

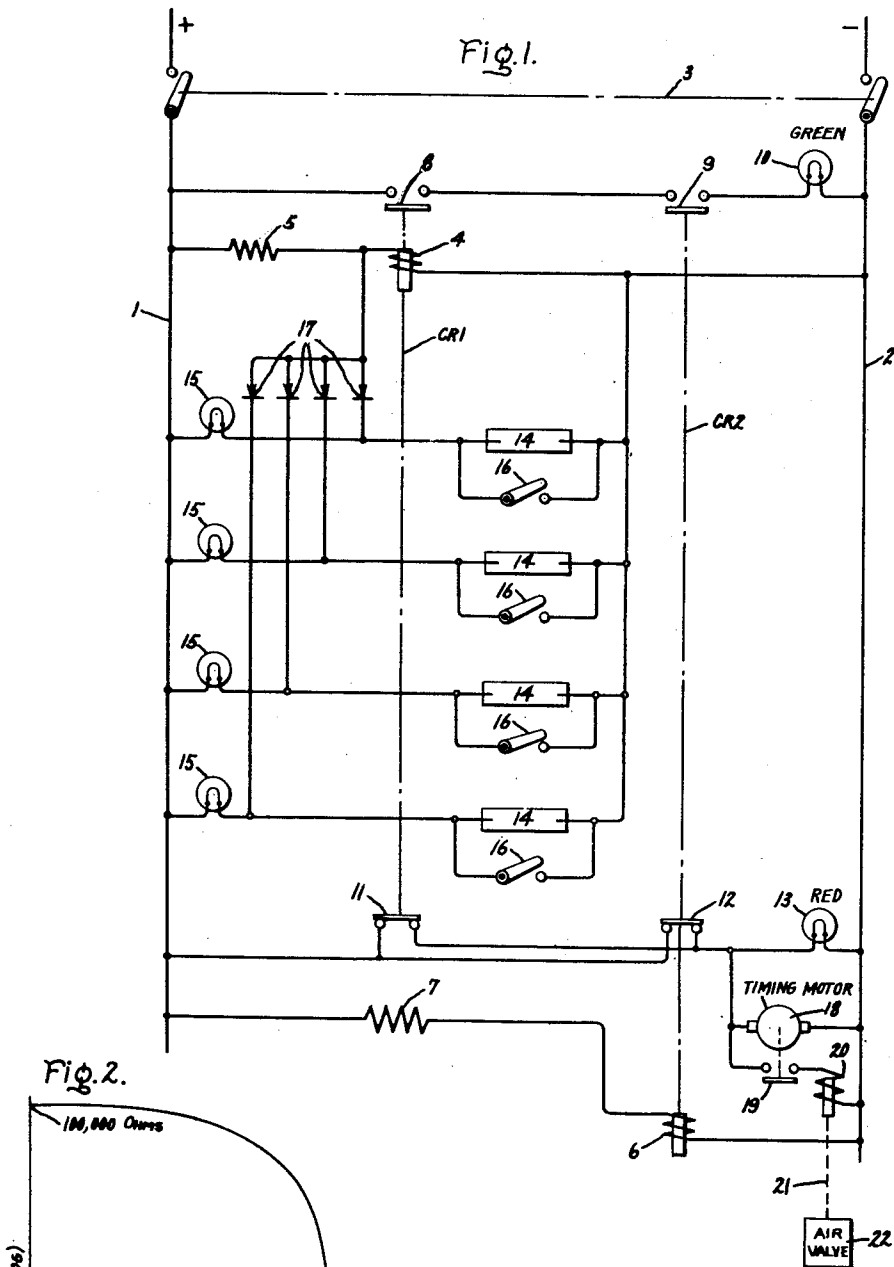
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ANNUNCIATOR ALARM SYSTEM

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ANNUNCIATOR ALARM SYSTEM

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6 Claims. (Cl. 177-311)

1 My invention relates to electric annunciator alarm systems and the like, and is particularly applicable to apparatus for remotely indicating the existence of an undesired condition at any one of a plurality of spaced-apart stations. For example, my invention is especially suitable to apparatus for remotely indicating excessive temperature of railroad car journal bearings and the like, and simultaneously identifying the bearing at which the indicated over-temperature exists.

Accordingly, it is a general object of my invention to provide a new and improved electric annunciator alarm system which is at once simple, inexpensive and dependable in operation.

It is another object of my invention to provide a new and improved annunciator alarm system in which a common control means is simultaneously operable in conjunction with operation of any one of the annunciator indicating means.

It is a more particular object of my invention to provide a new and improved electric annunciator alarm system, in which simultaneous operation of a common control means and an affected station indicator is provided without effecting any false operation of any other station indicator.

My invention itself will be more fully understood and its various objects and advantages further appreciated by referring now to the following detailed specification taken in conjunction with the accompanying drawing, in which Fig. 1 is a schematic circuit diagram of an annunciator alarm system embodying my invention, and Fig. 2 is a graphical representation of the preferred resistance-temperature characteristic of the various temperature-sensitive resistance elements, or thermistors, illustrated at Fig. 1.

Referring now to the drawing, and more particularly to Fig. 1, I have there illustrated, as a preferred embodiment of my invention, an electric alarm system of the annunciator type particularly adaptable to journal bearing over-temperature indication in railroad cars and the like. I provide a pair of direct current supply conductors 1 and 2 adapted to be connected respectively to the positive and negative terminals of any suitable source of direct current supply (not shown) by means of a manual control switch 3. A control relay CR1 is provided with an actuating winding 4 connected between the supply conductors 1 and 2 in series circuit relation with a current-limiting resistor 5. A second control relay CR2 is provided with an actuating winding

6 connected between the supply conductors 1 and 2 in series with a current limiting resistor 7. The control relays CR1 and CR2 are provided with normally open contacts 8 and 9, respectively, and normally closed contacts 11 and 12, respectively. A green indicating lamp 10 is connected across the supply conductors 1 and 2 in series with both normally open relay contacts 8 and 9. The normally closed relay contacts 11 and 12 are connected in parallel circuit relation with each other and arranged separately to connect across the supply conductors 1 and 2 a red indicating lamp 13.

Connected across the supply conductors 1 and 2 in parallel circuit relation with the control relay energizing circuits are a plurality of indicating or annunciator circuits. Each annunciator circuit includes in series circuit relation a temperature-sensitive resistance element, or thermistor, 14 and a lamp 15 or other electro-responsive station indicating device. Each temperature-sensitive resistor 14 is connected to be shunted by a manual test switch 16.

In order to provide a significant and positive over-temperature indication the negative temperature coefficient resistors 14 should be of the type demonstrating a sharp break in electrical resistance at a critical temperature or within a narrow critical range of temperatures. While various negative temperature coefficient resistors well known to those skilled in the art are usable in conjunction with my invention, I prefer to use for such resistor a pressed or sintered mixture of metal sulfides including at least one sulfide of a metal of group II of the periodic table, such as disclosed and claimed in my copending application Ser. No. 106,293, filed July 22, 1949 and entitled "Resistance Materials and Elements." Although a number of the compounds disclosed in my copending application may be used in practicing my subject invention, I find particularly suitable a sintered resistance material containing by weight about 20%-30% calcium sulfide, .03%-10% molybdenum sulfide, .03%-10% sulfur and the remainder silver sulfide. Such a resistance material demonstrates a relatively sharp break in electrical resistance at about 175° C., and has a resistance-temperature characteristic of the type graphically illustrated at Fig. 2. At Fig. 2 the ordinate of the curve represents electrical resistance in ohms, plotted on a logarithmic scale, and the abscissa represents temperature in degrees centigrade. As illustrated at Fig. 2, such a resistor may have a resistance of 100,000 ohms at 0° C., decreasing abruptly at about 175° C. to about 4 or 5 ohms. Effectively such a re-

sistance element acts as an insulator at normal temperatures, but offers very little resistance to the flow of current when exposed to a temperature of 175° C. The decrease of resistance is so abrupt that the resistor functions effectively as a switch.

In order to provide simultaneous operation of the control relay CR1 upon energization of any one of the indicating lamps 15, I provide a plurality of unilateral conducting devices, such as dry plate rectifiers 17, each connected to shunt the actuating winding 4 of the control relay CR1 through a separate one of the temperature-sensitive resistors 14. In this connection it will be noted that the common terminals of the rectifiers 17 are connected to the point between the actuating winding 4 and the current-limiting resistor 5, so that current passing through any rectifier 17 does not short-circuit the associated indicating lamp 15.

If desired, any suitable control means may be provided in addition to the indicating means described above. As illustrative of such control means, I have shown connected in parallel circuit relation with the red indicating lamp 13 a timing motor 18 having a normally open contact 19 which is arranged when timed closed to connect in parallel circuit relation also with the red indicating lamp 13 an actuating winding 20 of an air valve control solenoid 21. The solenoid 21 is connected to control an air valve 22, which may suitably be arranged to bring into operation the vehicle air brake system.

It may now be assumed that in operation each of these negative temperature coefficient resistance elements 14 is embedded in a different journal bearing of a railroad car or the like, or is otherwise located for response to the bearing temperature. The indicating lamps 10, 13 and 15, as well as the test switches 16, are all located upon a common control panel inside the car and remote from the journal bearings.

In operation, when the manual control switch 3 is closed, unidirectional potential is applied to the supply conductors 1 and 2. Such application of potential to the supply conductors causes both the control relays CR1 and CR2 to pick up. When both these relays are picked up the contacts 11 and 12 are opened, so that the energizing circuit for the red indicating lamp 13 and the timing motor 18 is interrupted. At the same time the control relay contacts 8 and 9 are closed, so that the energizing circuit for the green indicating lamp 10 is completed. So long as all the bearing temperatures are normal, the resistance elements 14 have such high resistance that no significant amount of current passes through the indicating lamps 15 or the rectifiers 17. The operability of any series indicating circuit through the lamps 15 may be tested by short-circuiting the associated resistance element 14 through the connected test switch 16. For the purpose of illustration, however, let it be assumed that all the test switches 16 are open. Under this condition the control relay CR2 provides undervoltage protection, in that whenever the supply voltage between the conductors 1 and 2 falls below a predetermined safe value the relay CR2 drops out, thereby opening its contact 9 and closing its contact 12. When the contact 9 is opened, the green indicating lamp 10 is de-energized, and when the contact 12 is closed the red indicating lamp 13 and the timing motor 18 are energized. If now no action is taken by an operator, the timing motor 18 closes its contact

19 after a delay interval and thereby energizes the solenoid 21 which actuates the air valve 22.

Let it now be assumed that the supply voltage between the conductors 1 and 2 remains normal but that one of the journal bearings attains a temperature of the order of 175° C., so that the associated temperature sensitive resistor 14 abruptly decreases its resistance. Such decrease of resistance of any one of the resistance elements 14 permits a significant current to flow through the series indicating circuit including that resistance element and the connected indicating lamp 15. At the same time the effected resistance element 14 substantially short-circuits the control relay actuating winding 4 through the associated rectifier 17. Thus, as soon as any one of the indicating lamps 15 is energized the actuating winding 4 is effectively short-circuited and the control relay CR1 drops out. When the control relay CR1 drops out it opens its contact 8, thereby to de-energize the green indicating lamp 10, and closes its contact 11 to energize the red indicating lamp 13 and the timing motor 18. As previously described, energization of the timing motor 18 effects energization of the solenoid 21 after a delay interval, thereby to actuate the air valve 22.

It will now be noted that when any one of the negative temperature coefficient resistance elements 14 becomes operative to permit energizing current to flow through the serially connected indicating lamp 15, current is prevented from flowing through any other indicating lamp 15 by reason of the interposition of the rectifiers 17 between the parallel-connected series indicating circuits. Specifically, current flowing through any affected resistance element 14 would have to flow through two of the rectifiers 17 to reach any indicating lamp 15 other than that connected directly in series with the affected resistance element. Such two rectifiers, however, are connected back to back, so that no current can flow in either direction through both in series. By this arrangement false operation of unaffected indicating lamp 15 is prevented while permitting simultaneous operation of any affected indicating lamp 15 and the control relay CR1.

While I have described only a preferred embodiment of my invention by way of illustration, many modifications will occur to those skilled in the art, and I, therefore, wish to have it understood that I intend in the appended claims to cover all such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric annunciator system for connection to a source of direct current supply, a plurality of condition-responsive resistance elements adapted to be located at spaced-apart stations separately subject to variation of said condition, an electro-responsive indicating device connected in series circuit relation with each said resistance element, an electro-responsive control device, and separate unilateral conducting devices connecting said resistance elements separately to shunt said control device.

2. In an electric annunciator alarm system for connection to a source of direct current supply, a plurality of temperature-sensitive resistance elements adapted to be positioned at spaced-apart stations, said resistance elements demonstrating an abrupt change of resistance within a narrow critical range of temperature variation, an electro-responsive indicating device connected in se-

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ries circuit relation with each of said resistance elements, an electro-responsive control device, and separate unilateral conducting devices similarly disposed and connecting said resistance elements separately to shunt said control device.

3. In an electric annunciator system for connection to a source of direct current supply, a plurality of condition-responsive resistance elements adapted to be positioned at spaced-apart stations separately subject to variation of said condition, an electro-responsive indicating device connected in series circuit relation with each said resistance element, said resistance elements normally having a resistance sufficiently high to prevent appreciable flow of current through said indicating devices and demonstrating an abrupt decrease of resistance substantially at a predetermined value of said condition, an electro-responsive control device, and separate unilateral conducting devices connecting said resistance elements separately to shunt said control device, said unilateral conducting devices being disposed to permit current traversing any resistance element to affect only the indicating device serially connected thereto.

4. In an electric annunciator system for connection to a source of direct current supply, a pair of supply conductors, a plurality of condition-responsive resistance elements adapted to be positioned at spaced-apart stations separately subject to variation of said condition, an electro-responsive indicating device connected in series circuit relation with each of said resistance elements across said supply conductors, said series indicating circuits being disposed in parallel circuit relation with each other, an electro-responsive control device connected across said supply conductors in parallel circuit relation with said series indicating circuits, and separate unilateral conducting devices connecting said resistance elements separately to shunt said control device.

5. In an electric annunciator system for connection to a source of direct current supply, a pair of supply conductors, a plurality of condi-

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tion-responsive resistance elements adapted to be positioned at spaced-apart stations separately subject to variation of said condition, an electro-responsive indicating device connected in series circuit relation with each said resistance element across said supply conductors, said series indicating circuits being disposed in parallel circuit relation with each other, an electro-responsive control device connected across said supply conductors in series circuit relation with a current limiting resistor, and separate unilateral conducting devices connecting said resistance elements separately to shunt said control device, said unilateral conducting devices connecting each said indicating device in parallel circuit relation with said current limiting resistor and preventing transfer of current between said series indicating circuits.

6. In an electric annunciator alarm system for connection to a source of direct current supply, a pair of supply conductors, a plurality of temperature-sensitive resistance elements adapted to be positioned at spaced-apart stations separately subject to temperature variation, said resistance elements having a negative temperature coefficient of resistance and demonstrating an abrupt change in resistance within a narrow critical range of temperature, an electro-responsive indicating device connected in series circuit relation with each said resistance element across said supply conductors, an electro-responsive control device connected across said supply conductors in series circuit relation with a current-limiting resistor, and separate unilateral conducting devices connecting each said resistance element separately to shunt said control device, said unilateral conducting devices connecting each said indicating device in parallel circuit relation with said current-limiting resistor and preventing false operation of unaffected indicating devices when any one of said resistance elements is within said critical temperature range.

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No references cited.