Dec. 15, 1959 G. T. K. DURLAND 2,917,606

FIRE ALARM

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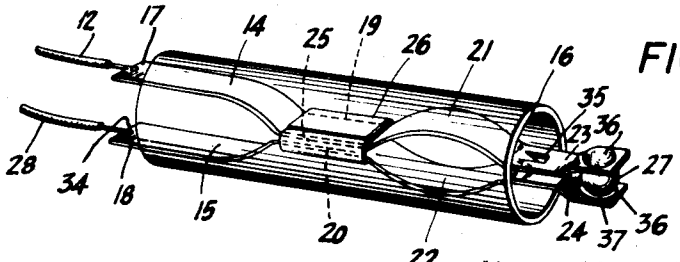


FIG. 1.

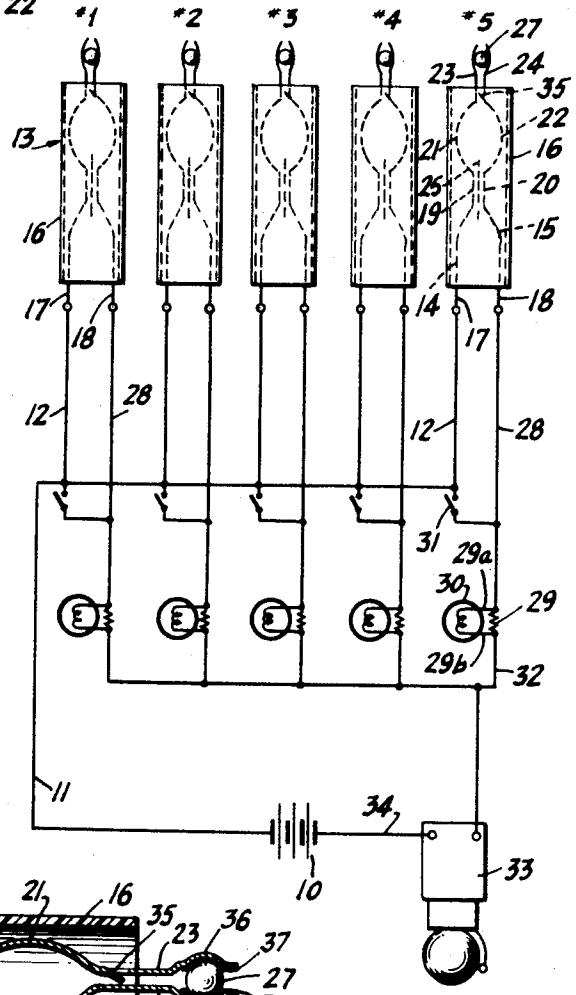


FIG. 4.

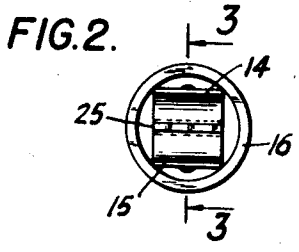


FIG. 2.

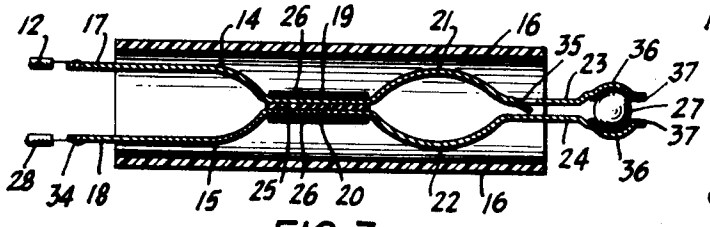


FIG. 3.

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FIRE ALARM

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6 Claims. (Cl. 200—142)

This invention relates to an automatic fire alarm system and particularly to a heat-sensitive circuit closing device for use in an electrically energized fire alarm system.

Fire alarm systems including heat-sensitive circuit closing devices are well known articles of commerce. Devices comprising resilient contact means normally spaced apart by a heat-fusible material have taken many forms. These mechanisms have, however, been generally fairly complex and have been too large and expensive to be readily adapted for use in homes and the like.

It is an object of this invention, therefore, to provide a fire alarm system which, because of its inexpensive and simple nature, can be employed in homes, apartments and individual rooms as well as in larger buildings and commercial establishments.

A further object of this invention is to provide a heat detecting circuit closing device for use in a fire alarm system which may be readily manufactured by low-cost mass production methods.

Another object of this invention is to provide a fire detecting device for use in a fire alarm system which is of very small size and which, at the same time, is extremely sensitive to temperature increases in the air currents contacting its surface.

Still another object of this invention is to provide a fire alarm system including both visible and audible alarm means, which system is simple and positive in operation and inexpensive to install and maintain.

These and other objects of the invention are realized by providing an automatic fire alarm system comprising an electrical circuit, one or a plurality of fire-detecting units connected in parallel with the circuit, an audible alarm, one or a plurality of signal lamps and fixed resistors in the circuit between each detecting device and the alarm, and a power source.

Each detector unit comprises a tube of nonconducting material and a pair of contact elements frictionally positioned within the tube. The contact elements are connected to a corresponding conductor of the circuit and are spaced apart by an insulating member. The ends of each conducting element remote from the conductor form contact arms which are normally urged together. The contact arms, however, are normally spaced apart by a heat-fusible element, thus maintaining an open circuit.

These and other advantages of the present invention will become evident in the discussion of the accompanying drawings in which:

Figure 1 is a perspective view showing the fire detector unit of the present invention;

Figure 2 is an end elevation of the detector unit shown in Figure 1;

Figure 3 is a longitudinal cross-sectional view of the device of Figure 2, taken along the view lines 3—3 looking in the direction of the arrows; and

Figure 4 is a schematic drawing showing a suitable

arrangement of circuits for the fire alarm system of this invention.

Referring now to the system shown by Figure 4, a power source **10** is connected by means of a conductor **11** to a plurality of conductors **12** leading to a plurality of detector devices **13**. Each detector device **13** comprises a pair of conducting elements **14** and **15** arranged within a tube **16** of an insulating material.

The conducting elements **14** and **15** shown in detail in Figures 1 and 3 are of a resilient electricity-conducting material such as Phosphor bronze, and are preferably in the form of strips, containing free ends **17** and **18**, substantially centrally located constricted portions **19** and **20**, bowed portions **21** and **22** and contact arms **23** and **24**.

The conductor **12** bringing electrical energy from the power source **10** is connected to the free end **17** of the conducting element **14**. The conducting elements **14** and **15** are spaced apart at the constricted portions **19** and **20** by means of an insulator **25**. The free ends **17** and **18** are biased in the direction of the confining walls of the tube **13** and are in frictional engagement therewith. The constricted portions **19** and **20** with the intermediate insulator **25** are retained in a properly aligned relationship by means of a winding **26** of insulating material.

The bowed portions **21** and **22** are pinched together prior to their insertion into the tube **13**, and are therefore urged in the direction of the retaining walls of the tube **13** to form a frictional engagement therewith. Because of the compression of the bowed portions **21** and **22**, they also urge the contact arms **23** and **24** in the direction of their normally closed position. The contact arms **23** and **24** are spaced apart, however, by means of a heat-fusible element **27**.

Referring again to Figure 4, the conductor **28** leads from the free end **18** of conducting element **15** to a fixed resistor **29**. A lead **29***a* connects the conductor **28** with a low voltage lamp **30**, while a lead **29***b* connects the lamp **30** with a conductor **32**. A test switch **31** is inserted to bridge the gap in the circuit between the conductor **28** and the conductor **12**. The conductor **32** leads from the fixed resistor **29** to an alarm **33**. An additional conductor **34** leads from the alarm **33** to the power source **10**.

Referring again to Figures 1 and 3, the free end portion **18** of the conducting element **15** contains an area **34** where the conductor **28** is attached by means of solder. A lanced portion **35** is formed by pressing out a portion of contact element **14** in the form of a point, the point being directed toward the opposing conducting element **15**. A formed pocket **36** at the tip of each of the contact arms **23** and **24** secures the fusible element **27** in position. A coating **37** of insulating material is provided within the pocket **36** to prevent passage of electric current from the contact arm **23** to the contact arm **24** in the event the fusible element **27** is of a conducting material.

The fire detector unit **13** may be disassembled and assembled with relative ease. As the conducting elements **14** and **15** are retained within the tube **16** solely by means of frictional engagement, the tube may be readily slipped off from the conducting elements **14** and **15**. When the elements **14** and **15** are removed, the winding **19** maintains the elements **14** and **15** in their opposed relation at their centrally constricted point, but the tension is removed. The fusible plug **27** falls free.

In order to re-insert the elements **14** and **15** into the tube **16**, it is only necessary to replace the fusible plug **27** at its proper place between the contact arms **23** and **24**, compress the resilient contact members **14** and **15** so that

they may be readily received within the tube **16**, and slide the tube into position over the contact elements **14** and **15**. Confinement of the contact elements **14** and **15** within the tube in this manner provides a means of frictional anchorage and also creates a powerful inherent source of mechanical energy for closing the contact arms.

It will be readily seen that the detector devices **13** of this invention may be easily attached at the desired site by means of attaching the tube **16** to a wall or other desired place. The tube **16** may be transparent, but is preferably made in decorator colors to harmoniously blend in with interior moldings or other decorative features. The tube **16** may be either compression molded of any suitable plastic or other insulating material, or it may be cut off from tubular extrusions of similar material.

Any number of the detector units with appropriate circuits may be added to a fire alarm system without adversely affecting its efficiency in any way. As the portion of the contact arms **23** and **24** engaging the fusible plug **27** extends slightly from the tube **16**, the device is more sensitive to temperature changes in the surrounding air. When the temperature of convected air currents reaches the yield point or melting point of the fusible plug, the plug collapses, allowing the contact arms to close. Where a lanced contact point **35** is employed, the point is forced into contact with the opposing conducting element to close the circuit, thereby energizing the alarm and indicating the presence of a fire.

The fusible plug **27** may, of course, be of any desired material and where a metallic alloy having the desired melting point is employed, it is advantageous that the contact arms **23** and **24** immediately adjacent the fusible plug **27** be insulated in order to prevent passage of current through the metallic plug. Other materials, however, such as suitable waxes, may be employed as a heat-fusible plug where desired. The plug may easily be replaced with higher or lower melting materials, according to changes in local fire hazards. It is also noted that the location of the contact point within the protective covering of the tube **16** lessens the danger of covering the contact points with dust, paint, grease and the like, which would tend to prevent proper closing of the contact points.

The test switches **31** are provided in the event periodic testing of the power source **10**, signal lamp **30** and alarm **33** is desired.

It will be understood that the above-described embodiment of the invention is illustrative only and that modifications will occur to those skilled in the art. Accordingly, the invention is not to be limited to the specific apparatus disclosed herein, but is to be defined by the appended claims.

I claim:

1. In an electrically energized fire alarm system a heat-responsive circuit-closing detector unit comprising, a casing of non-conducting material, a pair of resilient conducting elements received within the casing, and a solid, heat-fusible plug, each conducting element having a free end, an inwardly constricted portion, a bowed portion and a contact arm, the solid heat-fusible plug separating the contact arms of the conducting elements and the resilient contact arms being spaced apart within the

casing at the inwardly constricted portion by an insulator, the conducting elements being arranged to cooperate with each other and with the inner surfaces of the casing in such a manner that the conducting elements are compressed and urged into frictional engagement with the inner surfaces of the casing to frictionally anchor the elements within the casing and to normally urge the contact arms to a closed position.

2. A detector unit for use in an open circuit electrical fire alarm system comprising a tube, a pair of resilient conducting elements received within the tube and a non-conducting solid heat-fusible plug, each conducting element having a free end, an inwardly constricted portion, a bowed portion and a contact arm, the solid heat-fusible plug separating the contact arms of the conducting elements and the resilient contact arms being spaced apart within the tube at the inwardly constricted portion by an insulator, the conducting elements being arranged to cooperate with each other and with the inner surfaces of the tube in such in a manner that the conducting elements are compressed and urged into frictional engagement with the inner surfaces of the tube to frictionally anchor the elements within the tube and to normally urge the contact arms to a closed position.

3. The detector unit of claim 2 wherein one contact arm contains a contact point extending in the direction of the opposing contact arm.

4. The detector unit of claim 3 wherein the contact point is arranged on the contact arm at a point within the tube.

5. The detector unit of claim 2 wherein the portion of the contact arms bearing the heat-fusible plug extends beyond the edge of the tube.

6. A detector unit for use in an open circuit electrical fire alarm system comprising a tube, a pair of resilient conducting elements received within the tube, a solid heat-fusible plug, and insulating means intermediate the plug and conducting elements, each conducting element having a free end, an inwardly constricted portion, a bowed portion and a contact arm, the solid heat-fusible plug separating the contact arms of the conducting elements and the resilient contact arms being spaced apart within the tube at the inwardly constricted portion by an insulator, the conducting elements being arranged to cooperate with each other and with the inner surfaces of the tube in such a manner that the conducting elements are compressed and urged into frictional engagement with the inner surfaces of the tube to frictionally anchor the elements within the tube and to normally urge the contact arms to a closed position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,030,196	Lucier	June 18, 1912
1,175,432	Garretson	Mar. 4, 1916
1,940,176	Marshall	Dec. 19, 1933
2,552,331	Lamb	May 8, 1951
2,731,627	Herbst	Jan. 17, 1956
2,765,457	Stang	Oct. 2, 1956