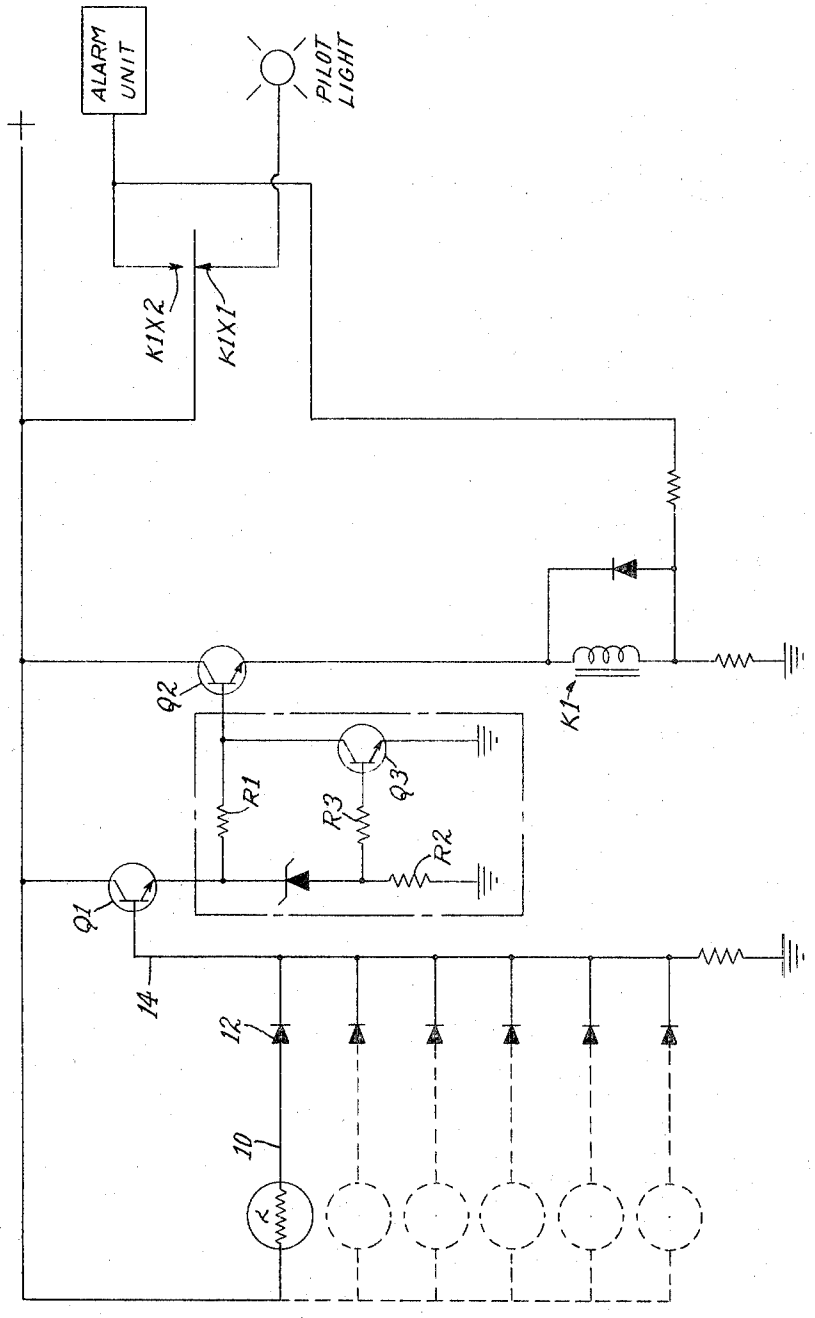
Aug. 23, 1966 A. W. VASEL 3,268,881

DETECTION DEVICE

Filed Aug. 1, 1963



INVENTOR.
Alfred W. Vasel
By his Attorney
Robert E Ross

United States Patent Office 3,268,881 Patented August 23, 1966

1

3,268,881

DETECTION DEVICE

Alfred W. Vasel, Abington, Mass.

Filed Aug. 1, 1963, Ser. No. 299,327
2 Claims. (Cl. 340—213)

This invention relates generally to fire and smoke detection systems, and has particular reference to a detection system having means for preventing false alarms due to short circuits in wiring extending to the detection units.

Aircraft fire detection systems usually comprise a plurality of detector units, which may be optical, thermal, or both, connected to a common detector circuit which is adapted to operate an alarm device. In such an installation the occurrence of a false alarm is particularly undesirable, since it can prevent an aircraft from taking off, or if occurring in flight, can require that the aircraft land as soon as possible.

The object of this invention is to provide a fire and smoke detection system in which means is provided for detecting a predetermined voltage from a detector unit for actuating an alarm, and means is provided responsive to a substantially higher voltage for preventing actuation of the alarm.

Referring to the drawing there is illustrated a schematic diagram of a control circuit for a fire detection system embodying the features of the invention. As described herein, the circuit is adapted for use with a plurality of optical or smoke detection heads **10** each connected through a diode **12** into a common detection line **14** and to the base of an NPN transistor Q1. The detection heads may comprise a light sensitive material such as cadmium sulfide which responds to incident radiation from a fire by a decrease in resistance, thereby causing an increase in voltage at the base of transistor Q1 to actuate the alarm in a manner to appear hereinafter.

The alarm actuating portion of the circuit comprises an alarm actuating relay K1 having normally closed contacts K1X1 connected to a pilot light or beacon, and normally open contacts K1X2 connected to an alarm device such as a horn, bell, or light. The coil of relay R1 is connected to the power source through the emitter-collector circuit of NPN transistor Q2.

To cause the alarm actuating portion of the circuit to respond to an increase in voltage at line **14** due to a detector cell receiving radiation from a fire, the base of transistor Q2 is connected to the power source through the emitter-collector circuit of transistor Q1. Hence an increase in voltage at the base of transistor Q1 permits current flow through the emitter-collector circuit thereof providing an increase in voltage at the base of transistor Q2, to permit current flow in the emitter-collector circuit thereof and through the coil of relay K1 to actuate said relay to open contacts K1X1 and close contacts K1X2 to actuate the alarm device.

It will be noted that in the absence of the portion of the circuit which includes transistor Q3 and Zener diode ZD1, to be described hereinafter, a short circuit occurring in one of the leads to the detector heads **10** or in the common lead **14** can place the full power supply voltage onto the base of transistor Q1, thereby actuating the alarm, even though no fire radiation has been received by any of the detector units.

To prevent such false alarms, the collector-emitter circuit of transistor Q3 is connected between the base of

2

the alarm actuating transistor Q2 and ground, and a Zener diode ZD1 is connected from the emitter of transistor Q1 to ground through resistor R2 and to the base of transistor Q3 through resistor R3. The Zener diode is poled to permit current flow to ground only when the Zener breakdown voltage is exceeded, as will appear hereinafter.

The values of the various components are selected so that with a supply voltage of 28 volts, the alarm relay will be actuated when about 14 volts appears at the base of transistor Q1, and the maximum voltage that can appear at the base of transistor Q1 due to radiation received by the detector cells is about 24 volts. During normal operation of the device, in the absence of a fire within the area under surveillance, substantially no voltage appears at the base of transistor Q1 and no current flows in the relay coil, hence contacts K1X2 are open and contacts K1X1 are closed so that the pilot light is lit to indicate that the control unit is energized.

When a fire is observed by one or more of the detector units, the resulting decrease in resistance of the unit causes an increase in voltage at the base of transistor Q1 which thereby biases said base positive with respect to the emitter, and permits conduction in the collector-emitter path, to cause an increase in voltage at the base of transistor Q2. The base of transistor Q2 being thereby biased positive with respect to the emitter, current flow results in the emitter-collector circuit through the relay coil to close contacts K1X2 and actuate the alarm unit.

In the event that a short circuit occurs in a lead to a detector head it is possible for the full power supply voltage of 28 volts to appear at the base of transistor Q1, whereas a maximum of 24 volts appears when a fire is detected. In such case the resulting voltage at the Zener diode is greater than its breakdown voltage, resulting in current flow through the Zener diode, causing an increase in voltage at the base of transistor Q3 to permit conduction in the emitter-collector path of transistor Q3. The conductive path thereby provided to ground prevents the voltage at the base of transistor Q2 from rising high enough to permit conduction in the circuit of relay K1, hence the alarm is not actuated.

Although in the illustrated embodiment the detector units are optical photo-resistive devices, with suitable modifications some or all of the units could be heat sensing, rather than radiation sensing, devices. In place of the transistors, relays of suitable characteristics may be used.

Since certain other obvious changes may be made in the device without departing from the scope of the invention, it is intended that all matter contained herein be interpreted in an illustrative and not a limiting sense.

I claim:

1. A detection system, comprising a photo-responsive detection device, an alarm actuating relay, first transistor responsive to an increase in base voltage to a predetermined value to energize said relay, a second transistor responsive to an increase in base voltage resulting from a decrease in resistance of the photo-responsive detection device to effect said increase in base voltage of the first transistor, a third transistor responsive to an increase in base voltage to prevent an increase in base voltage of the first transistor to said predetermined value, and a Zener diode responsive to an excessive increase in voltage at the second transistor to increase the base voltage of the third transistor.

2. A detection system, comprising a detection device responsive by a change in resistance to an environment to be detected, an alarm actuating device, first switching means actuatable by an applied voltage of predetermined value to actuate said alarm actuating device, second switching means responsive to a change in applied voltage resulting from a change in resistance of the detection device to apply a voltage of said predetermined value to said first switching means, a third switching means responsive to a predetermined change in voltage applied thereto to prevent the application of an applied voltage of said predetermined value to said first switching means, and

means responsive to an excessive voltage applied to the second switching means to effect said predetermined change in applied voltage to said third switching means.

References Cited by the Examiner

UNITED STATES PATENTS

3,171,110	2/1965	Pearson	340—213
3,188,617	6/1965	Jones et al.	340—213

NEIL C. READ, *Primary Examiner.*

R. M. ANGUS, D. YUSKO, *Assistant Examiners.*