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M. ALAFI ETAL
FIRE WARNING DEVICE
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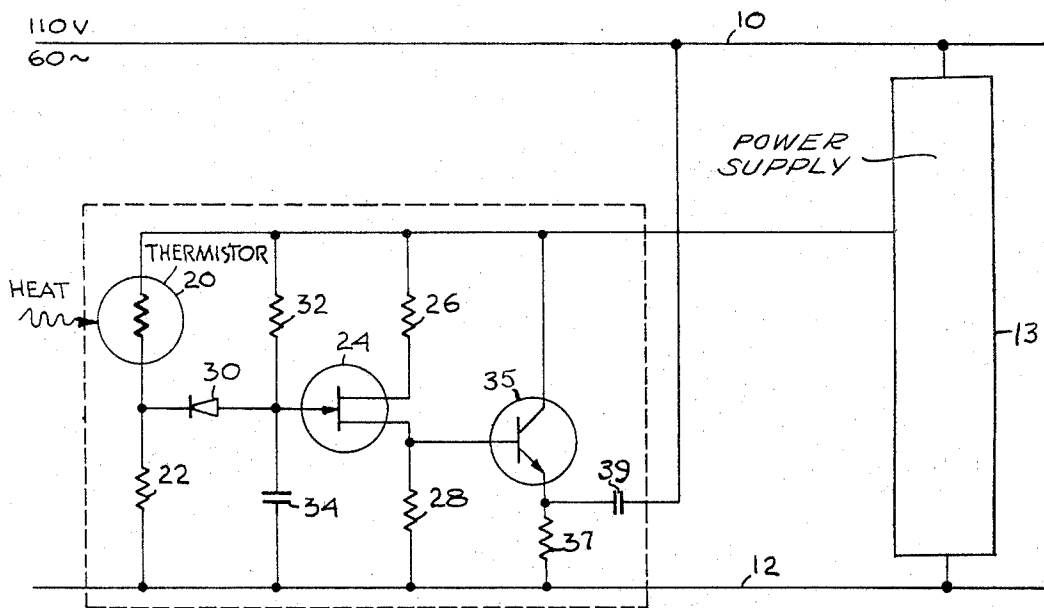


Fig. 1

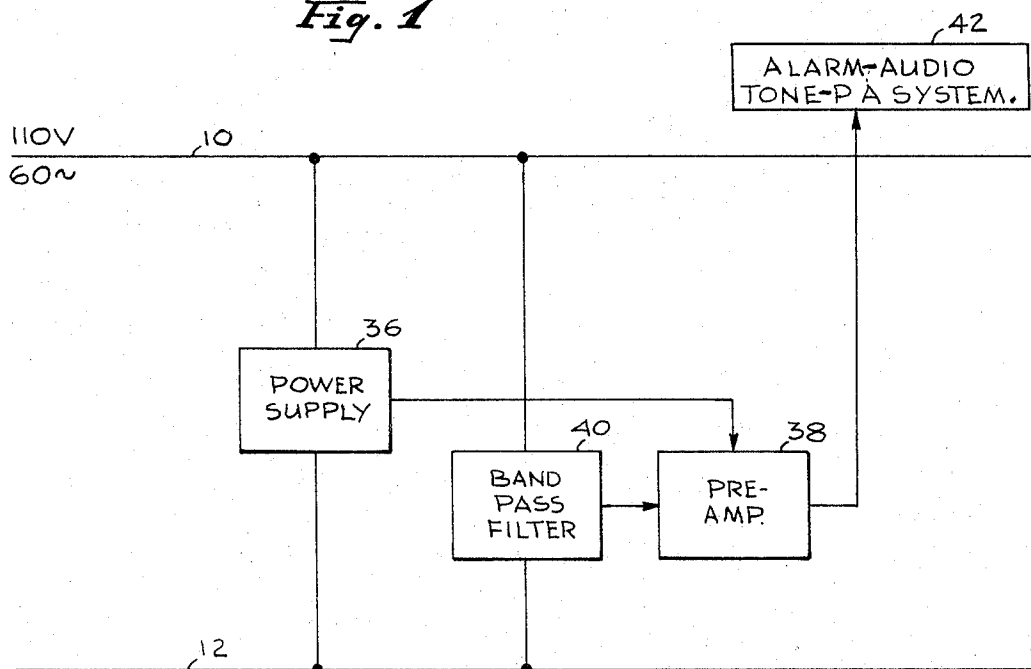


Fig. 2

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FIRE WARNING DEVICE

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1 Claim. (Cl. 340-228)

This invention relates to devices for indicating at a remote location the occurrence of a fire or an elevated temperature sufficient to operate said device, and more particularly to improvements therein.

In fire alarm systems which are presently employed for indicating the occurrence of a fire at a location which is remote from the location of the fire, there is provided, at the location at which the fire is desired to be detected, apparatus for generating an alarm signal. At the location at which it is desired to indicate the presence of a fire there is provided apparatus for responding to the alarm signal. Usually, some auxiliary transmission lines connect the detector and the indicator. Further, an independent power supply is usually required for the detector and also for the indicator.

It is an object of this invention to provide an alarm system which does not require an independent power supply for the detector and for the indicator.

It is another object of the present invention to provide an alarm system which does not require any auxiliary transmission system other than that which is already in existence and required for other purposes.

Still another object of the present invention is the provision of a novel, useful, simple and fail safe fire warning system.

These and other objects of the present invention are achieved by providing, at the location at which it is desired to detect the presence of a fire, apparatus which includes an element which is sensitive to temperature and in response to sensing temperature enables associated structure to generate "non-sixty cycle" signals. These signals are applied to the sixty cycle power lines which carries them to a central location, such as the electric meter. There, a filter is connected to the sixty cycle lines for passing therethrough only the "non-sixty cycle" signal. Any suitable alarm device may then be operated from the output of this filter.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

FIGURE 1 is a circuit diagram of apparatus which, in accordance with this invention, is used to detect the occurrence of a fire or an elevated temperature and in response thereto to generate and apply "non-sixty cycle" signals to the 110 volt sixty cycle power lines; and

FIGURE 2 is a block diagram of the alarm system which is positioned at a suitable central location.

In accordance with this invention the fire detection apparatus receives its energy from the usual power supply lines respectively 10, 12. The detection apparatus is positioned at a location which it is desired to monitor. The apparatus includes power supply circuitry generally indicated at 13, for providing a potential for operating the solid state detecting circuitry. The power supply serves to convert the 110 volts provided by the power lines to the voltage required by the detector, and in addition provides half wave rectified voltage for operating the transistors contained therein.

A heat sensing element such as a thermistor 20 is con-

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nected in series with a resistor 22. Thermistor 20 and resistor 22 are connected between the junction of capacitors 14 and 16 and one side of the power line. As is well known, the thermistor has a resistance value which decreases with increasing temperature. Thus, the voltage at the junction between the thermistor 20 and resistor 22 increases as the resistance of the thermistor decreases. When the temperature being sensed by the thermistor is sufficiently high, the voltage at the junction between the resistor and the thermistor attains a sufficiently high value to trigger a voltage gated oscillator connected to this junction.

The voltage gated oscillator includes a unijunction transistor 24, having one base connected through a resistor 26 to one side of the power supply, and its second base connected through a resistor 28 to the other side of the power supply. The emitter of the unijunction transistor 24 is connected through a diode 30 to the junction between resistor 22 and thermistor 20. A resistor 32 connects the unijunction transistor emitter to one side of the power supply and a capacitor 34 connects the emitter of the unijunction transistor to the other side of the power supply.

The circuitry including the resistor 32, capacitor 34, and unijunction transistor 24 will be recognized as that of a relaxation oscillator. However, no current flow can occur through the two bases of the unijunction transistor 24 until its emitter attains a predetermined potential level. In the quiescent state, current flow occurs through resistor 32, through diode 30, and through resistor 22 which prevents the capacitor 34 from charging up to a potential at which it can render the unijunction transistor conductive. However, when the resistance value of the thermistor 20 gets sufficiently low due to the presence of heat so that the diode 30 is blocked, then capacitor 34 can be charged up through resistor 32. When capacitor 34 charges up to the voltage level at which unijunction transistor 24 is rendered conductive, the capacitor 34 can discharge through the unijunction transistor and through the resistor 28 to thereafter be charged up again.

Accordingly, the oscillator is triggered into operation when the thermistor detects a predetermined elevated temperature. The frequency of oscillation of the oscillator may be selected, by the values selected for the components, to have a frequency such that the oscillator output will be readily transmitted through the power lines and can be easily distinguished from the power line frequency as well as any power line transition frequencies. The selected oscillator frequency may be any of those used in carrier current communication, or may be an audio frequency. The output of the oscillator is applied to the base of an amplifying transistor 35. This transistor has its collector connected to one side of the power supply and its emitter connected through a resistor 37 to the other side of the power supply. The amplified oscillations are then coupled to the power lines through a capacitor 39, which is connected between the emitter of transistor 35 and the power line 10.

At a central location, such as the fuse box, to which all of the power lines 10, 12 connect, there may be placed a single detector or a detector for each one of the power line circuits, if desired for localizing the location of a fire. A power supply 36, such as the one shown in FIGURE 1, is provided. This power supply provides operating potential to a preamplifier 38. A band pass filter 40 is connected across the power lines 10, 12 and serves to prevent the sixty cycle power line frequency or any transients from being applied to a preamplifier 38. The band pass filter passes only the frequency generated by the oscillator at the detector. The amplified signal is then applied by the preamplifier 38 to a suitable alarm device

42. The alarm device can be a siren, flashing light, telephone message or any other basic signalling system.

Some of the advantages of the system which has been herein described are that it is fail safe for normal power system operation. It can provide early warnings since it is associated with electrical circuits which are one of the commonest causes of fires. Signalling can be achieved for a number of electrical circuits within the same structure by using only one sensing filter and alarm at the main power line location. No maintenance is required and installation can be as simple as using a plug-in unit in existing wall sockets at desired locations in the structure desired to be protected. Public structures such as hotels, schools, etc. can use a single alarm arrangement and numerous heat sensing detectors, providing multiple alarm service. The alarm system can then be both internal within the building structure, as well as connected directly to the fire department. The herein-described invention structure draws power and requires energy only when it has been activated for transmitting an alarm signal and thus is more fail safe than alarm systems requiring standby power.

What is claimed is:

1. Apparatus for generating at one location signals indicative of a predetermined temperature being exceeded and for transmitting these along the power lines to a second location for detection thereat comprising means for generating a signal having a predetermined value when

the temperature of said means exceeds said predetermined value including a thermistor, a first resistor connected in series with said thermistor, and means for applying operating potential across said serially connected resistor and thermistor, oscillator means inoperative except in the presence of said predetermined voltage comprising a unijunction transistor having a first and a second base and an emitter, means for applying operating potential across a first and second base of said unijunction transistor, a second resistor, a capacitor connected in series with said second resistor, means for applying operating potential across said resistor and second capacitor, means connecting the junction of said second resistor and capacitor to said unijunction emitter, and diode means connecting said junction between said thermistor and first resistor to the junction between said second resistor and capacitor, and means for applying the output of said oscillator means to said power lines.

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