal point of the reflector as possible.

Tests made with the pickup unit disclosed herein indicate that a single pickup unit, if properly mounted, as at a high point near the ceiling, is sufficient for even rather large rooms. For example, the pickup unit has been found to be triggered by the light of a match at a distance of over twenty feet.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. An alarm system of the character described, comprising: a case; a light sensitive element mounted in a bulb having a base portion; a parabolic light reflective surface having a focal point and having a centrally located opening therethrough; a sleeve extending rearwardly from said opening and through the case whereby the bulb enclosing said light sensitive element may be inserted through said opening and adjustably supported in said sleeve; a shoulder on said bulb base arranged to engage the inner end of the sleeve to limit the depth of insertion of the bulb therein thereby to position automatically the light sensitive element substantially at the focal point of said reflector; and circuit means responsive to said light sensitive element for providing an alarm signal under predetermined light conditions.

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2. An alarm system of the character described, comprising: a case; a light sensitive element extending to outside the case; circuit means in the case, including a normally energized relay having contacts associated therewith which are open when said relay is energized, responsive to said light sensitive element for interrupting the energization circuit of said relay whenever the light acting on said elements is greater than a predetermined level; alarm signal means connected in series with said relay contacts to provide a desired alarm signal when said contacts close; and a normally open, thermally operated switch in the case connected in parallel with said relay contacts to complete the circuit to said signal means under predetermined conditions of temperature.

3. The alarm system of claim 2 wherein the light sensitive element and thermally operated switch are directed in different directions.

4. An alarm system of the character described, comprising: means responsive to the level of light intensity in a selected space to operate a signal device, said signal device being operated by said means only when the light intensity is greater than a predetermined level; means responsive to the temperature in the selected space to operate said signal device, said signal device being operated by said last named means only when said temperature is greater than a predetermined temperature; and means for associating said above named means as an integral unit.

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