April 14, 1931. C. O. MARKLUND 1,800,801

FIRE ALARM

Filed Sept. 21, 1928

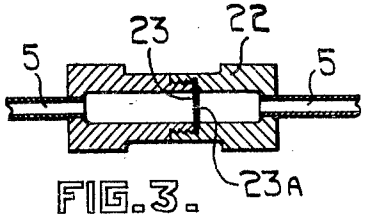

FIG. 3.

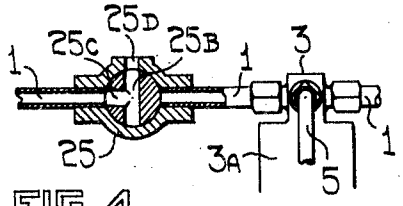

FIG. 4.

FIG. 1.

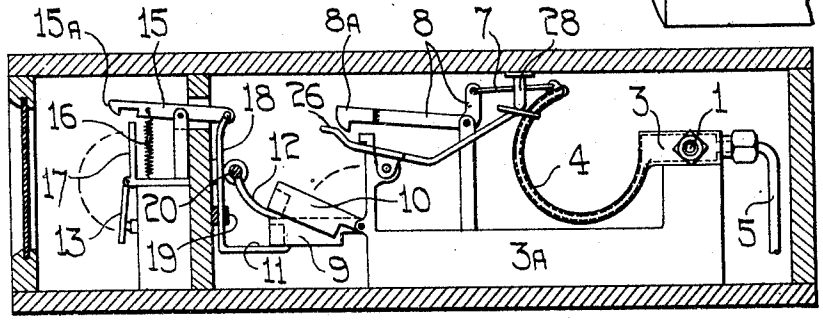

FIG. 2.

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UNITED STATES PATENT OFFICE

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FIRE ALARM

Application filed September 21, 1928, Serial No. 307,431, and in New Zealand November 25, 1927.

This invention relates to apparatus adapted to give automatic warning of fire or incipient fire upon the temperature in a room or building exceeding a predetermined maximum; and has for its object the provision of means adapted to be actuated by excessive temperature in a room or building and in turn to actuate visual and audible warning or alarm apparatus and set in motion suitable automatic telegraph transmitting apparatus adapted to communicate warning of fire to a fire station or the like.

According to this invention a pipe circuit consisting of suitable hollow metal tube is provided through a room or building, said tubing containing air under a predetermined pressure and having fitted therein at suitable intervals or positions thermostatic devices of the type wherein a plug of low fusing point metal normally closes an air outlet aperture communicating with the interior of said tubing.

This tubing circuit communicates with a detector of special design comprising a ribbon like length of hollow metal tube closed at one end and normally curved but adapted on pressure greater than atmospheric pressure being applied to its interior to straighten out to a degree corresponding to the degree of pressure applied to its interior.

The free end of this detector is connected by means of suitable levers and the like to a catch adapted to normally retain a pair of hammers in their raised position so long as said detector remains under the influence of pressure in the tubing circuit.

On the pressure in the tubing circuit becoming reduced or escaping through fusing of one or more of the thermostats the detector contracts or curves back to its normal curvation thereby actuating the catch to release the pair of gravity hammers, which latter, in falling, strike and operate visual and audible alarm apparatus and set in motion suitable automatic transmitting apparatus communicating with the fire station or the like.

The invention, will however, be more particularly described with reference to the accompanying drawing, wherein:—

Figure 1 is a perspective view illustrating a single tubing circuit and thermostat connected to a detector unit, annunciator and transmitter.

Figure 2 is a sectional elevation of the casing containing the detector unit and annunciator.

Figure 3 is a sectional view of a regulator for controlling the supply of air under pressure to the tubing circuit from the pressure supply tank, and

Figure 4 is a sectional view of a cock associated with the tubing circuit and used in testing the latter and the detector.

There is erected throughout the room or rooms or building to be protected, a circuit consisting of a continuous length of hollow metal tubing 1 containing one or more thermostats 2 arranged at suitable intervals or positions within said room or rooms.

The ends of this tubing circuit 1 are connected to a hollow chamber 3 mounted on the base 3A of a detector 4, the latter comprising a ribbon like length of hollow tubing suitably curved or bent, one end of said tube being closed and free while its other end is secured to the chamber 3 so as to provide communication between the interior of the detector 4 and the interior of the said chamber 3.

The chamber 3 is also connected by means of a tube 5 to a pressure storage tank 6 by means of which the entire tubing circuit 1 and detector 4 are placed and maintained under pressure to a desired degree.

The effect of this pressure on the interior of the detector 4 is to cause the latter to be slightly unbent or to tend to straighten with the result that its free and closed end is moved slightly away from its end which is connected to the chamber 3.

The free end of the detector 4 is connected by means of a link 7 with the short or vertical arm of a bell crank lever 8 suitably pivoted to a pillar rising from the base 3A of the detector unit, and the outer or free end of the long or horizontal arm of said bell crank lever 8 is fashioned to form a catch 8A adapted to engage and hold in their raised positions, a pair of pivoted hammers 9 and

10, so long as the detector 4 remains under the action of the pressure as aforesaid and in its slightly expanded position.

The hammers 9 and 10 are hinged at their lowermost edges to the front end of the base 3A of the detector unit and are so arranged that, on the catch 8A being raised to disengage their upper edges, they fall by gravity about their said pivots, and in falling, contact with or strike projections or levers 11 and 12 adapted to actuate respectively a suitable annunciator 13 and alarm bell controlled thereby, and the starting release lever 14A of an automatic electric transmitter 14 of approved design.

The annunciator 13 comprises a hinged flap normally held in a raised position by means of a catch 15A formed on the forward end of a pivoted lever 15 the latter being acted upon by means of a spring 16 so that its end forming the catch 15A is normally drawn downwards to its operative position where said catch engages the upper edge of the flap 13, to hold same in front of a fixed plate 17 on which some suitable visual warning word or indication of the circuit by which said annunciator is controlled is printed, and which said flap 13 is adapted to cover so long as it is retained in such position.

The rear end of the lever 15 is connected to a rod 18 slidable vertically through a guide or guides 19 and having its lower end formed to provide the aforesaid projection 11 adapted to be acted upon by the hammer 9.

The lever 12 adapted to be acted upon by the hammer 10 is secured to a horizontal shaft 20 mounted in bearings 20A so as to be capable of partial turning movement or rotation on said lever 12 being struck by the hammer 10. Also secured to the shaft 20 is a further lever or projection 21 the outer end of which is suitably connected to or engaged with the ratchet release lever 14A of the electric transmitter, so that on said shaft 20 being partially rotated in its bearings as aforesaid, the lever 21 depresses said release lever 14A to permit mechanism of the transmitter 14 to operate and cause electric impulses to be telegraphically transmitted to the fire station or the like in the well known manner.

The thermostat 2 used in connection with this apparatus preferably comprises a U-shaped bend of pipe having an aperture of desired size formed through said bend and sealed with some suitable low fusing point metal as shown at 2A in Figure 1.

On the temperature of a room rising to a degree higher than the melting point of the metal seal 2A, either due to the presence of an outbreak of fire in said room or from any other cause, the seal 2A fuses to expose the aperture in the thermostat and permit the air under pressure in the circuit to escape therethrough. This results in an immediate reduction in or complete loss of pressure in the circuit 1, chamber 3 and detector 4, with the result that the latter contracts to its normal fully curved position, and by means of the connecting link 7 operates the bell crank lever 8 to raise the catch 8A and allow the hammers 9 and 10 to fall about their pivots.

The hammer 9 in falling strikes the projection 11 thereby moving the rod 18 downwards and actuating the pivoted lever 15 so as to clear its end 15A from the annunciator drop flap 13, the latter then falling to expose the indication on the plate 17. If desired suitable means can be provided in conjunction with the annunicator or drop flap 13 so that an alarm bell or mechanical gong is operated or is caused to commence operation immediately said flap 13 is dropped.

Simultaneously with the hammer 9, the hammer 10 falls and strikes the lever 12 on the shaft 20, thereby imparting to the latter partial turning movement in its bearings 20A resulting in downward movement of the lever 21 which depresses the transmitter ratchet release lever 14A and allows the mechanism of the transmitter 14 to commence operation and transmit the selected code telegraph signals to the fire station.

In order to prevent the pressure of air in the circuit 1 being maintained after fusing of a thermostat 2 by air under pressure being passed from the storage tank 6 through the pipe 5, a reduction fitting 22 is fitted in the latter, so that the rate or supply of air from said tank 6 will not be rapid enough to replace the air escaping from the circuit 1 through the aperture in the burnt out thermostat 2, thereby ensuring that the pressure in the circuit 1 will drop immediately the said thermostat is fused and an immediate alarm be given.

This reducing fitting 22 preferably comprises a hollow chamber formed in halves adapted to be screwed together to form an air-tight joint and having secured between said halves and completely across the interior of said chamber a silver disc 23 through the centre of which is provided an aperture 23A of considerably smaller diameter than the internal diameter of the piping 1 or of the aperture in the thermostat 2 through which the air in the circuit escapes. This hole or aperture 23A is sufficiently large to permit air under pressure to be passed through it at a sufficient rate to maintain the pressure in the circuit 1 under all normal conditions, but it is not large enough to maintain the full pressure in the said circuit upon a thermostat or thermostats 2 becoming fused.

A suitable stop cock 24 is preferably provided on the pressure tank 6 to permit the pipe 5 and circuit 1 to be disconnected from the latter when desired, for repairs or the like.

Where more than one circuit 1 is provided within a room or building, each separate circuit is connected to a separate detector 4 provided with its own annunciator 13, but only one transmitter 14 is provided, the shaft 20 being provided with a lever 12 opposite the hammer 10 of each detector unit. By this means the dropping of the hammers 9 and 10 of any one detector unit will operate the annunciator 13 provided in conjunction with that unit, while the hammer 10 of the latter will strike the lever 12 provided opposite it and so turn the shaft 20 and operate the ratchet release lever through the lever 21 on said shaft 20.

Where more than one circuit 1 and detector unit 4 is provided in a single installation each separate circuit and unit is connected to a common pressure tank 6 by means of its own pipe 5, reducing fitting 22 and cock 24.

At one side of the chamber 3 of each unit, and in the circuit 1, is provided a three-way cock 25. This is manually operated by means of a lever 25A and is for use in periodic testing of the apparatus. In normal use, that is when the apparatus is in operative condition, uninterrupted communication is provided through the cock 25 by means of a passage 25B straight through its plug communicating with the ends of the tubing 1 connected to said cock.

When it is desired to test the circuit 1 and the detector 4 this cock plug is rotated to the position shown in Figure 4 of the drawing when through communication between the ends of the tubing 1 is interrupted and the tubing end furthermost from the chamber 3 is placed in communication with the atmosphere through a short passage 25C in said plug leading into the passage 25B and a port 25D in the cock casing.

This permits the evacuation of the pressure throughout the entire circuit 1 back to the chamber 3 and detector 4 causing the latter to operate and raise the catch 8A, and release the hammers 9 and 10. As however, it is not desired to drop the hammer 10 which sets in operation the transmitter 14, a catch 26 is provided on the detector base 3A, and this catch 26 is first lowered so that its hooked or forward end engages the hammer 10 to prevent the latter dropping. The catch 26 is shown in this position in Figure 1 of the drawing.

The hammer 9 is however permitted to drop and release the annunciator shutter 13, which indicates that the circuit being tested is in order.

If desired a further catch 27 can be provided or the detector base 3A to engage the hammer 9 and hold same against falling when it is desired to repair test or overhaul the device without dropping the annunciator 13.

As it is essential that the catches 26 and 27 be raised clear of their respective hammers 9 and 10 on the apparatus being set ready for operation projections 28 can be provided on the underside of the lid of the casing within which the detector unit is housed, said projections being adapted to contact with and depress the rear ends, of the said catches on said lid being closed, thereby raising the forward or hooked ends clear of the hammers 9 and 10 as shown in Figure 2 of the drawing.

It will be apparent that while the device has been hereinbefore described as operated by means of air under pressure in the circuit 1 and detector 4, very slight modification of the connection between the free end of the said detector 4 and the catch 8A would render the apparatus capable of operation by means of vacuum. In this event the circuit 1, chamber 3 and detector 4 would be normally acted upon by means of a vacuum from the tank 6 and fusing of the thermostat plug 2A would admit atmosphere to the said circuit, chamber and detector resulting in movement of the free end of the latter to operate the catch 8A and drop the hammers 9 and 10.

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

1. In a fire alarm, a pressure operated device for controlling the alarm including a detector of hollow curved form closed at one end and open at the opposite end to pressure, the detector form varying in accordance with the pressure, hammers mounted adjacent the detector, said hammers respectively controlling independent signals and means for normally holding the hammers against operative movement, said means being controlled by the form of the detector.

2. A fire alarm including a pressure operated device in the form of a normally curved hollow tubing open at one end to the pressure and closed at the opposite end, signal operating hammers pivotally supported adjacent the closed end of the detector, a lever normally engaging the hammers and holding the same in inoperative positions, and a connection between the lever and detector whereby the change in the form of the detector incident to the absence of predetermined pressure therein will operate the lever to release the hammers.

3. A fire alarm including a pressure operated device in the form of a normally curved hollow tubing open at one end to the pressure and closed at the opposite end, signal operating hammers pivotally supported adjacent the closed end of the detector, a lever normally engaging the hammers and holding the same in inoperative positions, a connection between the lever and detector whereby the change in the form of the detector incident to the absence of predetermined pressure therein will operate the lever

to release the hammers, and means whereby one of the signal operating hammers may be held against movement when released to permit the other hammer to provide a test operation of the apparatus.

4. In a fire alarm, an operating device subject to change of form under varying pressures, independent alarm signals, independent elements for controlling the respective signals, said element being normally influenced toward signal operating position, and means controlled by the operating device for normally holding the elements against operative movement, the change of form of the operating device incident to a predetermined variation of pressure therein operating said means to release said elements for operative movement.

5. In a fire alarm, an operating device open to pressure and operated under predetermined variations in pressure, independent signals, elements normally influenced toward operative position and serving in movement to operative position to control said signals, and means responsive to one pressure condition of the operating device to hold the elements against normal operation, said means being actuated to release the elements in the movement of the operating device under a varying pressure.

6. A fire alarm including a hollow operating device open to pressure and having a free end movable under variation in such pressure, independent signals, elements normally influenced for movement to a position to influence said independent signals, and means connected with and controlled by the free end of said operating device for normally holding the elements against operative movement under a predetermined pressure in the operating device and releasing said elements for operative movement under a different pressure in said device.

7. A fire alarm including a hollow operating device open to pressure and having a free end movable under variation in such pressure, independent signals, elements normally influenced for movement to a position to influence said independent signals, means connected with and controlled by the free end of said operating device for normally holding the elements against operative movement under a predetermined pressure in the operating device and releasing said elements for operative movement under a different pressure in said device, and a manually operable element for preventing at will the operative movement of one of the elements without regard to the position of said means.

In testimony whereof I have signed at Dunedin, in the Dominion of New Zealand, this 31st day of May, 1928.

CHARLES OLAF MARKLUND.