Oct. 5, 1948. J. SCHMIDINGER 2,450,450

SUPERVISORY INDICATING CIRCUIT

Filed May 8, 1945

FIG. 1

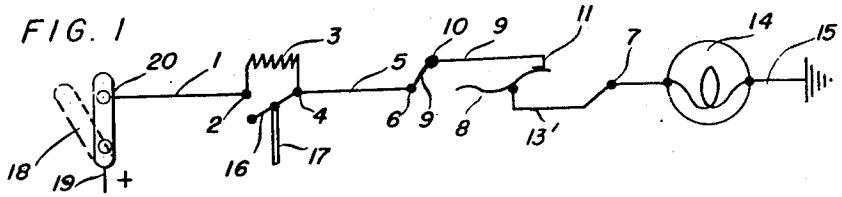


FIG. 2

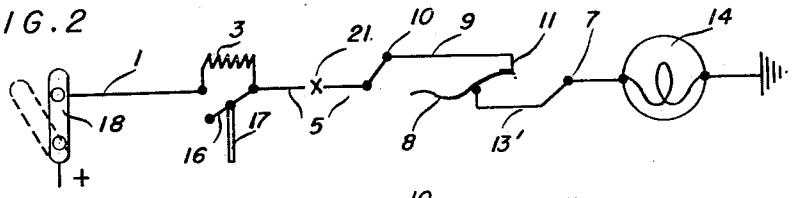


FIG. 3

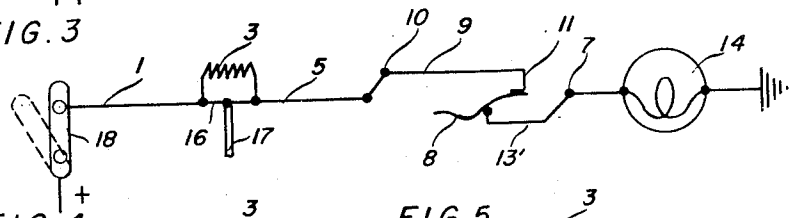


FIG. 4

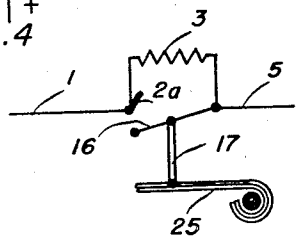


FIG. 5

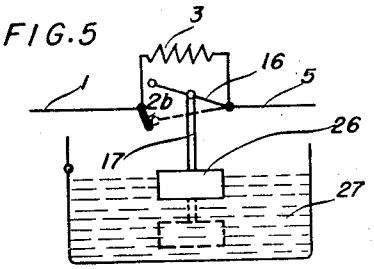


FIG. 6

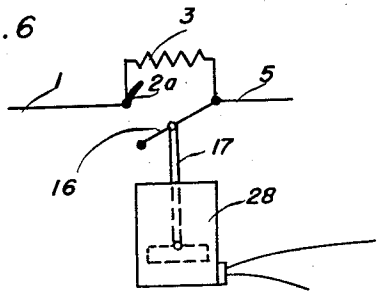
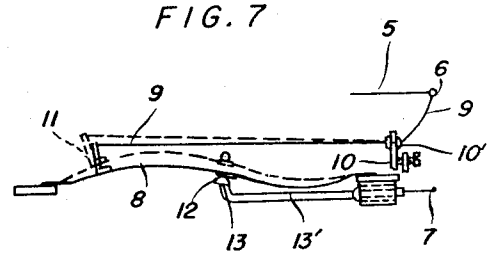


FIG. 7



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SUPERVISORY INDICATING CIRCUIT

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3 Claims. (Cl. 177—311)

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My invention relates to signal lamp systems and comprises a system of this type suitable for use to guard conditions such as liquid levels, temperatures, pressure or the like to give a warning in the event of a departure of the guarded condition from the desired values or of a failure or injury to the wiring system.

An object of the invention is to provide an improved guard system of the above general type.

A further object of the invention is to provide a signal lamp or guard system wherein all the switch and wiring elements are connected in series with the signal device.

Still another object of the invention is to provide a signal lamp system wherein the signal lamp burns at a steady dimmed glow when the guarded condition and the entire wiring system of the circuit is normal and flashes brightly the instant a dangerous condition exists.

Other and further objects of the invention will become apparent as the description proceeds.

For a better understanding of the invention reference may be had to the accompanying drawings, of which,

Fig. 1 is a diagrammatic circuit drawing of a signal system embodying the invention;

Figs. 2 and 3 illustrate the system of Fig. 1 under different circuit conditions;

Figs. 4, 5 and 6 illustrate diagrammatically different conditions which may be guarded by the system of Figs. 1 to 3; and

Fig. 7 illustrates a thermal switch suitable for use in the signal system of Figs. 1 to 3.

Referring to the drawings I have illustrated in Figs. 1, 2 and 3 a simple circuit embodying my invention, the three figures corresponding to different circuit conditions.

The circuit comprises a branch 1 leading to a contact 2 and then through a resistance 3. From the resistance the current flows to the contact 4 into a branch wire 5 to a contact 6. Between the contacts 6 and 7 is disposed a normally closed vane type thermal switch preferably of the general character shown in Fig. 7. This switch comprises a constrained vane 8 which is operated by a pull wire 9, the latter being fixedly attached to a suitable frame at 10 at one end as by insulating bead 10' and at the other end to a bracket arm 11 which is fastened to the constrained vane 8. The vane 8 carries a contact 12 which cooperates with a fixed or stationary contact 13. The circuit continues from the contact 13 to the arm 13' carrying the contact to the terminal 7. From the terminal 7 the circuit runs through a device 14 which is preferably an electric lamp or the

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like. From the lamp the current flows through the branch 15 to the ground connection shown. A switch member 16, illustrated diagrammatically, controls the resistance 3, as, for example, by short-circuiting this resistance in one position and opening the short-circuit in another position; the switch 16 being shown in Figs. 1 and 2 in the latter position. When the switch 16 is open and the resistance 3 is in circuit, the contacts 12 and 13 of the vane switch remain closed as the electric current through the pull wire 9 is insufficient to heat up the pull wire to the point where its expansion would permit the vane 8 to snap to open circuit position, but when the resistance 3 is short-circuited the current is sufficient to heat up the wire and cause expansion thereof sufficiently to permit the opening of the circuit at the contacts 12 and 13 by the snap action of the vane 8. When the switch 16 is again opened, the pull wire 9 contracts due to the decreased heating current flowing therethrough and thereby operates the vane 8 to close the circuit at the contacts 12 and 13. With the switch 16 closed to short-circuit the resistance 3, the thermal switch successively opens and closes the circuit at the contacts 12 and 13 to flash on and off the signal lamp 14. The switch 16 may be operated by any element responding to a condition to be determined by closure of the main circuit as, for example, it may be operated responsively to the temperature of some compartment, chamber or the like, or to a liquid level to be tested or guarded or a pressure to be tested or guarded. These are examples of means for controlling the switch 16 but it is understood that there are numerous such devices and means to be guarded or tested.

I have diagrammatically shown an operating means 17 operatively connected with the switch 16 and it is understood that this means 17 responds to the temperature, liquid level, pressure or other condition of the apparatus to be tested or guarded.

The main circuit is energized by a switch 18, this switch 18 being connected with the positive side of an energizing circuit indicated at 19 and with its free end connecting the circuit 19 with the circuit 1 at the contact 20. When it is desired to test the device or apparatus to be guarded, it is only necessary to close the switch 18, thereby energizing the main circuit through the normally closed contacts 12 and 13. The voltage supply and the resistance of the circuit are so adjusted that when the lamp 14 burns dimly everything is normal, that is the guard circuit is nowhere impaired either by breakage or otherwise and the

switch 16 is in the open position corresponding to the normally desired condition of the apparatus, device, etc. to be tested or guarded. Fig. 1 indicates this all-clear condition or the normal condition, whatever the normal condition may be.

If the guard circuit should be impaired as, for example, by being broken, this would be indicated by the lamp 14 being completely out. This condition is illustrated in Fig. 2 wherein a break 21 is indicated in the main circuit.

If the condition, as for example the temperature condition, the liquid level condition, the pressure condition, etc. is not normal, or the desired condition, which in the particular embodiment shown corresponds to the short-circuiting of the resistance 3 by the switch 16, then the thermal switch, due to the increased heating current flowing through the pull wire 9 flashes the lamp 14 on and off; the lamp burning brightly when on, due to the short-circuiting of the resistance 3. This condition is indicated in Fig. 3. This also indicates that the guard circuit is unimpaired and in working condition.

Figs. 4, 5 and 6 illustrate as examples three of the many conditions which may be guarded or tested by the circuit of Figs. 1, 2 and 3. In Fig. 4 I have shown a bi-metallic thermostatic element 25 operatively connected with the switch 16. The element 25 responds to the temperature condition of a device or chamber to be guarded, as, for example, a dangerously high or low temperature condition. If desired, the contact 2 at the terminal of resistor 3 may be elongated to form an arc, as indicated at 2a, to insure shunting of resistor 3 over a range of temperatures of the element 25. For example, if excessive temperatures are to be guarded against, as for example, of an engine radiator, the element 25 would close the switch 16 when the temperature exceeds a predetermined value and the switch would be maintained closed at still higher temperatures by engagement of the movable arm with the arcuate contact 2a. I may mention as examples engine radiator temperature or the temperature of any liquid.

In Fig. 5 I have shown diagrammatically a liquid level responsive device such as a float 26 which is operatively connected with the switch 16 to close the same when the level of the liquid in a tank 27 departs from a desired value. If the condition to be guarded against is a low liquid level, a depending arcuate contact 2b could be provided to insure shunting of the resistor 3 at any liquid level below that desired.

In Fig. 6 I have shown the switch 16 as operatively connected with a pressure device or indicator 28 for responding to low or high pressures, hydraulic, pneumatic, fluid pressures generally, vacuums, etc. As in Fig. 4 an arcuate contact 2a may be provided to maintain the switch 16 closed throughout a predetermined pressure range.

From the above description it will be apparent that I have devised a simple and effective signal or guard system which insures prompt indication not only of the occurrence of a dangerous or unwanted condition but also of the failure of any part of the system itself. In the new system it is important, as heretofore indicated, that the various series resistances, that of the element 3, of the pull wire 9 and of the filament of lamp 14, be so proportioned with respect to each other and with respect to the supply voltage, that the current flowing through the circuit when the switch 16 is open is insufficient to cause opening

of the contacts of the vane switch or to cause the lamp 14 to burn brightly while the current in the circuit when resistance 3 is shorted by switch 16 is sufficient to cause operation of the vane switch and brilliant lighting of lamp 14 during the periods of closure of the vane switch. For example, with a supply voltage of say seven volts, the resistance values of the elements may be such that, with switch 16 open, there is a three volt potential difference across resistor 3, a one-half volt potential difference across the pull wire 9 (which will be insufficient to operate the switch) and a three and one-half volt potential difference across lamp 14 (which is sufficient to cause the lamp to glow dimly). When the switch 16 is closed the potential across the pull wire 9 increases to one volt and that across the lamp to six volts, causing operation of the switch and flashing of the lamp, with the lamp lighting brightly during the on periods. The above figures are merely illustrative of one practical installation of the system.

It is also important that the flasher switch of the system be one which will conduct a useful amount of current without operating and will start operating upon increase of current through it. The vane switch illustrated in Fig. 7, which is described and claimed in my earlier Patent 2,133,309, dated October 18, 1938, is well suited for use in the system of the present invention but the invention in its broadest aspects is not limited to any particular switch construction. When the supply voltage for the system is apt to fluctuate as, for example, in the case of batteries on motor vehicles, false indications may be prevented by making the resistance to be shunted of a material having a relatively high coefficient of temperature resistance as, for example, of tungsten filaments or tungsten filament lamps. Such resistors will check to a large degree the current surges through the circuit during voltage rises and allow a larger flow when the voltage drops below normal, thus tending to stabilize the holding current through the expansible pull wire of the vane switch during normal condition of the system.

It will be apparent that the new signal system as above described with reference to the drawings will have a wide range of application, as it may be usefully employed wherever a condition is to be guarded. One important application of the system of the invention is in connection with motor vehicles, particularly trucks, where it could be employed to guard the oil pressure, the radiator temperature, the gasoline level, or any other desired condition.

I claim:

1. A guard circuit comprising in combination a resistor, a normally closed flasher switch and a signal lamp all connected in series across a voltage supply, said resistance, switch and lamp being so proportioned relative to the voltage supply that the current through the circuit is insufficient to operate said switch but is sufficient to cause said lamp to glow dimly and thereby indicate both a normal guarded condition and an unimpaired circuit, and means independent of said resistor and responsive to a condition to be guarded for shunting said resistor when the guarded condition departs from normal to increase the current through the switch and lamp sufficiently for operation of the switch with consequent flashing of the lamp, the lamp glowing brightly during the on periods.

2. A guard circuit comprising in combination a resistor, a sprung vane type flasher switch hav-

ing a resistance pull wire normally tensioned to hold the vane in circuit closing position and a signal lamp, said resistor, pull wire and lamp being connected in series across a source of voltage supply, and means responsive to a condition to be guarded for shunting said resistance when the guarded condition departs from normal and directly increase the current through pull wire and lamp, the higher current through said pull wire upon shunting of said resistor being sufficient to cause operation of said switch, with consequent flashing of said lamp and the lower current through said pull wire when said resistor is not shunted being sufficient to cause said lamp to glow dimly but insufficient to operate said switch whereby normal conditions are indicated by a dim steady glow of said lamp, a break in the circuit is indicated by the extinguishment of said lamp and departure from normal of the guarded condition is indicated by flashing of the lamp.

3. A guard circuit of the character set forth comprising in combination a resistor, a normally closed flasher switch and a signal lamp all connected in series across a voltage supply, with the signal lamp normally indicating an uninterrupted circuit and also the normalcy of the guarded condition, said resistor, switch and lamp being so proportioned and adjusted relatively to the voltage supply that the current through the circuit is insufficient to cause flasher operation of said switch but is sufficient to cause said lamp to glow dimly for indicating the unimpaired circuit and the normalcy of the condition, and means independent of said circuit and responsive to the condition to be guarded for cutting out said resistor when the guarded condition departs from normal to increase the current through the switch and lamp sufficiently to cause flashing operation of the switch with the lamp glowing brightly during the on periods in contrast with the steady dim glow during the normal condition.

JOSEPH SCHMIDINGER.

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