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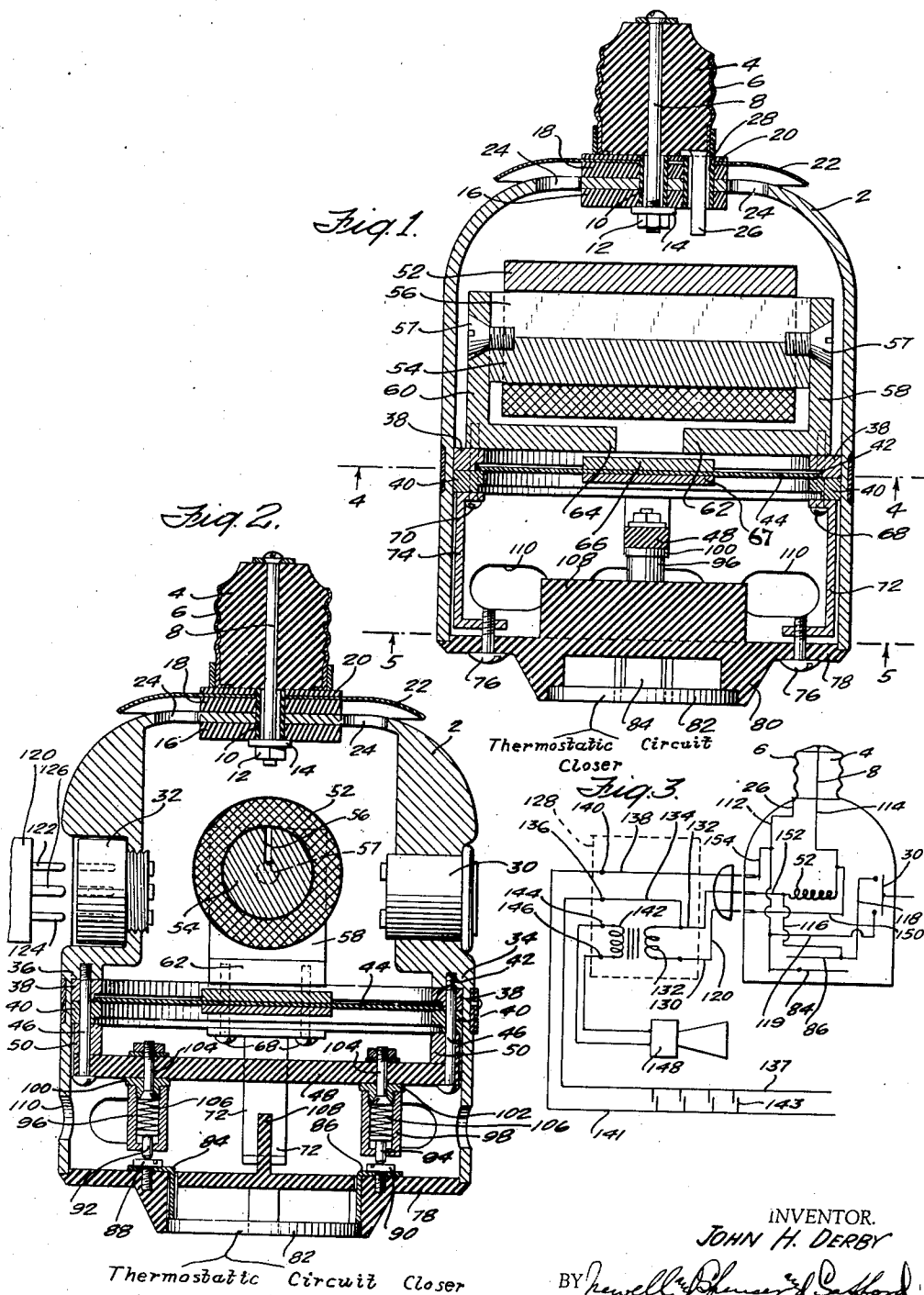
J. H. DERBY

2,107,525

FIRE DETECTING AND ALARM MECHANISM

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2 Sheets-Sheet 1



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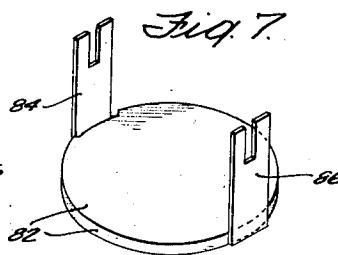
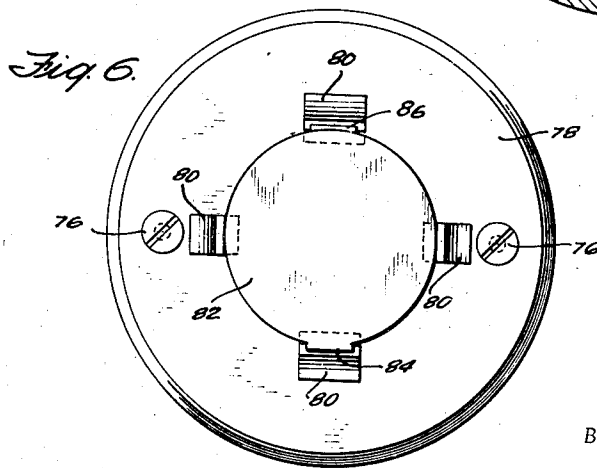
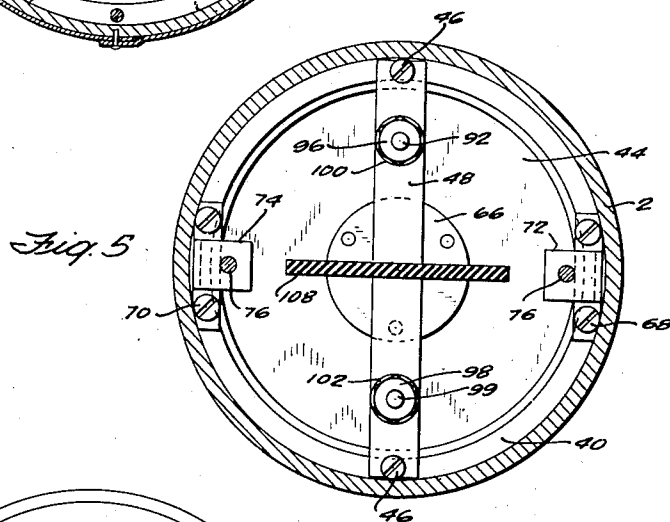
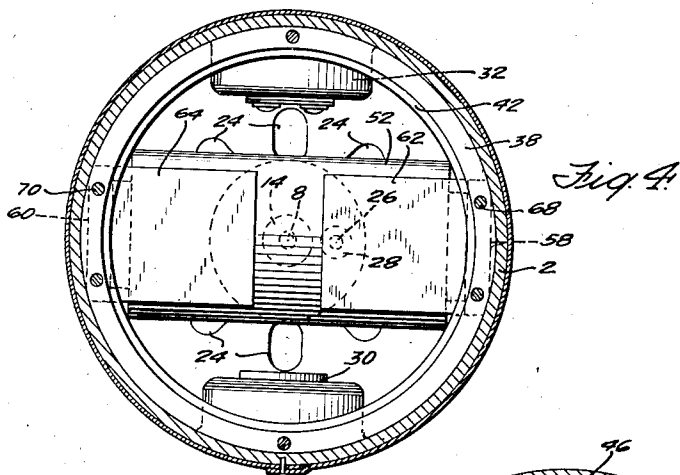
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FIRE DETECTING AND ALARM MECHANISM

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2 Sheets-Sheet 2



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FIRE DETECTING AND ALARM MECHANISM

John H. Derby, Scarsdale, N. Y.

Application January 8, 1935, Serial No. 819

1 Claim. (Cl. 177-311)

This invention relates to fire alarm systems, and particularly to a combined fire detector and alarm unit adapted for convenient installation in and operation from alternating current house and building lighting systems.

Although approved thermally-operated fire detecting units, such as metallic couples, fusible alloy bridges, switch actuators acting upon a predetermined rate of rise of temperature and explosive element switch releases, for closing alarm circuits, have long been on the market, difficulty has been encountered in getting them into general use, particularly in private homes, because of the fact that they require considerable wiring to effect their installation, thus usually requiring the services of an expert electrician and also of a person sufficiently familiar with the action of fires to know where the detecting units should be located. Because of the expense and trouble connected with their installation and of the necessity for instructing those who install them in the manner of installation, the sales and service organizations required to market such fire prevention systems have seemed so large and costly in proportion to the probable market that makers of such apparatus have not been able to interest capital in the house and small building field and thus the very desirable, more extended use of fire-detecting and signaling systems in homes and minor public and semi-public buildings such as schools and stores has not yet come about.

One of the aims of the present invention is to provide an improved, compact and relatively inexpensive unit of the type which includes both fire-detecting and alarm giving mechanism and which does not require the use of specially skilled men for its installation, whereby homes and small buildings may readily be given fire prevention protection, at least at the more obvious points of danger.

The invention aims further to provide a unit of this kind that is substantially fool-proof and that is so constructed that it will not be affected by dust, dampness or the corrosive influences usually present in locations where fires are apt to start. At the same time the invention aims to provide such simple and easy means for testing the operativeness of the unit that anyone can tell at any time whether or not it is in operative condition.

An important feature of the invention is the provision of a combined, readily installed unit, containing both detecting and alarm mechanisms, which is so constructed that it can readily be connected to additional detecting units whereby one can easily add to the protected area covered by the fire prevention system.

An important object of the invention is to provide a device for the purposes set forth which,

while it is so constructed that it is sure to function when the occasion arises, is not liable to give false alarms and which, when it has operated, can quickly and easily be restored to operative condition by the owner thereof and without the use of skilled labor.

Among the important features of the invention are the novel construction and arrangement of the sound-producing diaphragm, the provision of vents in the housing on both sides of the diaphragm so that sound waves may be propagated from both faces thereof and so that there will be no interference with the vibrating movements of said diaphragm, and the provision for conveniently connecting an extension signal to the detecting means.

Other important features and objects of the invention will appear when the following description and claim are considered in connection with the accompanying drawings, in which

Figure 1 is a vertical section through a combined fire detecting and alarm unit embodying the present invention;

Figure 2 is another vertical section through said unit at right angles to the section shown in Figure 1;

Figure 3 is a wiring diagram;

Figure 4 is a section on the line 4-4 of Figure 1;

Figure 5 is a section on the line 5-5 of Figure 1;

Figure 6 is a bottom plan view, and

Figure 7 is a perspective of the thermostatic circuit closer unit.

In the illustrative embodiment of the invention the housing 2 in which the elements of the combined fire detecting and alarm unit are enclosed and by which they are supported is connected to an electric socket plug, preferably of the screw type to insure permanent connection, said plug having the usual core of insulation 4, the usual sheet metal conductor 6, provided with the socket threads, and the usual central conductor 8 in the form of a bolt preferably long enough to serve to clamp the housing 2 to the socket plug.

As herein shown, the housing 2 of any suitable material, preferably a not readily corrodible metal, is provided with a central opening at its top through which an insulating bushing 10 passes. The bolt 8, which extends through the bushing 10, is provided at its lower end with a nut 12 and a washer 14 which clamps against an insulating washer 16 on the inner side of the housing 2. Between the base of the plug and the outer face of the housing is a second insulating washer 18 which preferably forms one of a pair of clamp members between which and the other insulating clamp washer 20 a metal canopy 22 is clamped, the purpose of this canopy 22 being to 60

shield the vent openings 24 in the top of the housing 2 from dust particles dropping through the air or from the ceiling on which the unit is mounted.

5 The sheet metal conductor 6 extends beneath the insulating core 4 where it is engaged by an extension piece in the form of a rivet 26 passing through a second opening in the housing 2 and through corresponding openings in the washers 10 16, 18 and 20 into the interior of the housing 2 where it may be connected to the wiring circuit of the unit. A bushing 28 insulates the extension member 24 from the housing 2.

As shown in Figure 2, the wall of the housing 15 2 is thickened at diametrically opposite sides to provide for proper support for a push button switch 30 and for a 3-way socket 32 for connecting additional thermostatic circuit closers to the normally open alarm circuit, and for connecting 20 an extension alarm. The functions of these parts will be set forth more fully hereinbelow.

This thickening of the housing also provides shoulders or abutments 34 and 36 against which 25 are clamped two rings of non-magnetic material 38 and 40, the ring 38 being provided with a rabbet 42 on its edge adjacent to the ring 40 whereby a groove is provided between the two rings to receive the edge of a non-metallic sound diaphragm 44 which may be made of any ma- 30 terial suitable for the purposes. In practice it has been found that a diaphragm made of a paper base impregnated with bakelite or other phenol-formaldehyde condensation product has the desired sound producing properties. The 35 rabbet 42 is preferably of sufficient depth to allow the diaphragm to move bodily in a direction perpendicular to its plane, this bodily movement apparently increasing the sound effect.

The rings 38 and 40 are clamped to the shoul- 40 ders or abutments 34 and 36 by screws 46 which also preferably serve to clamp a crossbar 48 of insulating material to the housing, spacing washers 50 being preferably provided between the lower ring 40 and the crossbar 48.

45 The upper ring 38 also serves as a support for the alternating current magnet structure now to be described. This magnet, which has its axle extending across the housing at right angles to the insulating bar 48, comprises a coil 52 and a 50 core 54 provided with the usual slot 56 employed in alternating current magnet cores. Connected to the two ends of the core 54 by screws 57 are polar extensions 58 and 60 in the form of angle pieces having their polar ends 62 and 64 suitably 55 spaced above an armature 66 carried by and connected to the non-metallic diaphragm 44. The armature 66 is preferably in the form of a piece of soft iron or steel located on the upper side of the diaphragm 44. A piece of aluminum 60 67 on the opposite face of the diaphragm riveted to the armature provides suitable connection. It will be noted that the armature bridges the gap between the two poles 62 and 64 and is spaced from the poles a sufficient distance to allow for free vibration of the diaphragm while at the same 65 time being in attractive relation to the poles.

The magnet is secured in position in the casing by screws 68 and 70 which extend through the 70 rings 38 and 40 and into the pole extensions 58 and 60 near the corners of these extensions, the screws 68 and 70 also serving to clamp against the under face of the ring 40 brackets 72 and 74 to which the combined housing end closer and thermostatic circuit closer carrier may be se- 75 cured by means of screws 76.

In order to provide for convenient restoration of the combined fire detecting and alarm unit to operative condition when the thermostatic circuit-closing element has operated to close the alarm circuit, the illustrative construction has 5 been so designed that a standard outlet unit, such as has been designed for use with ordinary outlet boxes, can be connected to the open lower end of the housing by the screws 76 threaded into the brackets 72 and 74 and that, when so connected, 10 it will serve as a closure for this open end of the housing and will also present its terminals in such relation to terminals hereinafter to be described in the housing that the desired circuit connections will be automatically made. 15

The standard outlet unit just referred to comprises a base 78 of any suitable insulating material, such as a phenol-formaldehyde condensation product, which base is provided with four 20 shouldered projections 80 for so spacing the thermostatic circuit closer 82 from the base that air may reach both faces of it. The said circuit closer is preferably of the type described and claimed in my application for United States Letters Patent Serial No. 619,181, filed June 25, 25 1932, and comprises in general two spaced metallic disks and a fusible element which, at a predetermined temperature, will fuse and unite the two disks to close a circuit of which they are the terminals, one of said disks being provided 30 with a terminal extension 84 and the other with a terminal extension 86 connected respectively by flat headed screws 88 and 90 to the base 78. The flat heads of these screws 88 and 90 serve as contacts to engage spring-ejected plungers 92 and 35 94 guided in cylinders 96 and 98 screwed upon bases 100 and 102 connected by bolts 104 to the insulating crossbar 48, suitable electric connections being made to the bases 100 and 102 through the bolts 104. Springs 106 in the cylinders 96 40 and 98 serve to eject the plungers 92 and 94 and thus hold the plungers 92 and 94 in intimate electrical contact with the flat heads of the screws 88 and 90.

The separating rib 108 on the base 78, which 45 is a part of the standard outlet unit used in the present construction, serves no useful purpose in this construction since there is no liability to short-circuiting across from one of the terminals 84 and 86 to the other by reason of projecting 50 or loose wires.

To insure free vibration of the diaphragm 44 and propagation of sound waves from both faces thereof, the lower part of the housing 2 is provided with vent openings 110 which serve the 55 same purpose as the vent openings 24 in the upper chamber of the housing, the diaphragm 44 dividing the housing into two chambers.

The electrical connections between the different elements of the structure hereinabove described are shown in the wiring diagram in Figure 3. It will be understood that the unit is designed to be connected to an ordinary screw socket of an alternating current house or other building lighting system and that when so connected 65 the conductor 6 of the plug is connected to one side of the wiring circuit and the bolt or conductor 8 of the plug is connected to the other side of the circuit. One side of the circuit includes the rivet extension 26 of the conductor 6, wire 112 and the terminal 84. The other side 70 of the circuit includes the bolt 8 of the plug, wire 114, coil 52 of the magnet, wire 116 and the other terminal 86. When, therefore, the terminals 84 and 86 are connected by the fusion at a prede- 75

terminated temperature of the fusible element of the thermostatic circuit closer 82, a circuit is closed through the coil 52 of the alternating current magnet which results in the armature 86 being alternately attracted and repelled by the poles 62 and 64, thus setting up a rapid vibration of the diaphragm and producing a loud and comparatively high-pitched sound.

In order to test the apparatus, the push button switch 30 is connected to the two sides of the circuit in parallel with the terminals 84 and 86, and between said terminals and the coil 52 whereby the push button may short-circuit the thermostatic circuit closer 82 and thus effect the manual closing of a circuit through the coil 52 to test the alarm mechanism.

An important feature of the invention is the provision for connection to the alarm mechanism of other thermostatic circuit closers besides the one which constitutes a part of the combined unit. This permits the operation of the alarm by thermostatic circuit closers located at other points where fires may start. Provision is preferably also made for connecting to the combined unit another alarm mechanism, which may be located at some other point in the building, so that when the occupants of the building are remote from the point where the combined unit is located they will still have an alarm within easy hearing distance.

In the illustrative embodiment of the invention very simple means have been provided for making these extension connections, both for the additional thermostatic circuit closers and for the extension alarm, in the provision of the 3-way receptacle 32 hereinabove referred to. This 3-way receptacle is adapted to receive a plug 120 having thereon three pins 122, 124 and 126 adapted to be received in correspondingly located sockets in the receptacle 32, one of the pins 126 being of larger diameter than the other two to insure proper connection being made.

The plug 120 is preferably permanently connected by a suitable cable to a transformer box 128, shown in Figure 3 merely diagrammatically, which will be furnished with the unit when extensions are desired in order to insure that the user will make the proper connections.

Referring to Figure 3, which illustrates the wiring diagram and particularly the connections through the receptacle 32 and plug 120 to the transformer box 128 from which the extension connections can readily be made without expert service, it will be seen that one of the pins of the plug 120 is connected by a wire 130 to one side of the primary coil 132 of the transformer and that another pin of the plug 120 is connected by wire 132 to the other side of the primary coil 132 and also to a branch wire 134 that goes to a binding post 136 on the transformer box 128 for connection to one side 137 of the thermostatic circuit closer extension circuit. The third pin of the plug 120 is connected by wire 138 to the other binding post 140 to which the other side 141 of the thermostatic circuit closer extension circuit is connected.

The secondary coil 142 of the transformer is connected to two binding posts 144 and 146 on the transformer box to which the two sides of the extension circuit for the extension alarm 148 are connected. This alarm may be of the same

type as the alarm comprised in the combined unit, but preferably operating at the lower voltage provided by the transformer.

The corresponding three sockets in the receptacle 32 for the pins of the plug 120, to which reference has just been made, are connected to the circuits inside the unit as follows:

The socket which receives the pin connected to the wire 130 is connected by a wire 150 to the wire 114 at a point between the coil 52 and the bolt 8. The socket for the pin which is connected to the wire 132 and also to the branch wire 134 is connected by a wire 152 to the wire 116 at a point on said wire between the coil 52 and the terminal 86 of the thermostatic circuit closer. It will thus be seen that the primary coil 132 of the transformer is connected to one side of the circuit in parallel or multiple or in shunt with the coil 52 of the alternating current magnet, the connection being on that side of the open circuit which includes the wire 114. Therefore no signal will be given either in the combined unit itself or by the extension signal 148 until the circuit, which includes the wires 112 and 114 is closed either by the thermostatic circuit closer 82 in the unit itself or by one of the extension circuit closers 143 arranged in parallel therewith, as hereinafter set forth.

The third socket, which receives the pin connected to the wire 138, is itself connected by a wire 154 to the wire 112 at a point between the terminal 84 of the thermostatic circuit closer in the unit itself and the rivet 26. From this it will be seen that the two sides 137 and 141 of the extension circuit for the extension thermostatic circuit closers 143 are connected in parallel with the circuit terminals 84 and 86 and between said terminals and the bolt 8 and rivet 26 whereby they may short circuit the terminals 84 and 86 if fire should occur near one of the outside thermostatic circuit closers 143.

As hereinabove suggested, the transformer box, with its connected cable, including the wires 138, 132 and 130, and the plug 120, connected with said cable, will preferably be supplied as a unit to be connected to the combined unit by merely plugging into the receptacle 32, there being suitable labels or other indicia on the binding posts 136, 140, 144 and 146 to show the manner of connection of the extension circuits, so as to prevent as far as possible improper connection of these circuits.

What I claim as new is:

A combined fire detector and alarm unit comprising, in combination, an electric socket connection by which said unit may be both supported from an electric socket and connected with a source of supply of alternating current, a housing carried by said socket connection, a sound diaphragm dividing said housing into two compartments, an alternating current magnet in one compartment, a magnet armature carried by said diaphragm in attractive relation to said magnet, a thermostatic circuit closer forming also a closure for said housing, a normally open circuit including said socket connection, said magnet, and said thermostatic circuit closer, each of said compartments in said housing being vented to the atmosphere to permit sound waves to be propagated from both faces of said diaphragm.

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