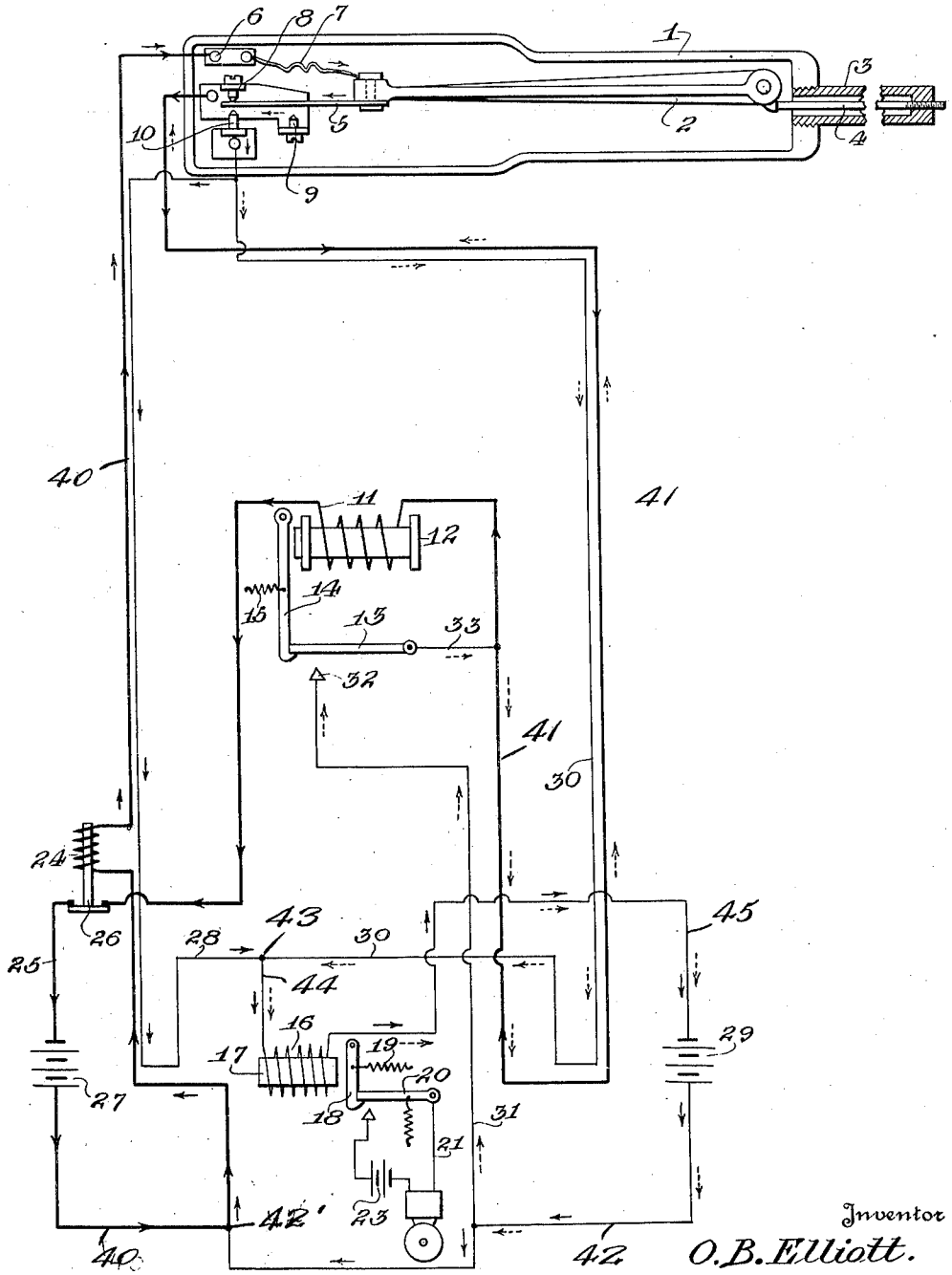
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AUTOMATIC FIRE ALARM

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AUTOMATIC FIRE ALARM.

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This invention relates to automatic electrical fire alarms whereby, upon a fire occurring, the annunciation is given by the action of a thermostat operating upon certain degrees of heat to open and close a plurality of circuits including eletromagnetic devices for giving alarms.

The object of the present invention is to provide an improved alarm whereby certain faults in the circuits, such as short circuits, broken lines, and run down batteries, are indicated instantly at the installation, and at the same time leaving the installation in such order that in the event of a fire the alarm will be given.

The electrical thermostatic alarm system embodying the present invention comprises a combined normally closed circuit and an open circuit, an alarm controlling means therefor operated in two steps by successive changes in the electrical condition of said circuits and thermostatically controlled means for producing such changes.

The first change in the electrical condition of said circuits, is the breaking of the normally closed circuit which will give a preliminary alarm or visible signal to a watchman of a building or other place of installation of the system, that a fault exists in the line such as run-down batteries, broken lines and the like, or that an alarm is about to be given. This closed circuit will prevent the accidental closing of the open circuit, such as crossing of the lines of said open circuit, a ground or a similar change in its electrical condition which may be caused by electrical storms and which changes would obviously render a false alarm for unnecessarily calling out the fire brigade.

The second change in the system is the closing of the open circuit which should happen only when a fire occurs and this open circuit has a number of electrical conductors greater than two, and each common thereto, whereby failure of one or more of said conductors, the remaining unimpaired conductors will function to establish a circuitous path for the electrical energy in order to close an alarm circuit, which latter may include a suitable alarm signal or transmitter whereby proper announcement will be made to the fire brigade station that a fire exists.

In the drawings the single figure is a diagrammatic view illustrating the arrangement and connections of the various parts, in a simplified manner.

The numeral 1 designates in its entirety a thermostatic switch comprising a pivoted arm 2 actuated by the different degrees of expansion of the dissimilar metal elements 3 and 3. Secured to the free end of the arm is a spring contact strip 5 electrically connected to a terminal 6 as shown at 7. A plate has mounted thereon in the path of movement of the strip or blade 5, two electrically connected contacts 8 and 9. Mounted spaced from the contact 8 is an open circuit contact 10. The arrangement of these contacts and strip 5 is such that the strip normally engages contact 8 and in its initial movement will break engagement with contact 8 and engage contact 10. Final movement of the arm 2 will bow strip 5 and thereby bridge the distance between contacts 9 and 10.

The system has included therein, a drop switch comprising a coil 11, magnet 12, switch blade 13, and release arm 14 forced to a releasing position by the spring 15 upon deenergization of the magnet 12. A control switch 16 is provided which also includes a magnet 17, arm 18 actuated by spring 19 and a switch blade 20. It will be noted that the arm 14 of drop switch is mounted to operate when the magnet 12 is energized whereas the arm 18 is mounted to release upon energization of magnet 17, whereby magnet 12 is normally energized and magnet 17 normally deenergized. Switch blade 20 normally breaks the signal circuit 21 which may be of any well known type but illustrated as a gong 22 energized by the battery 23.

A circuit breaker 24 is arranged within and adapted under certain conditions to break the closed circuit 25 by releasing the arm 26 that bridges a break in the circuit. The closed circuit includes a source of current 27 having a wire 40 leading therefrom to the coil 24 of a circuit breaker and from this coil 24 this conductor 40 extends to the terminal 6. A return wire 41 extends from a contact 8 upon the plate which supports the two electrically connected contacts 8 and 9 and as the blade 5 is normally in contact with this contact 8, the current will be permitted to flow through the conductor 41 to the coil 11 of the drop switch and from this coil 11 of the drop switch the return wire extends to the circuit breaker 26 and then to the battery 27. The closed circuit, as herein shown upon the drawings is represented in heavy lines in order to distinguish it from the open circuit to be later described. The wires 28 and 30 as herein shown are ar-

ranged in the same cable or sheath as the wires 40 and 41, but properly insulated therefrom.

The open circuit comprises a battery 29 from which leads a wire 42 and the latter being connected to the wire 40 of the closed circuit at the point 42'. The contact 10 of the thermostat has electrically connected thereto, the two wires indicated by the numerals 28 and 30 which are connected at the point 43 and from this point of connection 43 a line 44 extends to the coil 16 of the drop switch included in the alarm system and from this coil 16 a return wire 45 leads to the battery 29. A conductor 31 connects the contact 32 of the drop switch included in the open circuit with the wire 42 leading from the battery 29, whereas the wire 33 connects the switch blade 13 with the wire 41 of the closed circuit.

With a view towards providing a most dependable fire alarm system, the wire of the main circuit 25 is preferably arranged in the same cable or sheath with the return wires which connect to contact 10, whereby upon rupture of a return wire the main circuit will also, in all probability, be ruptured, causing the drop switch 13 to fall, thus indicating such fault.

In the operation of the system, arm 2 normally assumes a position to hold the strip 5 in engagement with contact 8 and thus the circuit 25 is normally closed allowing current from the battery 27 to pass through magnet 12 in order to energize the circuit breaker 24. Upon battery 27 becoming exhausted magnet 12 will become deenergized for allowing the drop switch 13 to fall, thereby giving a visual indication of a fault in the line and circuit breaker 24 will open for holding circuit 25 in an open position. This same effect will take place upon rupture anywhere in the main circuit 25. Upon the temperature in the vicinity of the thermostat rising above a predetermined degree, a difference in expansion of the elements 3 and 4 will cause the arm 2 to move to a position to throw the strip 5 into engagement with the contact 10 thereby breaking circuit 25 and closing the normally open circuit, passing current from the battery 29 through magnet 17 of the control switch and thereby attract arm 18 releasing switch blade 20 for closing the signal circuit for giving an alarm.

From the foregoing, it is obvious that before the open circuit can be brought into play, it is absolutely necessary that the closed circuit be broken, and when this closed circuit is broken, a suitable signal will be given by the fall of the blade 13 of the drop switch or by an annunciator associated therewith, that a fault exists within the closed circuit, which fault must be rectified in order to mainfain the system in proper working condition. So long as this closed circuit is in proper order, the drop switch 13 will be retained in the position as shown in the drawings, whereupon it will be impossible to close the open circuit should any of the wires of the open circuit be crossed or otherwise accidentally connected. When a fire occurs, the strip or blade 5 of the thermostat will leave the contact 8, thereby breaking the normally closed circuit and permitting the blade 13 of the drop switch to touch the contact 32 and as the closed circuit is now open, the second change in this system is permitted to take place wherein the open circuit may be closed and the alarm given. Owing to the arrangement of the several conductors included in this open circuit, the current from the battery 29 is permitted to pass through four distinct circuits in order to bring the alarm circuit into play and the path of travel of electrical energy from the battery 29 over these various circuits will now be described.

The first open circuit: The closed circuit being broken, the blade 5 will touch the contact 10 of the thermostat when heat is applied to the latter, whereby current may flow from the battery 29 through the wires 42, 40 to blade 5 through contact 10 to conductor 28, through coil 16 of the drop switch of the alarm circuit and return to battery 29 through the conductor 45. Should, however, the conductor 28 become broken the current from the battery 29 will take the second circuitous path which may now be called the second open circuit.

The second open circuit: The current from the battery 29 will pass through the conductors 42, 40 to blade 5 of the thermostat to contact 10, through conductor 30 to the coil 16 of the drop switch included in the alarm circuit and return by the wire or conductor 45 to the battery 29. Should, however, both of the conductors 40 and 28 which are included in the same cable, become broken, the current from the battery 29 may pass through the third open circuit.

The third open circuit: The fire still raging, will, of course, apply additional heat to the thermostat, whereby the blade 5 will bridge the contacts 9 and 10, whereupon the current from the battery 29 will pass through the conductors 42, 31 switch blade 13 of the drop switch, through the conductor 41 to the electrically connected contacts 8 and 9, from the contact 10 the current will flow over the conductor 30 to the coil 16 of the drop switch included in the alarm circuit and from the coil 16 the current may return to the battery 29 through the conductor 45. However, should the conductors 30 and 41 be broken, the current from the battery 29 may flow through the first open circuit as previously described or, if the conductors 30 and 40 be broken, the current from the battery 29 may flow over the fourth open circuit.

The fourth open circuit: The circuitous path of electrical energy from the battery 29 in establishing this circuit, flows over the con-

ductors 42, 31 the blade 13 of drop switch to conductor 41 to contact 9, through blade 5 of thermostat, to contact 10, through conductor 28 to the coil 16 of the drop switch included in the alarm circuit and returned to the conductor 45 of the battery 29.

Whereas I herein show and describe a single thermostat indicated by the numeral 1, it is of course, to be understood that any number of these thermostats may be employed as required by the place of installation and such thermostats must be connected in series. The circuit breaker 26 remains open after the closed circuit has been broken and must be manually reset before this closed circuit is again brought into use, but should a fire take place, the closed circuit will remain open until one of the open circuits as previously described, has been closed in order to effect the alarm. This closed circuit, however, may have a suitable signalling device attached to the drop switch thereof whereby an attendant at the switch board of the building or other place where installation has been effected, will be immediately notified of a fault existing in the closed circuit line or a suitable transmitter may be connected thereto whereby a signal will be given to the fire brigade station should any one of the open circuits fail to actuate the drop switch of the alarm circuit. Also, the alarm circuit may include a suitable transmitter whereby the alarm may be transmitted to a brigade station.

It is of course to be understood that various other forms of thermostatic devices may be used in any number depending upon the area to be protected. It is also to be understood that various other forms of circuit may be used for connecting the various electro mechanical devices together. Therefore, I do not desire to be limited in any manner except as set forth in the following claims.

I claim:

1. An automatic fire alarm system comprising a closed circuit, an open circuit, an alarm device, thermostatically controlled means for producing changes in said circuits, controlling means for said alarm device operated by a change in said open circuit whereby to directly effect an alarm, and means included in said open circuit for permitting said change to take place therein only after a change has taken place in said closed circuit.

2. An automatic fire alarm system comprising a closed circuit, an open circuit, an alarm device, means for controlling said alarm device operated by the successive changes in the electrical conditions of said circuits, thermostatically controlled means for producing said changes, said open and closed circuits being constituted by a number of electrical conductors greater than two and each of said conductors being common to said open circuit whereby in failure of one or more of said conductors to function a circuitous path of electrical energy will be established over the remaining unimpaired conductors to cause said controlling means to be operated when said thermostatically controlled means effects a change within said open circuit and several of said conductors being positioned at points remote from one another.

3. An automatic fire alarm system comprising a closed circuit, an open circuit, an alarm device, means for controlling said alarm device operable only by a change in said open circuit whereby to effect the alarm, means controllable by said closed circuit for permitting a change to take place in said open circuit and thermostatically controlled means for producing said changes in the opened and closed circuits.

4. An automatic fire alarm system comprising a closed circuit, an open circuit, an alarm device, means for controlling said alarm device operable by a change in said open circuit, a drop switch included in said open circuit, means included in said closed circuit for actuating said drop switch whereby a change in said open circuit may be permitted, a circuit breaker included in said closed circuit, thermostatically controlled means adapted to first effect a change in said closed circuit whereby said drop switch will be operated for permitting a change to take place within said open circuit and said circuit breaker operated to cause said closed circuit to remain open and said thermostatically controlled means adapted to subsequently effect a change in said open circuit whereby said alarm device will be operated.

5. An automatic fire alarm system comprising in combination a thermostatically controlled switch having a movable blade, a closed circuit contact, a secondary closed circuit contact, an open circuit contact, said blade adapted to bridge said secondary closed circuit and opened circuit contacts, a closed circuit including conductors electrically connected with said blade and said closed circuit contacts, an open circuit, an alarm device, means for controlling said alarm device operated by a change in the electrical condition of said open circuit, a source of electrical energy included in said open circuit, a conductor leading from said source of electrical energy and adapted to be electrically connected to the conductors of the closed circuit, a conductor leading from the open contact of said thermostatically controlled switch and electrically connected to said source of electrical energy, a drop switch included in said open circuit and means included in said closed circuit adapted to be actuated by a change in said latter circuit whereby said drop switch will be permitted to form an electrical connection between the conductor leading from said source of electrical energy and one of the conductors of said closed circuit.

6. An automatic fire alarm system comprising a thermostatic switch having a movable arm, a closed circuit contact mounted on one side of said arm and normally engaged by the latter, and an open circuit contact and a secondary contact arranged on the opposite side of said arm, said secondary contact being electrically connected to said closed circuit contact and terminating at a point lower than the open circuit contact, said open circuit and secondary contacts adapted to be successively engaged by said arm upon leaving the closed circuit contact; a closed circuit including said closed circuit contact, the coil of an electro-magnetic drop switch, a source of current and said movable arm; a first alarm open circuit having a lead conductor electrically connected to the closed circuit at a point between the source of current within said closed circuit and said closed circuit contact, a return conductor connected to said open circuit contact and the latter having the coil of another electro-magnetic drop switch therein; a circuit closed by said last mentioned drop switch upon operation thereof for operating an alarm; and, a secondary alarm open circuit including said movable arm, said open circuit and secondary contacts, said first alarm open circuit and the lead conductor of said first alarm open circuit being connected to the closed circuit by means of the first mentioned drop switch at a point between said secondary contact and the coil of the first mentioned drop switch.

7. An automatic fire alarm system comprising a closed circuit, an open circuit, an alarm device, controlling means for said alarm device adapted to be operated by said open circuit, a thermostatically controlled switch comprising a movable blade, a main and auxiliary closed circuit contacts arranged upon the opposite sides of said blade, an open circuit contact, a drop switch included in said open circuit, means included in said closed circuit for maintaining said drop switch in an open position whereby a change will be necessary in said closed circuit in order that said drop switch may assume a closed position within said open circuit, a conductor included in said closed circuit and connected to said blade of the thermostatic switch, another conductor included in said closed circuit and electrically connected to said main and auxiliary closed circuit contacts, a battery included in said open circuit, a conductor leading from said battery and electrically connected to the conductors of the closed circuit, a return conductor electrically connecting said open circuit contact with said battery, said blade normally engaging said main closed circuit contact, said blade adapted to cause said closed circuit to be broken upon leaving said main closed circuit contact and close said open circuit upon touching said open circuit contact whereby said controlling means for the alarm device may be operated.

8. An automatic fire alarm system comprising a closed circuit, an open circuit, an alarm device, controlling means for said alarm device operable only by a change in said open circuit, means included in said closed circuit for permitting a change to take place in said open circuit only after a change has taken place in said closed circuit, thermostatically controlled means adapted to first produce a change in said closed circuit and subsequently effect a change in said open circuit whereby said controlling means of the device may be operated, said open and closed circuits comprising a plurality of conductors over any two of which the current in the open circuit may pass should a fault arise in the remaining conductors said conductors being arranged in pairs and each pair of conductors being positioned at points remote from one another.

In witness whereof I have hereunto set my hand.

OTTO BREEDON ELLIOTT.