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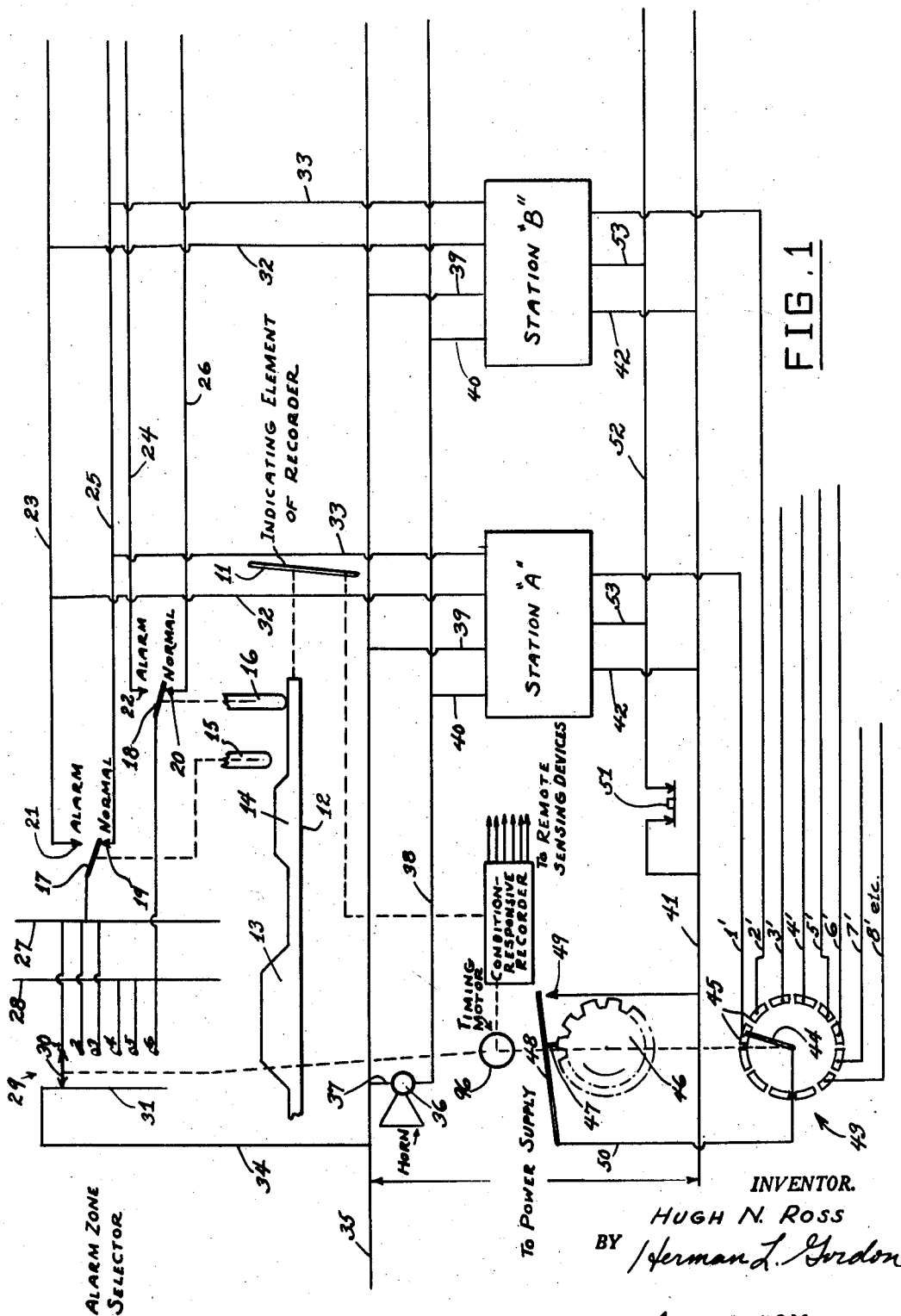
H. N. ROSS

2,730,703

MULTI-STATION CONDITION-RESPONSIVE ALARM SYSTEM

Filed March 5, 1954

2 Sheets-Sheet 1



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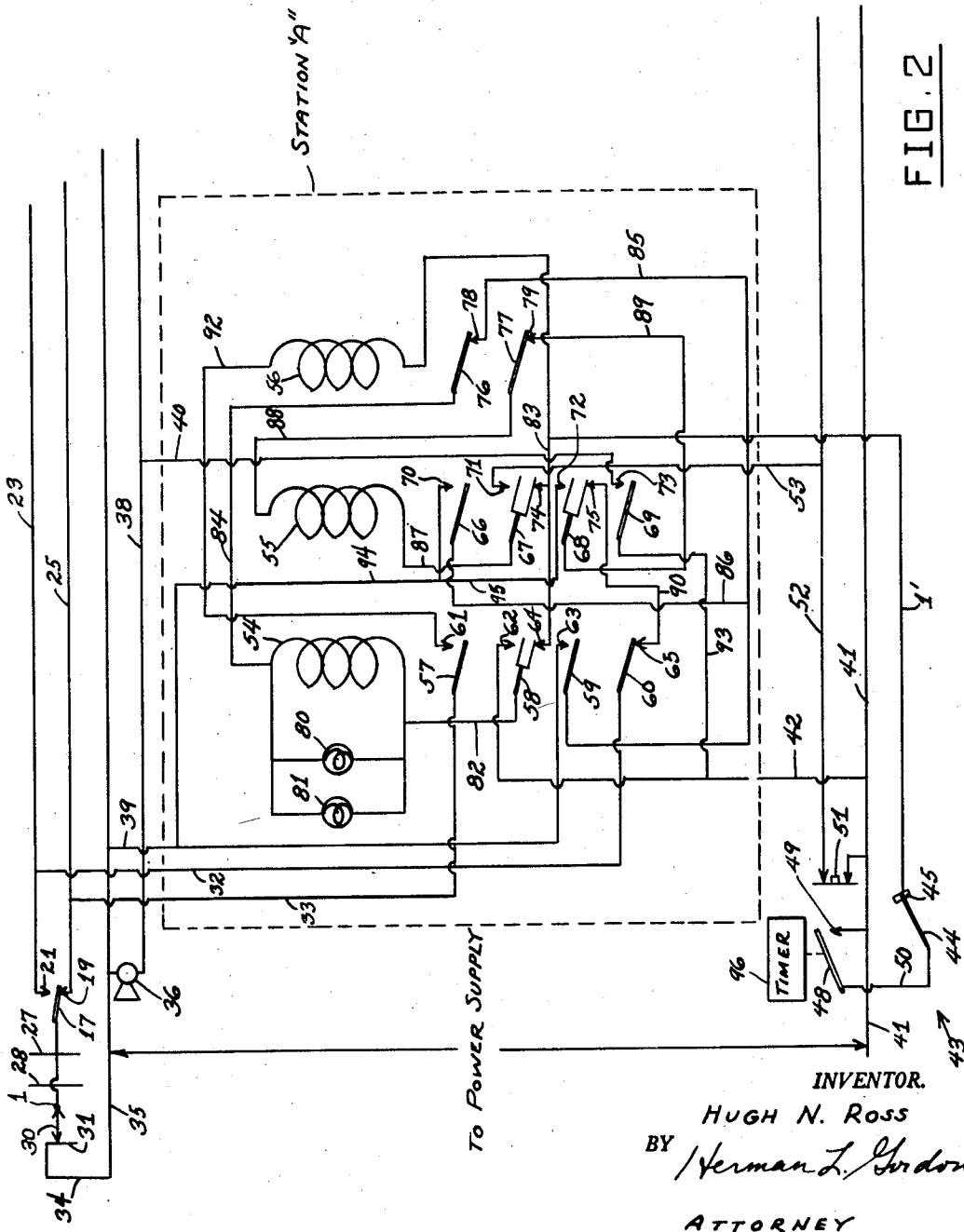
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2 Sheets-Sheet 2



1

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MULTI-STATION CONDITION-RESPONSIVE ALARM SYSTEM

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8 Claims. (Cl. 340-213)

This invention relates to electrical alarm systems, and more particularly to a relay system for operating both a common alarm device and individual alarm devices at respective stations from signal contacts in a multi-station, printing-type recorder.

A main object of the invention is to provide a novel and improved electrical alarm system which involves simple components, which is reliable in operation, and which provides continuous supervision of a plurality of stations which may be at different locations and wherein the alarm condition for selected groups of stations may be different from the alarm condition for other groups of stations.

A further object of the invention is to provide an improved electrical alarm system which includes both visual and audible alarm devices, said system requiring only an intermittently closing alarm contact, and requiring only an intermittently closing contact to return the system to normal automatically.

A still further object of the invention is to provide an improved multiple-station alarm system which operates a common audible alarm device but wherein each station has a separate visual alarm device, the system being so arranged that any station can be in either an alarm condition or a normal condition without interacting with the other stations, the system being provided with means for silencing the common audible alarm device without causing the extinction of the visible signal at a station subjected to alarm conditions, said visible signal continuing until a normal condition for the station has been resumed.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

Figure 1 is a schematic diagram showing the main elements of an improved multi-station alarm system constructed in accordance with the present invention.

Figure 2 is a wiring diagram of the electrical connections of the elements of one of the stations of the system diagrammatically illustrated in Figure 1.

Referring to the drawings, the system is applied to a plurality of stations, comprising the stations "A," "B," etc., which may be physically separated by substantial distances, and wherein supervision of a varying condition, such as temperature, humidity, etc., for the respective stations is desired.

Associated with the system is a conventional recording condition-responsive instrument which is successively connected to a plurality of remote sensing devices by a timing motor 96 and which is provided with an indicating element 11, such as an indicating pointer. Mechanically linked in any suitable manner to the indicating element 11 is a rectilinearly movable cam bar 12 formed with spaced cam portions 13, 14, etc., corresponding to different zones on the scale of the condition-responsive instrument. Designated at 15, 16, etc., are respective cam follower elements which are arranged to be individually engaged by different cam portions 13, 14, etc.,

2

as the indicating element 11 moves into the respective scale zones corresponding to said cam portions. The respective cam follower elements are provided with suitable guide means of a conventional nature constraining the follower elements to paths of movement fixed in relation to the path of movement of the cam bar 12, for example, perpendicular to said cam bar.

Mechanically linked to the respective cam follower elements 15, 16, etc., are the respective movable switch contact poles 17, 18, etc., having lower stationary contacts 19, 20, etc., normally engaged by the switch poles, and upper stationary contacts 21, 22, etc., engaged by the poles under alarm conditions, namely, when the cam follower elements 15, 16, etc., engage their associated cam portions 13, 14, etc., as will be seen from Figure 1.

The upper contacts 21, 22, etc., are connected to respective alarm lines 23, 24, etc., associated with the respective condition zones, and the lower contacts 19, 20, etc., are connected to respective normal condition lines 25, 26, etc., associated with the respective normal condition values of the system.

The respective poles 17, 18, etc., are connected to respective "condition zone" conductors 27, 28, etc., as shown. Thus, each of the conductors 27, 28, etc., is associated with a zone on the scale of the condition-indicating instrument, corresponding to a respective cam portion 13, 14, etc.

Designated at 29 is a zone selector device driven by timer motor 96 and synchronized with a selector 43 for setting the system to give an alarm when the condition being supervised for a selected group of stations is in a zone considered abnormal for this group of stations. Thus, the device 29 may comprise a movable switch contact 30 continuously engaging a conductive member 31 and being selectively engageable with a plurality of contacts 1, 2, 3, 4, 5, 6, etc., as diagrammatically illustrated in Figure 1. Certain of the contacts, for example, contacts 1, 2 and 3 are connected to one zone conductor, such as the zone conductor 27, and others of the contacts are connected to other zone conductors, such as to zone conductor 28. The respective stations are connected to selected zone wires, such as to zone wires 23, 25, as by wires 32, 33. The respective stations are connected to the zone wires associated with the respective condition zone conductors 27, 28, etc., corresponding to the respective zones of the supervised condition, such as temperature, humidity, or the like, considered to be abnormal for the respective stations.

To set the system to provide such supervision, the movable switch contact 30 is adjusted to engage a contact 1, 2, 3, etc., connected to the proper condition zone conductor. For example, in Figure 1, switch contact 30 is set to electrically connect zone conductor 27 to conductive member 31, thus setting the system to provide an alarm if the abnormal zone of the supervised condition for any of the stations "A," "B," etc., connected to zone wires 23 and 25 exists, since, if said abnormal zone exists, the cam follower 15 will be engaged by cam portion 13 and cause pole 17 to be moved into engagement with contact 21.

Conductor 31 is connected by a wire 34 to a first line wire 35. Designated at 36 is a horn having one terminal thereof connected by a wire 37 to line wire 35. The other terminal of the horn is connected to a wire 38. The respective stations of the system are connected to wires 35 and 38 by respective sets of wires 39 and 40. Designated at 41 is a second line wire. The respective stations of the system are connected to said second line wire 41 by respective wires 42.

Line wires 35 and 41 are connected to the terminals of a suitable source of current.

Designated generally at 43 is a "station selector," which comprises a movable contact arm 44 successively en-

engageable with respective contacts 45 which are respectively connected by wires 1', 2', 3', etc., to the respective stations "A," "B," etc. The device 43 includes a timer motor 96 which drives the arm 44 and which also drives a notched cam 46. The periphery of said cam is engaged by the depending pawl element 47 of a pivoted switch arm 48, which is thus intermittently engageable with a stationary contact 49 responsive to the rotation of cam 46. The timing motor 96 moves arm 44 successively to different contacting positions engaging the successive contacts 45, corresponding to the different stations "A," "B," etc. The arm 44 remains in contact with each element 45 for a given period and then is moved into contact with the next element 45. The periods of contact are synchronized with the printing periods of the recorder. The switch pole 48 engages contact 49 for a short time near the end of the contact period of arm 44 with an element 45, and printing occurs near the end of said contact period, shortly after pole 48 engages contact 49. Pole 48 is disengaged from contact 49 before the end of the printing period and while arm 44 still engages the contact element 45.

Thus contacts 48, 49 close for a short period immediately before the end of the cycle, namely, before arm 44 is moved into its next contacting position with an element 45.

Arm 48 is connected by a wire 50 to arm 44. Contact 49 is connected to line wire 41. The respective stations are connected to a wire 52 by respective wires 53. Wire 52 is connected to line wire 41 through a normally closed push button switch 51.

Referring to Figure 2, a schematic wiring diagram of station "A" is disclosed, the other stations of the system being identical to station "A." As shown, the station comprises the three normally deenergized relays 54, 55 and 56. Relay 54 has the respective poles 57, 58, 59 and 60. Pole 57 is engageable with a stationary contact 61, pole 58 is engageable with a stationary contact 62, and pole 59 is engageable with a stationary contact 63, when the relay 54 is energized. Normally, pole 58 engages a stationary contact 64 and pole 60 engages a stationary contact 65. Pole 58 is of the "make-before-break" type, namely, pole 58 engages contact 62 before disengaging contact 64, and vice versa.

Relay 55 has the respective poles 66, 67, 68 and 69. Pole 66 is engageable with a stationary contact 70, pole 67 is engageable with a stationary contact 71, pole 68 is engageable with a stationary contact 72, and pole 69 is engageable with a stationary contact 73, when the relay 55 is energized. Normally, pole 67 engages a stationary contact 74 and pole 68 engages a stationary contact 75. Poles 67 and 68 are of the "make-before-break" type.

Relay 56 has the respective poles 76 and 77, which normally engage respective stationary contacts 78 and 79.

Connected in parallel with relay 54 are the signal lamps 80 and 81.

The lower terminal of relay 54, as viewed in Figure 2, is normally connected to wire 1' by a wire 82, pole 58, contact 64, and a wire 83. The upper terminal of said relay is connected by a wire 84 to pole 76. Contact 78 of said pole is connected by a wire 85 to pole 59. Pole 66 of relay 55 is connected to wire 85 by a wire 86.

The lower terminal of relay 55 is normally connected to wire 83 by a wire 87, pole 67, and contact 74. The upper terminal of relay 55 is normally connected to wire 23 by a wire 88, pole 77, contact 79, a wire 89, pole 68, contact 75, a wire 90, contact 65, pole 60, and wire 32.

The lower terminal of relay 56 is connected to wire 83. The upper terminal of said relay is connected by a wire 92 to contact 61 of relay 54. Pole 57 of relay 54 is connected to wire 25 by the wire 33.

Contact 62 of relay 54 is connected by the wire 42 to line wire 41. Pole 69 of relay 55 is connected to wire 42 by a wire 93. Contact 63 of relay 54 is connected by a wire 39 to the other line wire 35.

Contact 70 of relay 55 is connected to wire 39 by a wire 94. Contact 72 of said relay is connected to wire 94 by a wire 95. Contact 71 of said relay is connected to wire 52 by the wire 53. Contact 73 of said relay is connected to wire 38 by the wire 40.

For purposes of describing the operation of the system, it will be assumed that zone selector switch arm 30 engages contact 1, as shown in Figures 1 and 2, and that switch pole 17 engages alarm contact 21, as a result of the existence of an alarm condition for station "A." The timer 96 causes pole 44 to engage the contact 45 connected to wire 1' for a definite interval of time. During said interval, the oscillating switch pole 48 engages contact 49. This energizes relay 55 through a circuit comprising line wire 41, contact 49, pole 48, wire 50, pole 44, contact 45, wire 1', wire 83, contact 74, pole 67, wire 87, relay 55, wire 88, pole 77, contact 79, wire 89, pole 68, contact 75, wire 90, contact 65, pole 60, wire 32, wire 23, pole 17, contact 1, switch arm 30, contact 31, wire 34, and line wire 35.

Before poles 67 and 68 disengage from contacts 74 and 75, said poles engage contacts 71 and 72. This establishes a holding circuit for relay 55 comprising line wire 41, push button switch 51, wire 52, wire 53, contact 71, pole 67, wire 87, relay 55, wire 88, pole 77, wire 89, pole 68, contact 72, wires 95, 94, wire 39 and line wire 35.

The energization of relay 55 causes pole 69 to engage contact 73 and energize horn 36 through a circuit comprising line wire 41, wire 42, wire 93, pole 69, contact 73, wire 40, horn 36, and line wire 35.

The energization of relay 55 also causes pole 66 to engage contact 70, whereby relay 54 is energized through a circuit comprising line wire 41, contact 49, pole 48, wire 50, pole 44, contact 45, wire 1', wire 83, contact 64, pole 58, wire 82, relay 54, wire 84, pole 76, contact 78, wire 85, wire 86, pole 66, contact 70, wire 94, wire 39, and line wire 35.

The signal lamps 80 and 81, connected in parallel with relay 54, are also thus energized.

Before pole 58 disengages from contact 64, it engages contact 62 and establishes a holding circuit for relay 54, comprising line wire 41, wire 42, contact 62, pole 58, wire 82, relay 54, wire 84, pole 76, contact 78, wire 85, pole 59, contact 63, wire 39, and line wire 35.

Thus, the horn 36 will give an audible signal of the alarm condition, and the signal lamps 80 and 81 at the station concerned, for example, station "A," will give a visual signal of said alarm condition.

The horn 36 can be silenced by deenergizing relay 55, to cause pole 69 to disengage from contact 73. This is done by opening the push button switch 51, whereby the holding circuit for relay 55 is broken. Since pole 58 is now disengaged from contact 64, relay 55 will remain deenergized. The visual signals provided by lamps 80 and 81 will continue to be given as long as the alarm condition continues.

When the condition again becomes normal, pole 17 disengages from contact 21 and engages contact 19. This energizes relay 56 when wire 1' is again connected to line wire 41, through a circuit comprising line wire 41, contact 49, pole 48, wire 50, pole 44, contact 45, wire 1', wire 83, relay 56, wire 92, contact 61, pole 57, wire 33, wire 25, pole 17, contact 1, pole 30, contact 31, wire 34, and line wire 35.

The energization of relay 56 breaks the holding circuits for relays 54 and 55 respectively at the contacts 76, 78 and 77, 79 of relay 56. At the same time, the energizing circuit for relay 56 is broken at contacts 57, 61 of relay 54, causing relay 56 to become deenergized, restoring the system to its original state.

It will be thus apparent that if normal condition occurs before the horn 36 has been silenced manually, both the horn and the signal lamps 80, 81 will become deenergized.

The sequence of events above described is for one of

5

the stations of the system. All of the stations operate the common horn 36, but each station has its separate signal lamps. Any of the stations can be in any of the phases of its cycle of operations without interacting with the other stations.

While a specific embodiment of an improved multi-station, condition-responsive alarm system has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. In combination, a condition-responsive device having an alarm position and a normal position, a common audible alarm device, a plurality of stations, a respective visual alarm device connected to each station, first relay means at each station, means for energizing said common audible alarm device and the visual alarm device of a station when said first relay means thereof becomes energized, means energizing said first relay means when said condition-responsive device assumes said alarm position, second relay means at each station, means energizing said second relay means when the condition-responsive device moves from alarm to normal position, means deenergizing said first relay means in response to the energization of said second relay means, and means deenergizing said second relay means responsive to the deenergization of said first relay means.

2. In combination, a condition-responsive device having an alarm position and a normal position, a common audible alarm device, a plurality of stations, a respective visual alarm device connected to each station, first normally deenergized relay means at each station, means for energizing said common audible alarm device and the visual alarm device of a station when said first relay means thereof becomes energized, means energizing said first relay means when said condition-responsive device assumes said alarm position, second normally deenergized relay means at each station, means energizing said second relay means when the condition-responsive device moves from alarm to normal position, means deenergizing said first relay means in response to the energization of said second relay means, and means deenergizing said second relay means responsive to the deenergization of said first relay means.

3. In combination, a condition-responsive device having an alarm position and a normal position, a common audible alarm device, a plurality of stations, a respective visual alarm device connected to each station, first relay means at each station, means for energizing said common audible alarm device and the visual alarm device of a station when said first relay means thereof becomes energized, means for independently deenergizing said common audible alarm device, means energizing said first relay means when said condition-responsive device assumes said alarm position, second relay means at each station, means energizing said second relay means when the condition-responsive device moves from alarm to normal position, means deenergizing said first relay means in response to the energization of said second relay means, and means deenergizing said second relay means responsive to the deenergization of said first relay means.

4. In combination, a condition-responsive device having an alarm position and a normal position, a common audible alarm device, a plurality of stations, a respective visual alarm device connected to each station, first relay means at each station, a source of current, means intermittently connecting the respective stations at different times to said source of current, means for energizing said common audible alarm device and the visual alarm device of a station from said source when said first relay means thereof becomes energized, means energizing said first relay means from said source when said condition-respon-

6

sive device assumes said alarm position, second relay means at each station, means energizing said second relay means from said source when the condition-responsive device moves from alarm to normal position, means deenergizing said first relay means in response to the energization of said second relay means, and means deenergizing said second relay means responsive to the deenergization of said first relay means.

5. In combination, a condition-responsive device having an alarm position and a normal position, a common audible alarm device, a plurality of stations, a respective visual alarm device connected to each station, first normally deenergized relay means at each station, a source of current, means intermittently connecting the respective stations at different times to said source of current, means for energizing said common audible alarm device and the visual alarm device of a station from said source when said first relay means thereof becomes energized, means for independently deenergizing said common audible alarm device, means energizing said first relay means from said source when said condition-responsive device assumes said alarm position, second normally deenergized relay means at each station, means energizing said second relay means from said source when the condition-responsive device moves from alarm to normal position, means deenergizing said first relay means in response to the energization of said second relay means, and means deenergizing said second relay means responsive to the deenergization of said first relay means.

6. In combination, a condition-responsive device having an alarm position and a normal position, a common first alarm device, a plurality of stations, a respective additional alarm device connected to each station, first relay means at each station, means for energizing said first alarm device and the additional alarm device of a station when said first relay means thereof becomes energized, means energizing said first relay means when said condition-responsive device assumes said alarm position, second relay means at each station, means energizing said second relay means when the condition-responsive device moves from alarm to normal position, means deenergizing said first relay means in response to the energization of said second relay means, and means deenergizing said second relay means responsive to the deenergization of said first relay means.

7. In combination, a condition-responsive device having an alarm position and a normal position, a common first alarm device, a plurality of stations, a respective additional alarm device connected to each station, first relay means at each station, a source of current, means intermittently connecting the respective stations at different times to said source of current, means for energizing said first alarm device and the additional alarm device of a station from said source when said first relay means thereof becomes energized, means energizing said first relay means from said source when said condition-responsive device assumes said alarm position, second relay means at each station, means energizing said second relay means from said source when the condition-responsive device moves from alarm to normal position, means deenergizing said first relay means in response to the energization of said second relay means, and means deenergizing said second relay means responsive to the deenergization of said first relay means.

8. In combination, a condition-responsive device having an alarm position and a normal position, a first alarm device, a plurality of stations, a respective additional alarm device connected to each station, first relay means at each station, means intermittently connecting the respective stations at different times to said condition-responsive device, means for energizing said first alarm device and the additional alarm device of a station when said first relay means thereof becomes energized, means energizing said first relay means when said condition-responsive device

assumes said alarm position, second relay means at each station, means energizing said second relay means when the condition-responsive device moves from alarm to normal position, means deenergizing said first relay means in response to the energization of said second relay means, and means deenergizing said second relay means responsive to the deenergization of said first relay means. 8

References Cited in the file of this patent

UNITED STATES PATENTS

1,443,165	Brown	Jan. 23, 1923
1,719,506	Field	July 2, 1929
2,493,548	Proctor	Jan. 3, 1950
2,578,447	Odell et al.	Dec. 11, 1951