April 29, 1952 D. A. HANSARD 2,594,921

FIRE OR TEMPERATURE RISE DETECTING APPLIANCE

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Fig. 1.

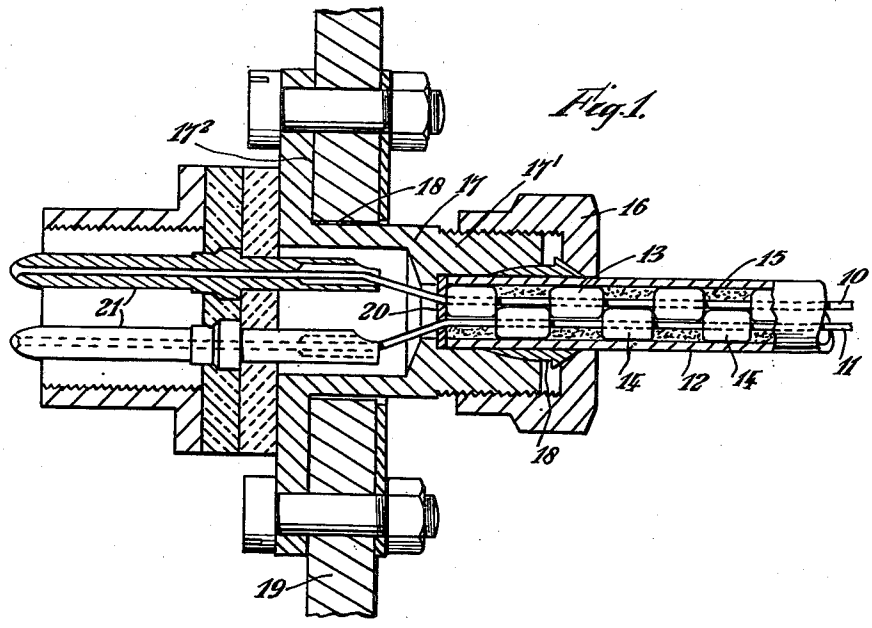
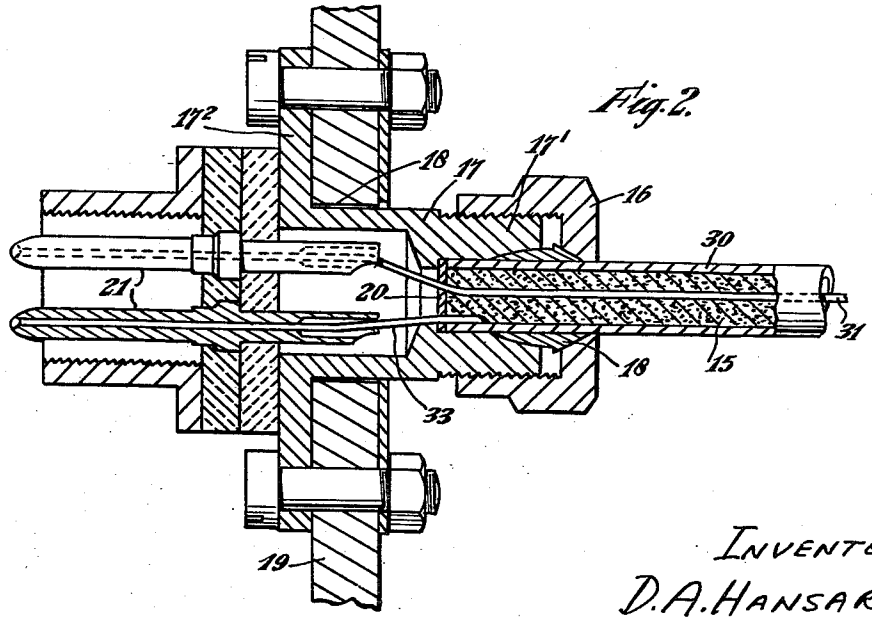


Fig. 2.



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FIRE OR TEMPERATURE RISE DETECTING APPLIANCE

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2 Claims. (Cl. 201—63)

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This invention relates to fire or temperature rise detectors of the kind comprising two conductors separated from each other by a substance (hereafter referred to as the "spacing substance") which is an insulator at temperatures below that known in the art as a "flame temperature" but which becomes conductive at flame or higher temperature.

It has previously been proposed to use certain salts, and in particular the potassium and sodium nitrates in dry or powdered form for separating the conductors.

When attempting to use detectors of the above described character for detecting fires upon aero engines and particularly upon jet or jet turbine power plants for aircraft, it is a general requirement and the appliance must withstand temperatures up to 300° C. without risk of becoming conducting or deterioration of the chemical substances, whereas a fire warning must be given with certainty when temperatures above 400° C. are obtained as this indicates abnormal temperature rise in which case prompt action must be taken. The most serious defect of detectors of the above described character is however, the fact that while they must comply with the above requirements, they must also remain serviceable after exposure to temperatures of over 1000° C. for five minutes or more as may occur when an engine or power plant does in fact catch fire.

It has been found that none of the known substances do in fact meet the above requirements and the object of the present invention is to propose alternative substances and mixtures of substances by which the desired effects can be obtained.

With the foregoing object in view, in a fire or temperature rise detector made in accordance with the present invention, the spacing substance comprises titanium dioxide either alone in the dry anhydrous powder or pulverulent form or admixed with an addition substance which acts as an inhibitor or controlling agent and enables the metal oxide to withstand a high temperature of over 1000° C. without becoming thereby unserviceable.

Instead of using a single metal oxide such as the above a mixture comprising a plurality of different metal oxides may be used.

Suitable metal oxides are barium oxide, and titanium oxide and particularly magnesium oxide.

The foregoing and other features of the invention will be further described with reference to the accompanying drawings, in which:

Figs. 1 and 2 illustrate partly in section and

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partly in elevation two constructions of fire or temperature rise detector made according to the invention fitted to a fireproof bulkhead in an aircraft.

Referring first to Fig. 1, two heat resisting metal conducting wires 10, 11 are respectively mounted in required spaced relationship inside a copper or steel tube 12 by means of two alternating sets 13, 14 of ceramic insulation beads, the space between which and the inner surface of the tube 12 is packed with a substance 15 comprising one or more powdered metal oxides, e. g. titanium dioxide, or a mixture of titanium and barium hydroxide. The tube 12 and conductor wires 10, 11 are as long as is necessary to extend along or around the area to be protected, as is usual with fire detectors of the cable type. The end of the tube 12 shown in the drawing is connected to the fireproof bulkhead 15 in an aircraft by means of a screwed union 16 screwed on to the flanged member 17, the threaded head 17' of which engaged by the union projects through an aperture 18 in the bulkhead and the flange 17^2 of which is bolted to the bulkhead. The threaded head 17' is tubular having a flared end to receive a known type coupling carried on the end of the tube 12 so as to be engaged between the head 17' and the union 16. The extreme end of the tube 12 is closed by a disc 20 of mica or highly resistant ceramic and having two apertures through which are respectively passed the ends of the two wires 10, 11, which are then respectively led through and brazed to the two pins of a plug-in socket 21 mounted on the bulkhead on the side opposite to that on which the tube 12 extends.

In the modified form of the device shown in Fig. 2 the tube 30 itself forms one of the two conductors, the other conductor comprising a wire 31 extending centrally through the tube 30 and maintained in this central position by a packing comprising the above mentioned grade of titanium dioxide or a mixture of powdered or pulverulent titanium dioxide and magnesium oxide. The device is mounted on an aircraft bulkhead similarly to the device of Fig. 1, but in Fig. 2 a wire 33 is connected to the tube 12 and is led with the wire 31 through the mica disc.

In experimental work with devices of the kind above described it has been found that the substance for spacing the two conductors comprising the above mentioned grade of titanium dioxide or a mixture of a metal oxide and an inhibitor or control agent, which substance is referred to hereafter as a "spacing substance" has

a high electric insulation resistance up to 300° C. to 400° C. which resistance appears to fall or at least the substances become electrically conducting at temperatures over 400° C. The device and the substances can be heated to over 1000° C. and when cooled returns to the normal and insulating state at below 400° C., again becoming conducting when the temperature is increased to over 400° C. The substances therefore have the basic requirements for a resetting fire or temperature rise detecting device suitable for use upon aero engines and jet power units.

It has been found that iron or steel tubing and wires tend to oxidise at the high temperatures, the ferrous oxides tending to contaminate the metal oxide space substance, thus causing electric resistance break down.

According to one feature of the invention the metallic tubing and wire are of copper or of copper nickel alloy of known grades which are resistant to temperatures over 1000° C. without scaling or deleterious effects and such materials are used for containing the metal oxide particularly titanium dioxide of the above described grade.

What I claim and desire to secure by Letters Patent is:

1. A temperature rise detector of indefinite continuous length for laying in an area to be protected comprising a pair of electrical conductors separated from each other by a spacing substance which is an insulator at temperatures below flame temperature but which becomes conductive at flame or higher temperature, said spacing substance comprising titanium dioxide admixed with magnesium oxide which acts as an inhibitor

enables said spacing substance to withstand a high temperature of over 1000° C. without thereby becoming unserviceable.

2. A temperature rise detector comprising a tube, a pair of electrical conductors positioned in said tube and separated from each other by a spacing substance which is an insulator at temperatures below flame temperature, but which becomes conductive at flame or higher temperature, said spacing substance comprising a metal oxide admixed with an addition substance which acts as an inhibitor and enables said spacing substance to withstand a high temperature of over 1000° C. without thereby becoming unserviceable, two rows of insulating beads, said conductors passing respectively through alternate ones of said insulating beads, said spacing substance being packed into the spaces between said beads and said conductors.

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