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AUTOMATIC FIRE ALARM

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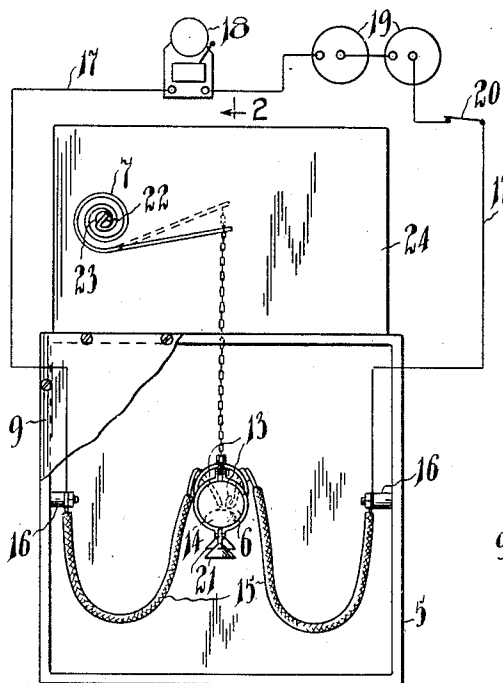


Fig. 1.

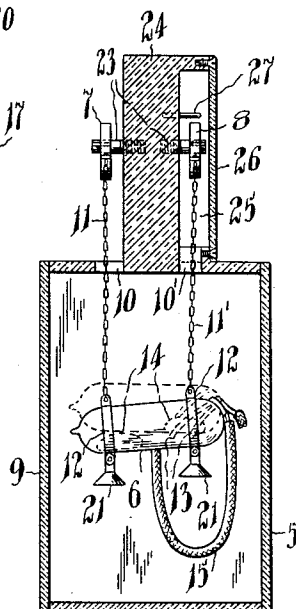


Fig. 2.

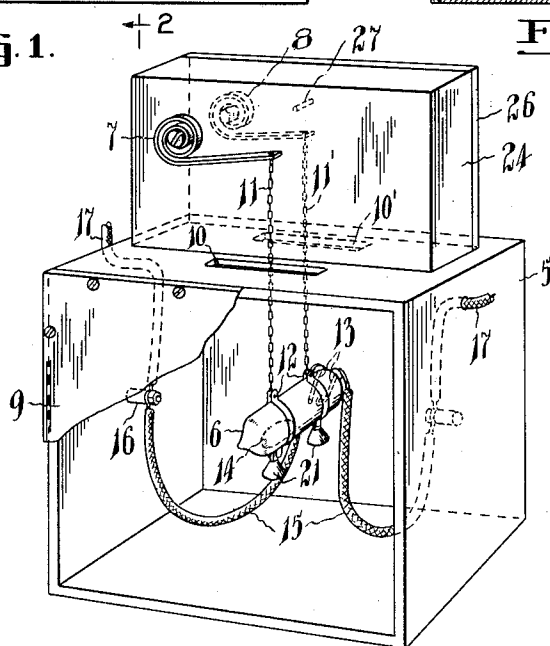


Fig. 3.



Fig. 4.

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AUTOMATIC FIRE ALARM

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6 Claims. (Cl. 200—138)

My invention generally relates to alarm systems of the electric type and particularly concerns the provision of an efficient and sensitive fire alarm suitable for detecting fire in its incipient stage and is so designed as to raise an alarm in a space of time that is automatically shortened in accordance with the rate of temperature increase.

My invention is especially adapted for installation in dwellings for the awakening of sleeping occupants in the event of a fire breaking out for by virtue of construction it is not only safe and reliable but is also possessed of the feature of compensation that enables it to function without producing a false alarm.

The thermostatic device herein set forth operates on the rate of rise principle and therefore no delay ensues such as would allow a fire to gain serious headway before an alarm is sounded. So soon as an abrupt increase in temperature takes place the device functions irrespective of room temperature at the instant of the outbreak of a fire. Seasonal changes in temperature have no effect on the alarm.

The invention is in keeping with a device involving heat responsive agents having a differential of expansion caused by a quick change in temperature and operably associated with electric contacts of an annunciator circuit. In devices of this nature it has hitherto been proposed to employ exposed contacts, but experience has shown that the same are not satisfactory for various reasons. They gather dust and foreign matter over a period of time such as may elapse before the device is called into operation and therefore cannot be relied upon for the proper and effective closing of the circuit at the critical time. Furthermore, they are objectionable in that they present a hazard due to their being likely to ignite by arcing any accumulation of gases that might be present and which might give rise to an explosion more disastrous than the fire itself.

It is an important feature of the present invention to produce a practical and serviceable fire alarm in which the use of exposed contacts is obviated. This is accomplished by a structure in which heat responsive agents are caused to actuate a sealed mercury tube of standard type upon a sudden rise in temperature but not otherwise. That is to say, the structure is such that the heat responsive agents will not function to open or close the contacts of the mercury tube during a slow temperature variation, but will act to close the contacts in response to a sudden change in temperature.

In the preferred embodiment of the invention herein disclosed, the heat responsive agents are in the nature of spiral bars of bimetallic material having equal rates of travel during slow variations in temperature and jointly suspending a conventional mercury tube in such manner as to be unaffected by said equal rates of travel. One of the bars is so shielded or housed that a sudden change in temperature causes it to lag and thus produces unequal rates of travel between the bars whereby the tube tilts and the contacts are closed for sounding the alarm. The heat may have to travel a devious route to act on the shielded or housed bar.

This manner of operating the tube is simple and effective, other means however could be resorted to such as any construction and arrangement of heat responsive agents of a solid material in which a differential of expansion is brought about by an abrupt change in temperature to produce a tilting or similar movement of the tube whereby the contacts are bridged to energize the circuit. On the other hand it is conceivable that non-solids could be taken advantage of. For instance, differential fluid columns functioning to actuate float devices are possible but have drawbacks from a practical standpoint. Tubes of expansile fluid would constitute the said columns and a coating of heat insulating material on one of the tubes would function to effect a volumetric increase, or the material of one of the tubes could be made thicker than the other to bring about a similar result.

The accompanying drawing is illustrative of the preferred mode of carrying out the invention. Figure 1 is a side elevation of the device in which a wall of the casing is broken away to depict the interior arrangement. In this view the alarm circuit is diagrammatically represented.

Figure 2 is a vertical section taken on line 2—2 of Figure 1.

Figure 3 is a general perspective view of the device in which a wall of the casing is broken away.

Figure 4 is a detail of a stud on which a bimetallic bar is mounted.

Like numerals of reference denote similar parts in each figure of the drawing.

As shown herein, a suitable dust-proof casing 5 is provided to house and protect a mercury tube 6 suspended by heat responsive agents 7 and 8 located exteriorly of the casing. The casing is in the nature of a box preferably made of such material as "Bakelite" and may have one of its walls detachable in order to gain access to the

interior. In the present instance the front wall 9 is shown detachable and is secured by suitable fastening elements.

In use the casing will be mounted upon a wall of a room or otherwise supported in a building according to circumstances. In the top of the casing two parallel slots 10, 10' are furnished through which suspension elements 11 and 11' extend from the heat responsive agents and connect with the mercury tube. The suspension elements are chains attached to bands 12 embracing the tube and spaced near the ends of the same.

The mercury tube is of the standard type, being a sealed glass member containing at one end a pair of spaced contacts 13 which are bridged by the displacement of a globule of mercury 14 to close the electric circuit. The flexible conductors 15 that extend from the tube are allowed to hang freely with their ends connected to the binding posts 16 on the opposite side-walls of the casing.

As depicted in Figure 1, the electric circuit of the fire alarm comprises conductors 17 attached to the binding posts 16 and to an annunciator 18, the circuit being energized by batteries 19 or otherwise, and preferably supplied with an ordinary switch 20.

The mercury tube is desirably weighted in any suitable manner as represented at 21 in order to stabilize it and to preclude the leads 15 exerting any undesirable influence such as tending to unbalance it.

The heat responsive elements aforesaid are bi-metallic members of similar bi-metallic dimensions and structure. Each is in the form of a spiral terminating in an arm connected to a suspension chain of the mercury tube. The inner coil of the spiral is lodged in a slot 22 of a supporting stud 23 carried by the wall 24 upstanding from the casing. The arms extend in substantial horizontal direction and the bi-metallic members are disposed in parallel planes for upward travel when subjected to heat. The studs are threadedly connected with the wall 24 or otherwise mounted whereby they may be turned to adjust the bi-metallic members.

The bi-metallic member 8 is enclosed while the other is exposed. The enclosure of the one member is effected by a chamber 25 formed at the corresponding side of the wall 24 and communicating with the interior of the casing by means of the slot 10'. The enclosure provides a heat-retarding shield and may have a detachable side plate 26. Disposed over the arm of the bi-metallic member 8 is a stop pin 27 for limiting upward travel of the arm. This stop could be adjustable if so desired.

Operation

It will be manifest from the preceding description that the mercury tube is solely suspended by the two chains that hang from the arms of the heat responsive agents 7 and 8. The tube is normally in a slight sloping position with the contacts at the high end so that the mercury is at the low end. Consequently the contacts are open and the alarm circuit remains inoperative. During slow or gradual variations in temperature, the exposed and the enclosed bi-metallic elements have only slight fluctuation in their travel but this is insufficient to cause the tube to operate to close the contacts. The bimetallic elements therefore may be said to have substantially uniform rates of travel and therefore the tube is not subjected to an appreciable tilting action. The uniform travel ensues because in a slow rise

in temperature the heat passes into the casing through the slot 10, thence into the chamber 25 through the slot 10' and acts on the bi-metallic member 3 with the same force and effect as on the member 7. In other words there is no operative lagging action due to a time interval. However, when an abrupt or speedy increase in temperature takes place, as in the case of a fire, due to the fact that the heat must travel through a devious passage to affect the member 8, the exposed member 7 is acted on more quickly with the result that its arm in having a greater rate of travel thus tilts the tube, displaces the mercury and closes the contacts. The circuit is thus energized and the alarm raised. A distinctive feature of this construction is that the tension on the member 7 is reduced by displacement of the mercury. Therefore the tube is tilted quickly and to greater extent which prolongs the ringing of the alarm.

While one way of carrying out the invention has been shown and described, it will be understood that the invention broadly contemplates any means of employing a slow-acting heat-responsive agent and a quick-acting heat-responsive agent to produce a differential of movement under a speedy temperature change such as to actuate a sealed mercury tube for closing an alarm circuit.

What I claim is:

1. A thermostat quick change temperature detector for operating alarms, comprising a casing having a vertical chamber of which the walls thereof are composed of heat insulating material, said chamber being closed to the ambient atmosphere with the exception of a restricted passage at the base portion communicating with the ambient atmosphere for admittance of heat to the interior in upward direction by convection current, said passage being so proportioned that an abrupt change in temperature is communicated in retarded manner to the interior of the chamber to bring about a differential of temperatures between that of the chamber and that of the exterior atmosphere, a pair of heat responsive agents operably supported on the casing aforesaid, one of which is freely exposed to the ambient atmosphere outside of said chamber and the other of which is disposed in said chamber free of the walls thereof, and a mercury contactor tube disposed below said chamber and tiltably suspended by the heat responsive agents and operable thereby with quick temperature change.

2. A thermostat quick change temperature detector for operating alarms, comprising a casing divided into a lower compartment and an upper vertical chamber, said chamber having its walls composed of heat insulating material and being closed to the ambient atmosphere with the exception of a restricted passage at the base portion communicating with said compartment which is supplied with an induction opening forming with the passage a devious communication proportioned for admitting heat to the interior of the chamber by convection current such that an abrupt change in temperature is communicated in retarded manner to the interior of the chamber to bring about a differential of temperatures between that of the chamber and that of exterior atmosphere, a pair of heat responsive agents operably supported on the casing, one of which is disposed within the chamber clear of the walls thereof and the other of which is located outside of the chamber so as to be freely exposed to the

ambient atmosphere, a mercury contactor tube disposed in said compartment, and pendent suspension means whereby the contactor tube is jointly carried by the heat responsive agents in tiltable manner so as to be operable only with quick temperature change.

3. A device as set forth in claim 2, and in which the heat responsive agents consist of concentric thermostatic spirals having fixed inner ends and movable outer ends, and in which the spirals have their outer ends connected to elongated pendant members that jointly suspend the mercury contactor tube, one of the pendant members freely extending through the restricted passage of the said chamber.

4. A thermostat quick change temperature detector for operating alarms, comprising a casing having a chamber of which the walls thereof are entirely composed of heat insulating material, said chamber being closed to the ambient atmosphere with the exception of a restricted passage at the base communicating with the ambient atmosphere for admitting heat to the interior by convection current, said passage being so proportioned that an abrupt change in temperature is communicated in retarded manner to the interior of the chamber to bring about a differential of temperatures between that of the chamber and that of the exterior atmosphere, a pair of thermostatic spirals of similar bimetallic dimensions having fixed inner ends and movable outer ends, one of the spirals being disposed within the chamber clear of its walls and the other spiral being located outside of the chamber and exposed fully to the ambient atmosphere, an elongated member suspended swivelly from the outer end of each spiral, one of said members extending through an aperture in the aforesaid chamber, a mercury contactor tube disposed below the chamber, and bands encircling said contactor tube near the end thereof and swivelly attached to the lower ends of said elongated members, whereby the contactor tube is tiltably carried in a manner such that a differential of temperature reaction on the

spirals operates to tilt the tube to close the contacts thereof.

5. A thermostat quick change temperature detector for operating alarms, comprising a casing having a chamber of which the confining walls thereof are composed of heat insulating material, said chamber being closed to the ambient atmosphere with the exception of a restricted passage for the flow of heat, said passage being devised so that an abrupt change in temperature is communicated in retarded manner to the interior of the chamber to bring about a differential of temperatures between that of the chamber and that of the ambient atmosphere, a pair of heat responsive agents operably supported for co-operation, one of which is freely exposed to the ambient atmosphere outside of said chamber and the other of which is disposed within said chamber free of said confining walls thereof, and a mercury contactor tube tiltably sustained and arranged for operation by the joint action of the heat responsive agents with abrupt temperature change.

6. A thermostat quick change temperature detector for operating alarms, comprising a casing having a chamber of which the confining walls thereof are composed of heat insulating material, said chamber being closed to the ambient atmosphere with the exception of a restricted passage for the flow of heat, said passage being devised so that an abrupt change in temperature is communicated in retarded manner to the interior of the chamber to bring about a differential of temperatures between that of the chamber and that of the ambient atmosphere, a pair of heat responsive agents operably supported for co-operation, one of which is freely exposed to the ambient atmosphere outside of said chamber and the other of which is disposed within said chamber free of said confining walls thereof, and a switch connected to the heat responsive agents and operable thereby with quick temperature change.

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