Jan. 20, 1959 G. R. SCHULZE 2,870,434

DETECTION AND SIGNALING APPARATUS

Filed Jan. 18, 1955

FIG. 1

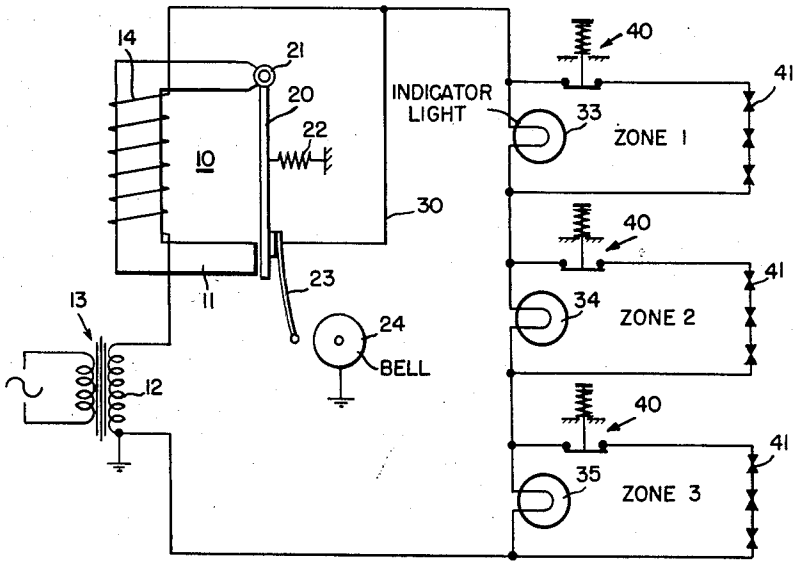


FIG. 2

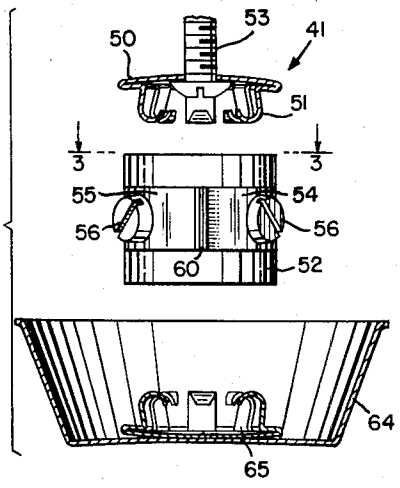


FIG. 3

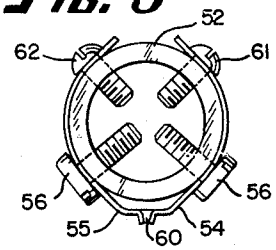
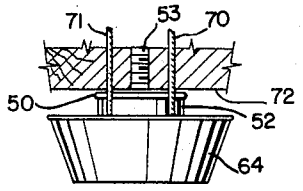


FIG. 4



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DETECTION AND SIGNALING APPARATUS

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The present invention is concerned with a fire detection and alarm system for residential use, in particular, an alarm means having a plurality of detectors connected thereto so that when anyone of the detectors senses the presence of a fire in its locality a visible and audible alarm is given.

While fire detection systems are broadly old there is a market for an inexpensive and reliable system for use particularly in newly constructed homes. The present invention provides for a system which is dependable and can be periodically checked to determine whether the alarm device is in working order. The system has a plurality of individual series circuits so that one circuit can be used for each particular zone of the dwelling. In each circuit, for indicating the trouble in that particular zone, an indicator light is used so that if a fire occurs in one zone it will be so indicated on the main control panel. A switch is provided in each zone for testing the particular zone by opening the detector circuit to energize both the alarm and the indicator.

It is therefore an object of the present invention to provide an improved detection system.

A further object of the present invention is to provide an improved fire detection and alarm system having a plurality of branches each containing an indicator responsive to the detection of a fire in the locality of the branch.

Another object of the present invention is to provide in a detection system a responsive element having a sensing unit adapted to be mounted on a ceiling or surface, the sensing unit having an inverted cup-shaped cover being slightly spaced from the ceiling or surface when attached to the sensing unit.

These and other objects will become apparent upon a reading of the following specification and drawings of which:

Figure 1 is a schematic drawing of the circuit and associated components of the fire detection system;

Figure 2 is an assembly view of one of the detector elements showing the clip for mounting it on a ceiling, the thermal sensitive unit, and the cover;

Figure 3 is a vertical view of the sensor element shown in Figure 2;

Figure 4 discloses the method of mounting the detector unit as assembled to a surface or ceiling with the connection wires leading therefrom.

Referring to Figure 1 an actuator **10** is shown having a core member **11** with an energization winding **14** wrapped thereon. A movable member **20** pivotally connected to member **11** at **21** is biased counterclockwise away from engagement with member **11** by a spring **22**. Whenever the winding **14** is energized the magnetic flux produced in member **11** causes movable member **20** to pull against member **11** at the end opposite the pivotal connection to form a closed magnetic path.

Connected to the winding **14** is a series circuit containing a secondary winding **12**, of a power transformer **13** connected to a source of power, and a plurality of

indicator lights **33**, **34**, and **35** each of which by itself or all together is a sufficient resistance to reduce the current to winding **14** to cause member **20** to drop away from member **11**. Connected in parallel with each of the indicator lights is a circuit comprising a normally closed switch **40** and a plurality of detectors or sensing elements **41**. The switch is spring biased in a closed position and has a manual button for opening the circuit for test purposes.

Connected to member **20** and electrically insulated therefrom is a bell clapper **23** for striking an associated bell **24** when winding **14** is de-energized and member **20** moves to the right. Clapper **23** is connected by a flexible conductor **30** to the upper end of winding **14**. The bell frame is electrically grounded, as well as the lower side of secondary **12**. Whenever anyone or all of the series circuits including detectors **41** are open and the current through one or all of the lights, **33**, **34** or **35** is not sufficient to hold member **20** in, it will move to the right to cause clapper **23** to strike bell **24**. This closes a shunt circuit to energized winding **14** which will again cause member **20** to pull in, resulting in a successive hammering of bell **24** by clapper **23**. The clapper and bell actually perform a switching function.

As shown the circuit connected in parallel with the indicator lights is available for one particular zone thus with the lights **33**, **34** and **35** a three-zone system might be obtained. To test any particular zone, switch **40** is opened and the indicator light for that particular zone is energized. At the same time the high resistance of the indicator light causes the actuator **10** to ring alarm bell **24**.

Referring to Figure 2, one of detector units **41** is shown having a disc shaped clip unit **50** having a plurality of projections **51** mounted in a circle on one side of the disc and adapted to be received into one end of a cylindrical insulator **52**. A screw **53** inserted through a hole in the center of the disc shaped unit is used to mount it to a surface such as the ceiling of the dwelling.

Mounted on member **52** with associated screws **56** is a pair of resilient members **54** and **55** joined by a low melting point alloy **60** so that upon the temperature of the alloy reaching some predetermined value members **54** and **55** will spring apart. Obviously while members **54** and **55** are shown butted together such a fusible leakage could be made by overlapping them. A pair of associated terminal screws **61** and **62** for connecting lead wires to members **54** and **55** are inserted into insulator **52**. A cover **64** having a disc shape, such as the shape of a portion of a hollow right angled inverted cone, has an upwardly curved bottom and an open top having a diameter larger than the bottom. A second disc shaped clip unit **65**, substantially the same as **50**, is attached to the bottom of cover **64** so that its projections are adapted to be received into the other open end of member **52**. Thus, when assembled the detector unit is substantially as shown in Figure 4 with the leads **70** and **71** connected to the terminal screws and the top of the cover **64** slightly spaced from the ceiling or a surface **72** upon which it is mounted.

Operation

As shown in Figure 1 the fire detection system is in operation. As all detectors **41** are closed and test switches **40** are closed a low resistance circuit is connected to secondary **14** so that the flux generated by winding **14** holds member **20** into engagement with core member **11**. As the clapper **23** must be moved back and forth to ring the bell **24** there is no audible signal being produced.

To test any one of the particular zones, test switch

40 is opened to simulate an open detector unit 41. This takes the shunt or parallel circuit away from the indicator light and its resistance when placed in the winding circuit is sufficient to render it ineffective in holding member 20 to the left. Member 20 is then dropped out and clapper 23 rings the bell. Upon testing any particular zone the light for that zone as well as the alarm is energized.

Assume that one detector unit 41 opened when the temperature of the unit reached some predetermined value and the alloy 60 melted and members 54 and 55 sprung apart. The indicator light for the particular zone having the open detector unit would be energized and actuator 10 would render an alarm.

While not shown the actuator 10, indicator lights 33, 34, and 35 and test switches 40 are mounted in a unit and the wires to the particular zones are strung therefrom to connect to the detector units 41. Whenever an alarm occurs it is thus possible to determine what zone has caused the alarm as its associated indicator light would be energized.

Such a system is relatively simple to install in newly constructed homes and while some difficulty might be experienced in placing it in existing homes, for the most part it could be installed with little effort. For each zone only a series circuit need be used, the detector units 41 being placed in different localities in that zone. For example, the two wires are strung in the ceiling and stuck through the plaster at the center of the room. Clip 50 of the detector unit is then fastened to the ceiling, by associated screw 53, close to the locality where the wires protrude. The insulator 52 having a sensing unit which is connected by screws 61 and 62 to the wires is then snapped onto the clip and the cover installed. With such an assembly the detector unit is relatively obscure as the cover normally would be painted the color of the ceiling. As the cover is spaced slightly from the ceiling adequate circulation of air around members 54 and 55 is obtained so that their junction by the low melting point alloy is definitely susceptible to the presence of an extreme heat in that locality. With such a detector unit 41, replacement of the element is rather simple and can normally be done by the home owner should one become open or defective.

While the detection and alarm system is disclosed as being applied to fire detection it is obvious that any sort of condition detection might be obtained, therefore it is intended that the invention only be limited by the scope of the appended claims in which

I claim:

1. In a fire detection and alarm system, actuator means having a bell clapper for energizing a bell, a source of power, control circuit means connecting said source of power and said actuator means in series, said control circuit comprising a plurality of indicator lamps each of which is shunted by a series circuit comprising a test switch and a plurality of normally closed temperature responsive means adapted to open upon reaching a predetermined temperature, and another circuit means closed when said clapper engages said bell for shunting said control circuit to connect said actuator directly to said source so that when said control circuit is ineffective to maintain said actuator means energized said clapper will successively engage said bell.

2. In a fire detection system, alarm means having a pair of terminals to which a detector circuit is connected, said alarm means responding to an increase in circuit resistance above a predetermined value, said circuit comprising a plurality of indicator means each of which is shunted by a plurality of normally closed detector means connected in series, said detector means comprising a cylindrical shaped insulating member having a pair of resilient members mounted on its outer surface, said resilient member being held together by a low melting point alloy, clip means adapted to be mounted to the ceiling, said clip means being received into one end of said cylindrical shaped member, and a cover adapted to be clipped to the other end of said cylindrical shaped member.

3. In a fire detection system having a plurality of detectors each comprising, a hollow cylindrical shaped insulator having a pair of resilient members fastened to its outer periphery, said members being soldered together at one end thereof by a low melting point alloy to form an electrical contact thus upon said alloy reaching a predetermined temperature said members spring apart opening said contact, clip means adapted to be received by one open end of said insulator for mounting said insulator in a position to be responsive to the presence of a fire, and cover means adapted to be received by the other end of said insulator, said cover having a cup shape with a relatively flat bottom and outwardly sloping sides so that its upper diameter is slightly greater than the diameter of said bottom, said cup having a depth less than the length of said insulator so that when said detector is assembled a space exists between the upper edge of said cover and the surface on which said clip is mounted.

4. In a condition detection system having a plurality of condition responsive detector means each comprising, insulator means, condition responsive means mounted on said insulator means, clip means having a plurality of resilient means adapted to be received in one end of said insulator means for mounting said insulator means to a surface, shield means having a portion adapted to be received in the other end of said insulator means, said shield means having a cup shape so that upon said clip means being mounted on the surface said insulator means is substantially protected by said shield means.

5. In a detection and alarm system, a source of power, actuator means adapted to pull a spring loaded bell clapper away from the engagement of a bell, first circuit means connecting said actuator means and said source in series to energize said actuator and pull the clapper away from the bell, a plurality of high resistance indicator means, said circuit means comprising said high resistance indicator means, a plurality of condition detection means having a low resistance when a normal condition is sensed, means connecting at least one of said detection means in parallel with each of said indicator means to form a low resistance circuit to maintain energization of such actuator means, and second low resistance circuit means formed when the clapper engages the bell, said second circuit means connecting said actuator means directly to said source so that when said first circuit has a high resistance said actuator means is energized to cause the clapper to ring the bell.

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