Nov. 2, 1943. J. SCHMIDINGER 2,333,125

THERMAL SWITCH AND RELAY

Filed Aug. 11, 1939

Fig. 3.

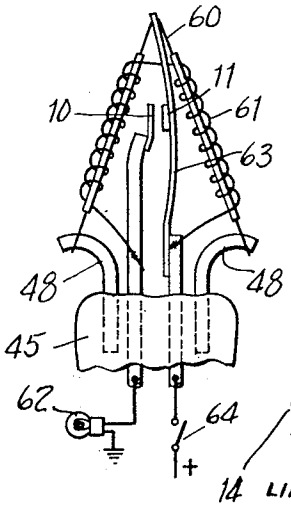


Fig. 1.

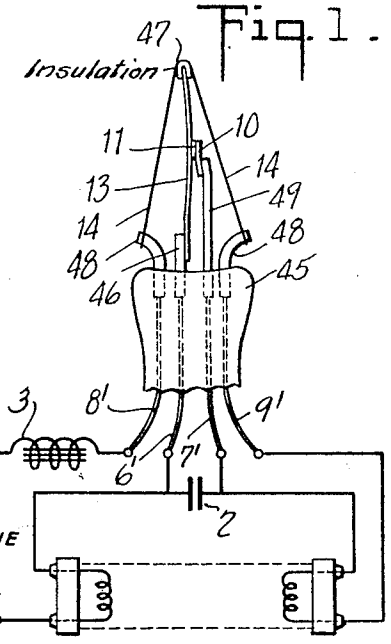


Fig. 2.

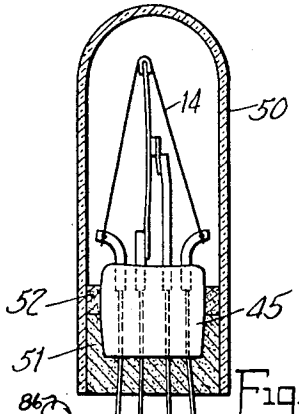


Fig. 11.

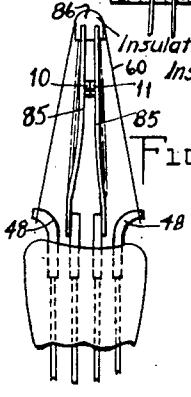


Fig. 4.

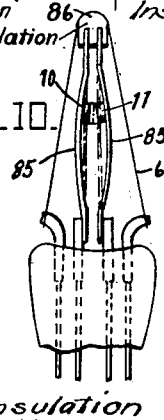


Fig. 10.

Fig. 5.

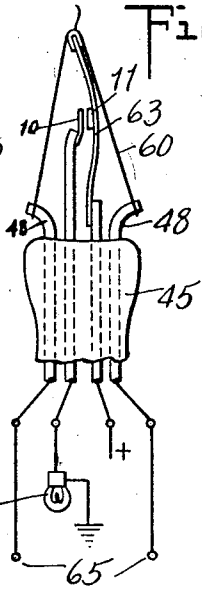
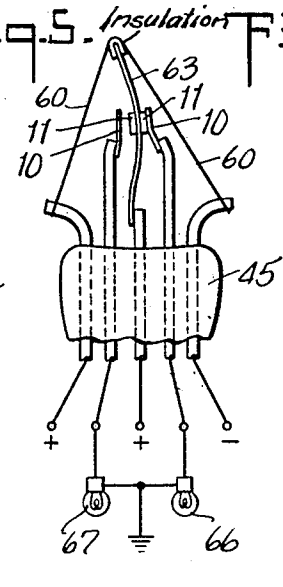


Fig. 6.



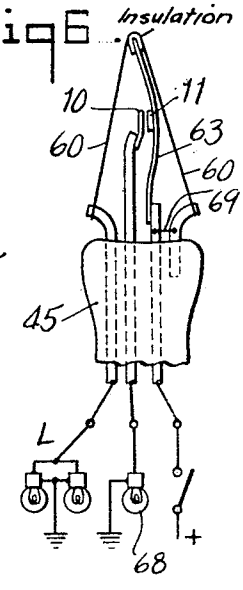


Fig. 7.

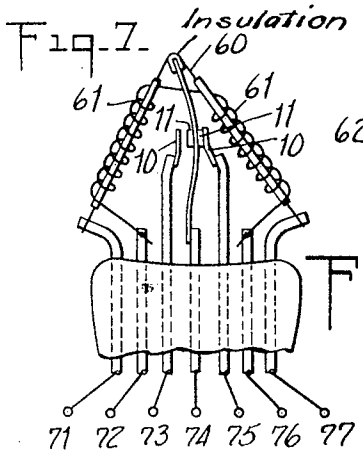


Fig. 8

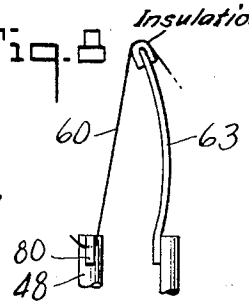
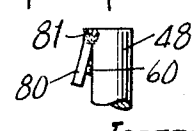


Fig. 9.



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UNITED STATES PATENT OFFICE

2,333,125

THERMAL SWITCH AND RELAY

Joseph Schmidinger, Long Island City, N. Y.

Application August 11, 1939, Serial No. 289,529

13 Claims. (Cl. 200—122)

This invention relates to thermally controlled or operated switches.

One object of the invention is a novel and improved thermal relay switch which is particularly adapted to use in the control and starting of fluorescent lamps, although it may be used for other purposes.

Further objects of the invention will hereinafter appear.

For a better understanding of the invention reference may be had to the accompanying drawing forming a part of this application wherein:

Fig. 1 illustrates a circuit of a fluorescent lamp with one embodiment of my invention associated therewith;

Fig. 2 is a view of the switch unit shown in Fig. 1 and Figs. 3 to 11, inclusive, are views illustrating modifications of the invention.

Referring to Fig. 1 I have shown diagrammatically a fluorescent tube lamp 1 of the type which has now gone into commercial use, whose circuit embodies a condenser 2 and a choke coil 3 the condenser being connected between the filament electrodes and the coil being connected in series with the tube, the electric supply line being indicated at 14. In the particular embodiment shown, at starting or upon initial closure of the switch the condenser 2 is short circuited, and when the shunt or short circuit across the condenser 2 is quickly opened after the heating of the filaments the surge produced tends to assist in starting the discharge for the normal lighting operation of the lamp. The thermal switch unit illustrated functions thus quickly to open the shunt across the condenser at starting with no or a minimum of make and break contacts at such operation, a minimum of surges and with the speed desired in practice.

The switch is mounted on a glass press or the like 45 with the leads 6', 7', 8' and 9' leading therethrough to the switch. A buckled strip or vane 13 is mounted on a support 46 connected with the lead 6' and the free end of the vane carries an insulating member 47 about which the wire 14 passes and is welded or otherwise fastened to the anchor members 48 connected with the leads 8' and 8'. The contact 10 is carried by an arm 49 which is also anchored to the press and is connected with the lead 7'. The vane 13 is constrained to have an inherent tendency to separate the contact 11 from the contact 10, but this tendency is overcome by the pull of the cold wire 14 which is put under tension to close the contacts. Upon the closing of the circuit, however, the wire 14 is heated and expands to permit the vane 13 to open the shunt or short circuit at the contacts 10 and 11 across the condenser 2.

In Fig. 2 the switch of Fig. 1 is shown mounted in a tube or bulb 50 with the press 45 mounted in any suitable closing plug 51, 52.

While I have shown wire 14 as being connected directly in circuit to be heated by the current flowing in the circuit, it is understood that indirect heating means may be provided, such, for example, as the heating coils shown in the modifications of Figs. 3 and 7.

Referring to Fig. 3 I have shown a switch generally of the character shown in Fig. 1 but here used as a flasher. Here the expansible wire 60 is heated by the electric heating coils 61, the latter being connected in a circuit in series with a flasher lamp 62 when the wire 60 is cold. The vane 63 is constrained so as to tend to close the contacts 10 and 11 but the contacts are held open by the cold wire 60 which buckles the vane to open the circuit as shown. Upon the closing of the line circuit at the switch 64 as indicated, the coils 61 heat the wires 60 thereby expanding the same and permitting the closure of the contacts 10 and 11 to short circuit the coils 61 and to light the lamp 62 at its full voltage. Upon short circuiting the coils 61 the wire 60 cools off, and the contacts 10 and 11 are again opened to cut in the coils and dim the flasher bulb 62. This action is thus repeated.

In the modification of Fig. 4 the expansible wire 60 is connected across a circuit 65 and when said circuit is closed the vane 63 is permitted to close the contacts 10 and 11 in an indicating circuit which includes the lamp 62. When the circuit 65 is opened the wire 60 is cooled and, therefore, opposes the inherent constraint of the strip 63 and opens the indicating circuit at the contacts 10 and 11.

The modification of Fig. 5 embodies a two-way indicated thermal relay, wherein the contacts 10 are duplicated, these contacts controlling the indicating lamps 66 and 67. In the cold position of the wire 60, namely, with the circuit of the wire interrupted, the lamp 66 is lighted through the right hand contact 10 and the movable contact 11. When the wire 60 is connected in circuit, however, the expansion of the wire 60 due to heating permits the buckled strip or vane 63 to respond to its inherent constraint to move the contact 11 out of contact with the right hand contact 10 and to shift it into contact with the left hand contact 10 to thereby connect the indicating lamp 67 in

circuit at the same time the lamp 66 is removed from the circuit.

Fig. 6 shows the use of the switch for lighting the pilot lamp 68 when the load in the circuit L is of a predetermined value, this load being indicated for purposes of illustration as formed of incandescent lamps in multiple. If the load should drop, thereby cooling off the wire 60 to a certain degree, the circuit through the pilot lamp 68 is interrupted to indicate this drop in load. If the load is at the predetermined value the circuit of lamp 68 is closed, etc.

In the modification of Fig. 7 a construction is shown which is particularly adaptable for slow or fast relay action, for one and two way contact action, and flasher operation. The terminals 71 and 77 are led directly through the expansible wire 60 and, accordingly, fast action of the control contacts 10 and 11 may be obtained by connecting these terminals in circuit. The terminals 72 and 76 however lead to the heating coils 61 for indirect heating, and, accordingly, with terminals 72 and 76 connected across the line slower action of the contacts may be obtained. With both the expansible wire 60 and the heating coils 61 across the line still faster action may be obtained. The terminals 73—75 may be used for two way, or circuit indication as shown in Fig. 5. The device of Fig. 7 may be used as a flasher by connecting the terminals 74 and 76 to one side of a supply line, the terminals 72 and 73 to one side of a lamp and the other side of the lamp to the other side of the supply line.

Figs. 8 and 9 show a method of fastening one end of the tension wire 60 to an anchor wire support 48. This consists in welding a flat metal tab 80 to the anchor 48 at the point 81 and the pull wire 60 can then be tensed and hitched to the clamping pole formed by the tab 80 as shown.

In the modifications of Figs. 10 and 11 I have shown modifications wherein very fast contact action and larger movements are obtained. In these modifications both the contacts 10 and 11 are carried by buckled strips or vanes 85 while pull wire 60 is carried around an insulating member 86 to which are fastened the vanes 85 at their upper ends. In Fig. 11 the vanes 85 are mounted in concave relation to one another to hold the contacts 10 and 11 apart with the wire 60 cold. When the latter is connected in circuit the expansion of this wire permits the strips 85 to respond to the inherent constraint therein to close the contacts 10 and 11. In Fig. 10 the vanes 85 are constrained to normally separate the contacts and, accordingly, with the wire 60 out of circuit and cold the inherent constraint in the strips 85 is overcome to bring the contacts together, with the strips having their convex sides disposed toward each other.

I claim:

1. In a fluorescent lamp device of the character set forth a condenser, an expansible wire in series with said lamp, a pair of contacts connected with the opposite sides of said condenser and a vane member inherently constrained to open said contacts, said vane member being held by said expansible wire when the lamp circuit is open to hold the said contacts closed against the inherent constraint of the vane but being adapted to open the contacts and assist in the starting operation when the circuit is closed.

2. In a lamp device of the character set forth a condenser, an expansible wire in series with said lamp, a pair of contacts connected with the opposite sides of said condenser and a vane member inherently constrained to open said contacts, said vane member being held by said expansible wire when the lamp circuit is open to hold the said contacts closed against the inherent constraint of the vane, the vane and expansible wire members being carried by a glass press.

3. A thermally operated switch comprising an elongated vane member carrying a contact and fixedly mounted at one end, a second contact cooperating with the first named contact, an expansible wire rigidly fastened at its ends and passing around the free end of said vane, said wire engaging the free end of said vane and buckling the same in a direction to oppose the inherent constraint set up in the vane, said free end of the vane being firmly held against movement solely by said wire and a circuit for heating said wire.

4. A thermally operated switch comprising an elongated vane member carrying a contact and fixedly mounted at one end, a second contact cooperating with the first named contact, an expansible wire rigidly fastened at its ends and passing around the free end of said vane, said wire engaging the free end of said vane and buckling the same in a direction to oppose the inherent constraint set up in the vane, said free end of the vane being firmly held against moement solely by said wire, and a circuit for heating said wire, the heating circuit comprising a heater disposed in thermal relation to the wire, said heater being connected across said contacts.

5. A thermally operated switch comprising an elongated vane member carrying a contact and fixedly mounted at one end, a second contact cooperating with the first named contact, an expansible wire rigidly fastened at its ends and passing around the free end of said vane, said wire engaging the free end of said vane and buckling the same in a direction to oppose the inherent constraint set up in the vane, said free end of the vane being firmly held against movement solely by said wire, and a circuit for heating said wire, the heating circuit comprising a heater disposed in thermal relation to the wire, said heater being connected across said contacts, together with means for passing current through either the wire, the heater, or both.

6. A thermally operated switch comprising an elongated vane member carrying a contact and fixedly mounted at one end, a second contact cooperating with the first named contact, an expansible wire rigidly fastened at its ends and passing around the free end of said vane, said wire engaging the free end of said vane and buckling the same in a direction to oppose the inherent constraint set up in the vane, said free end of the vane being firmly held against movement solely by said wire, and a circuit for heating said wire, the heating circuit comprising a heater disposed in thermal relation to the wire, said heater being connected across said contacts, together with means for passing current through either the wire, the heater, or both, and a pair of fixed contacts, one to be engaged by the vane in one position and the other to be engaged by the vane in the other position.

7. A thermally operated relay switch comprising a movable vane member which is inherently constrained to occupy one position to control a circuit, said vane member being fixedly mounted at one end, and an expansible wire with means for connecting the same in a heating circuit, said expansible wire engaging the free end of said vane

and buckling the same against the inherent constraint therein to actuate the vane to a position opposed to the position to which it is inherently constrained to move, said contact controlling an indicating circuit.

8. A thermally operated switch comprising an elongated vane member carrying a contact and fixedly mounted at one end, a second contact co-operating with the first named contact, said vane member having an inherent constraint tending to cause the same to occupy one position, an expansible wire disposed at an angle to the vane and passing around the free end thereof, said wire engaging the free end of the vane and buckling the same in a direction to oppose the inherent constraint set up in the vane and tending to cause the vane to occupy another position and a circuit for heating said wire.

9. A thermally operated switch comprising an elongated vane member carrying a contact and fixedly mounted at one end, a second contact co-operating with the first named contact, said vane member having an inherent constraint tending to cause the same to occupy one position, an expansible wire disposed at an acute angle to the vane and passing around the free end thereof, said wire engaging the free end of the vane and buckling the same in a direction to oppose the inherent constraint set up in the vane and tending to cause the vane to occupy another position.

10. A thermally operated switch comprising an elongated vane member carrying a contact and fixedly mounted at one end, a second contact cooperating with the first named contact, said vane member having an inherent constraint tending to cause the same to occupy one position, an expansible wire disposed at an acute angle to the vane and passing around the free end thereof, said wire engaging the free end of the vane and buckling the same in a direction to oppose the inherent constraint set up in the vane and tending to cause the vane to occupy another position, the second mentioned contact being also carried by a buckling vane which is operated by said expansible wire.

11. A thermally controlled switch comprising a pair of contacts to be controlled, an elongated vane member fixedly mounted at one end for controlling said contacts and having an inherent constraint set up therein, an expansible wire fastened at one end to a frame element, said expansible wire engaging the free end of said vane and buckling the same in a direction to oppose the inherent constraint set up in the vane, said free end of the vane being firmly held against movement solely by said expansible wire, and a circuit for heating said wire.

12. A thermally operated switch comprising a pair of contacts to be controlled, an elongated vane member fixedly mounted at one end for controlling said contacts and having an inherent constraint set up therein, an expansible wire fastened at one end to a frame element, said expansible wire engaging the free end of said vane and buckling the same in a direction to oppose the inherent constraint set up in the vane, said free end of the vane being firmly held against movement solely by said expansible wire, and a circuit for heating said wire, the circuit for heating the wire being that of a fluorescent lamp and the controlling contacts being utilized for the purpose of assisting in the starting operation of the lamp.

13. A thermally operated switch comprising an elongated vane member carrying a contact and fixedly mounted at one end, a second contact cooperating with the first named contact, an expansible wire rigidly fastened at its ends and passing around the free end of said vane, said wire engaging the free end of said vane and buckling the same in a direction to oppose the inherent constraint set up in the vane, said free end of the vane being firmly held against movement solely by said wire, and a circuit for heating said wire, the heating circuit comprising a heater disposed in thermal relation to the wire.

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CERTIFICATE OF CORRECTION.

Patent No. 2,333,125. November 2, 1943.

JOSEPH SCHMIDINGER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 48, for "and 8'." read --and 9'.--; page 2, second column, line 29, claim 4, for "moement" read --movement--; page 3, second column, line 3, claim 11, for "controlled" read --operated--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of December, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)

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