

March 10, 1942.

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2,275,949

FIRE DETECTING SYSTEM

Filed March 4, 1938

2 Sheets-Sheet 1

FIG. 1

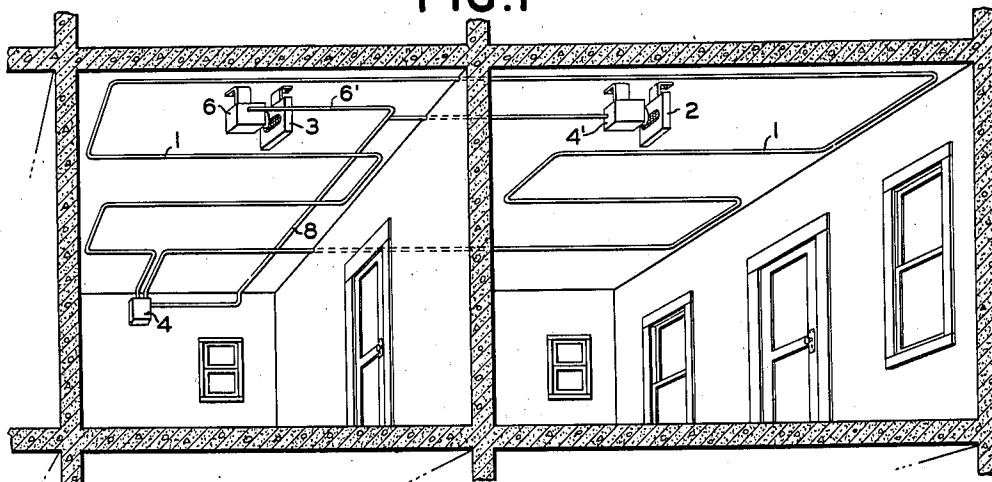


FIG. 2

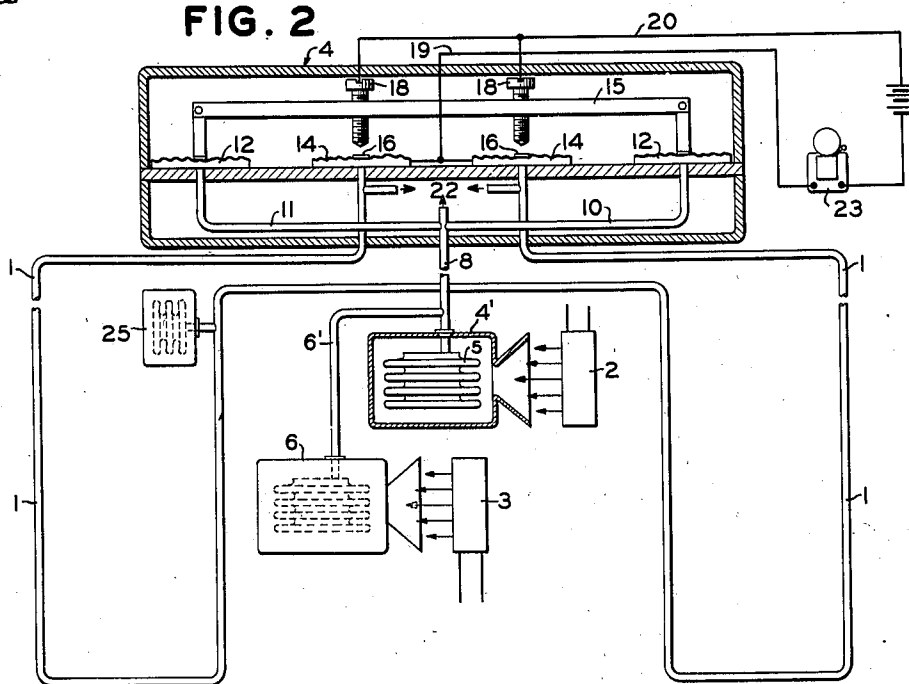
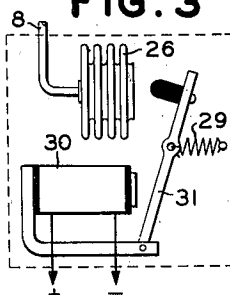


FIG. 3



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2,275,949

FIRE DETECTING SYSTEM

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Application March 4, 1938, Serial No. 193,878

7 Claims. (Cl. 177—355)

This invention relates to alarm or control systems for the supervision or detection of fire conditions in installations where large normal temperature changes are encountered. A sensitive alarm or control system may respond to normal or safe changes in temperature for which an alarm is unnecessary and not desired. For example in the protection of a premises or enclosure which is heated by blower heaters or similar heating means it is found that the rate of rise alarm system will occasionally cause a false alarm when a heater is turned on.

In prior systems it has been proposed that the system should be rendered inoperative during changes of temperature due to blower heater operation and therefore inoperative to an extent that the system will not supervise a fire condition thereby failing completely in its intended purpose. Correction of this fault has been obtained in prior aero-tube systems by venting the system during normal and safe temperature variations so that pressure can not be built up or by using an extremely high critical operating temperature for sending an alarm.

It is an object of this invention to provide a supervisory alarm system which will not respond to normal changes of temperature but will still be operative to detect a fire condition by providing a device which will change the operating characteristic of the alarm system.

It is a further object of this invention to provide an aero-tube system, in connection with an alarm system, wherein the pressure at which an alarm is given can be changed in response to a local heat source so that when it creates a rapid change of temperature an abnormal critical pressure in the aero-tube will be necessary before an alarm will be given.

Another object of this invention is to provide an aero-tube supervisory system wherein changes in pressure in said aero-tube system due to normal temperature changes will change the characteristics of an electric circuit to thereby inhibit an alarm due to such changes but still permitting an alarm to be given in the event of occurrence of a fire.

Still another object of this invention is to provide a rate of temperature rise supervisory system in which one set of contacts is provided for operation in an alarm circuit at abnormal temperatures while another set of more widely spaced contacts are substituted when a blower heater is started.

A further object of this invention is to provide an aero-tube supervisory system wherein false

alarms are prevented by isolating the section of aero-tube subject to rapid rate of rise in temperature and utilizing a differential valve to bypass pressure pulses resulting from fire conditions to thereby cause an alarm.

A further object of this invention is to provide a pressure tube system in connection with an alarm system in which the pressure is allowed to change due to any change of temperature but wherein false alarms are prevented.

Further objects and advantages of this invention will appear from the following description of the several preferred embodiments thereof shown in the accompanying drawings, wherein

Fig. 1 shows the general arrangement of this invention in an enclosure;

Fig. 2 shows a detailed arrangement of the preferred embodiment of this invention;

Fig. 3 shows a modification of the invention disclosed in Fig. 2;

Fig. 4 shows the detail of a different modification of this invention; and

Fig. 5 shows another modification of this invention.

Fig. 1 of the drawings shows an enclosure wherein an aero tube fire detecting system is arranged to detect a fire condition and is also so arranged that a blower heater may so affect the aero-tube system that a false fire alarm condition may exist. Aero tube 1 is shown arranged in the usual manner on the ceilings of two different rooms for fire detection and connected to an alarm or supervisory contact device 4' while the blower heaters 2 and 3 are located in close proximity to portions of the aero tube. The box 4 encloses a pressure controlled device attached to tube 1 and responsive to the pressure built up in the aero tube 1 by changes in temperature in the enclosure and device 4' embodies a part of the invention to be described later on which serves the purpose of preventing false alarms which might arise from change in temperature due to a blower heater being turned on. Therefore, when a fire condition exists an alarm will be instituted in box 4 while heater operation will not cause a false alarm.

Fig. 2 of the drawings shows the preferred embodiment of devices 4 and 4' of Fig. 1 for altering the characteristics of the supervisory system whereby normal changes in temperature in the enclosure will change the operating characteristics of the aero tube circuit to prevent false alarms. As in Fig. 1, the aero tube 1 serves to detect a fire condition and to create an alarm through the rate of rise in pressure in said tube;

the usual compensating vents 22 being provided to equalize the pressures inside and outside of the tube for gradual temperature changes. The blower 2 is arranged to direct hot air on a control device 4', such as is shown in Fig. 1. This device comprises an outer enclosure in which is located an expansion chamber 5. The expansion chamber 5 is connected to aero tube 8 and branches 10 and 11 thereof. These branches are in turn connected to bellows 12 which control a bridge member 15. The bridge member is adapted to support adjustable electrical contacts 18, said contacts being connected to alarm circuit 19 and 20. Contacts 16 are arranged to cooperate with contacts 18, said contacts 16 being controlled by bellows 14 which are in turn controlled by the aero tube 1.

The operation of this system is designed to neutralize the normal and rapid changes in temperatures in an enclosure to prevent a false alarm. In order to accomplish this result the spacing of contacts 16 and 18 is varied in such a manner that during normal or safe changes in temperature a closure of said contacts is prevented. This is accomplished when the control device 4' is actuated by the blower heater to cause expansion of the air and consequently an increase of air pressure to be transmitted through the tubes 8, 10 and 11 to bellows 12, which in turn lift the bridge member 15 to increase the separation between contacts 16 and 18. Thus when a fire condition occurs the aero tube 1 will respond in its usual manner even though the blower 2 has just come on and causes what might normally be an operating increase in temperature. The pressure in the aero tube will increase in response to a fire condition sufficiently to close the contacts 16 and 18, thereby closing the alarm circuit 19 and 20 to operate the bell 23. Of course the situation may arise where another blower heater may also affect the same aero tube system. In this event another control device 6 will be provided and connected to the first control device 5 through the tube 6'. Thus in the event that another blower heater 3 is turned on, the aero tube system will be in condition to prevent false alarms and to still respond to the fire condition.

Fig. 3 shows a modification of the control device 5 shown in Fig. 2 wherein a solenoid 30 and its armature 28 are adapted to generate a pressure in tubes 8, 10 and 11 by compressing a bellows 26. Thus when the blower heater motor is turned on, the circuit to solenoid 30 is completed and it operates in the obvious manner to increase the pressure in tubes 8, 10 and 11 to thereby lift the bridge 15 in the same manner as the device 5. Therefore the false alarm is prevented and the aero tube system is still maintained responsive to a fire condition.

Fig. 4 shows another modifications of this invention wherein closure of the motor circuit again changes the characteristics of the aero tube system to prevent a false alarm. 27 indicates a relay connected through conductors 35 and 37 to the motor circuit of blower 2 said relay being adapted to control the alarm circuit, including the conductors 19 and 20 and the bell 23. Relay 27 also controls the spacing of contacts which are in turn responsive to the aero tube 1. For normal operation of aero tube 1, aero-detector unit 14 is controlled by said aero tube. This aero-detector comprises two control chambers 9 and 13 which in turn operate the bellows 17. The bellows support the contacts 16 which are

in turn adapted to cooperate with contacts 18 to control the alarm circuit 19 and 20. One chamber 9 is connected to one end of the aero-tube while chamber 13 is connected to the other end of the aero-tube, each chamber having vents 22 which release minor changes in pressure within the aero-tube such as those usually caused by slow changes in temperature where no blower heaters are present. Thus in the absence of the blower heater operation a fire condition will cause expansion of the air in the aero tube to in turn operate the bellows 17 and close contacts 16 and 18. Contacts 16 and 18 close a circuit through conductor 19, relay armature 28, bell 23 and battery 24 to give a fire alarm. In the event that the blower motor is turned on by closing switch 32, a new detector unit 14' is thrown into the aero tube circuit by means of relay 27 which is energized by the motor circuit. The new detector having chambers 9' and 13' is connected through tube 7 to the main aero tube 1, this detector unit being similar in construction to unit 14 mentioned heretofore. The only difference in this detector unit is that the spacing between contacts 16' and 18' is much wider than the spacing between contacts 16 and 18, the result of which is that a much higher pressure is required in tube 1 to close the contacts and thereby operate the alarm 23. Thus when a blower heater motor is turned on by switch 32, a potential is impressed on relay 27 which operates armature 28 against spring 29 to thereby substitute contacts 16' and 18' for 16 and 18 which are normally in the alarm circuit. Now when a fire condition occurs the increased pressure in the aero tube 1 will operate the more widely spaced contacts 16' and 18' to operate the alarm 23. However, operation of the blower heater will not cause sufficient pressure to develop in the aero tube system to close the widely spaced contact gap.

Fig. 5 shows a further modification of this invention which embodies a different principle of operation in that the aero tube 1' is allowed to generate a high pressure due to a fire condition to thereby operate differential valves 41 which in turn connect the increased pressure to the aero-detector unit 14 and thereby cause operation of the alarm 23. As shown above in Fig. 4 the motor circuit will cause operation of solenoids 30. However, these solenoids are arranged to operate armatures 31 and valves 40 in the aero tube 1 and thereby isolate the local aero tube section 1' which is affected by the blower heater 2. Valves 40 may be by-passed by differential mercury valves as shown at 41. A different type of fire detecting unit is used in connection with the aero tube 1'. This unit may comprise a bellows 42 and a bimetallic element 43, said bimetallic element being adapted to compress bellows 42 under abnormal heat conditions. In normal operation a fire condition anywhere in the enclosure protected by aero tube 1 and 1' will operate the detector unit 14 to close contacts 16 and 18 and thereby operate the alarm 23. However, when a blower heater switch 32 is closed, the blower heater will start up and the solenoids 30 will operate to close valves 40. As a result aero tube 1 is left in condition for normal operation whereas the section 1' is isolated from tube 1 and will not operate in response to the blower heater 3 and can respond to a fire condition only with the aid of the devices 42. These detector units 42 are operated by the bimetallic elements 43 to increase the pressure in the aero tube 1' to such an extent.

that differential valves 41 will operate. The bi-metallic element is adjusted to operate at a temperature in excess of the maximum temperature of the blower heater so that its operation will not be caused by the blower heater but may be caused by a fire condition superimposed on the blower heater operation. The differential valves 41 are constructed as shown in the drawing and filled with mercury to the levels indicated therein so that abnormal pressure of the aero tube 1' will force the mercury from the well 44 over into the tube 45 to thereby allow transfer of pressure from tube 1' to tube 1, which pressure in turn operates the bellows 17 of the detector 14 and thereby closes the circuit 19-20 to give a fire alarm.

From the above description of the different modifications of this invention it is apparent that false alarms are prevented while maintaining the system operative to respond to fire conditions so that the premises is always protected. Prior art systems are known to prevent false alarms but it is believed that none of them presents the advantages of this system wherein the system is always maintained in operative condition to respond to an actual fire condition.

I claim:

1. In combination, an enclosure, a heating source therein, an aero-tube fire detecting system arranged to operate after a predetermined increase in pressure therein, pressure operated contact means adapted to be operated by said aero-tube system, pressure operated bridge means for spacing said contacts, an aero-tube system connected to control said bridge and a chamber positioned to be affected by said heating source and connected to said control aero-tube system for changing the gas pressure in said control aero-tube system in response to said heating source to thereby change the spacing of said contacts when said source gives off heat.

2. In combination, an enclosure, a heating source therein, an aero-tube fire detecting system arranged to operate after a predetermined increase in pressure therein, pressure operated contact means adapted to be operated by said aero-tube system, pressure operated bridge means for spacing said contacts, an aero-tube system connected to control said bridge, a bellows connected to said control aero-tube system and electromagnetic means actuated when said heating source operates for actuating said bellows, and increasing the pressure in said control aero-tube system to operate said bridge and change the spacing of said contacts to delay their closure.

3. In combination, an enclosure, a heating source therein, an aero-tube system arranged to supervise temperature changes in said enclosure and to operate upon a predetermined increase of pressure in said aero-tube, an alarm circuit, contacts therein, means connected to said aero-tube system for closing said contacts, a second set of contacts having greater spacing than said first

mentioned contacts, contact closing means connected to said aero-tube system in parallel with said first contact closing means for controlling said second set of contacts upon a rise in temperature due to operation of said heating source and switch means operated when said heat source operates for connecting said second set of contacts to said alarm circuit and disabling the first set of contacts.

4. In combination, an enclosure, a heating source therein, an aero-tube system to supervise temperature changes in said enclosure and to operate on a predetermined rate of rise of temperature, an alarm circuit, contacts therein, pressure controlled means in said system for closing said contacts, a second set of contacts having greater spacing than said first mentioned contacts, pressure controlled means in said system for closing said second contacts and switch means operated when said heat source operates for connecting said second set of contacts to said alarm circuit and for disabling the first contacts.

5. In combination, an enclosure, a heating source therein, an aero-tube system arranged to supervise temperature changes in said enclosure and to operate upon a predetermined rate of rise of temperature, an alarm circuit, means for operating said alarm circuit at a predetermined pressure in said system, means connected to said aero-tube system for controlling said first mentioned means, a second means for operating said alarm circuit at a different pressure in said system and means in said system for controlling said second means, and switch means operated when said heat source operates for connecting said second operating means to said alarm circuit and for disabling the first means for operating said alarm circuit.

6. In combination, an enclosure, heating means in said enclosure, a fire detecting system comprising an aero-tube circuit and pressure operated means therein for detecting a predetermined rate of rise of temperature in the enclosure, an alarm circuit, means including said pressure operated means for initiating operation of the alarm circuit at two different pressures in said aero-tube circuit, and means operatively associated with the heating means for preventing operation of the alarm circuit at the lower of said two pressures when the heating means is operated.

7. In combination, an enclosure, means for heating the atmosphere in the enclosure, an aero-tube fire detecting system in the enclosure, pressure operated contact making means connected to the aero-tube system for making contact at two different pressures in the aero-tube system, an alarm circuit including the contact making means, and means for preventing closure of the alarm circuit at the lower of said different pressures when the heating means is operated.

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