July 6, 1948. D. W. SCOFIELD 2,444,680

TERMINAL SWITCH WITH THERMOSTATIC SAFETY RELEASE

Filed May 5, 1945

Fig. 1

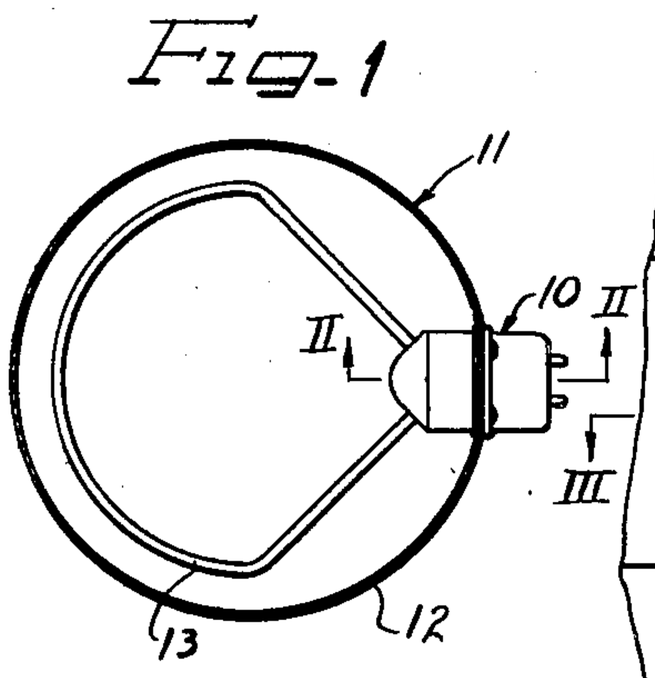


Fig. 2

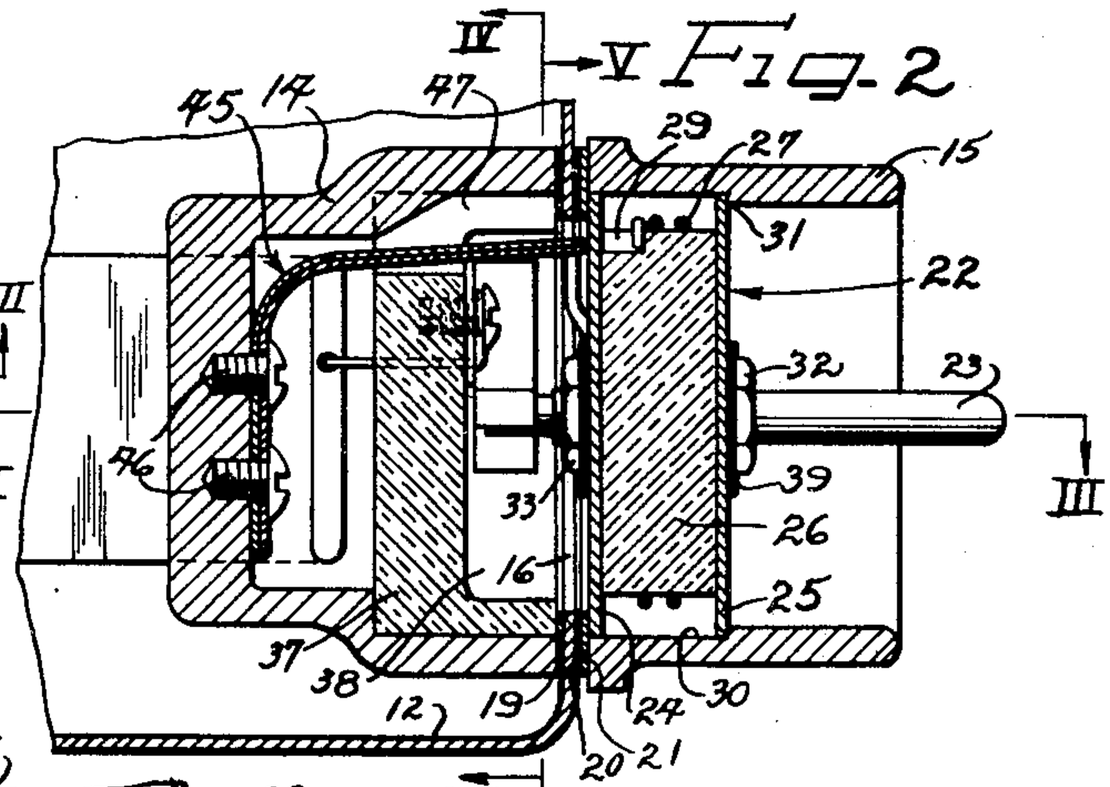


Fig. 3

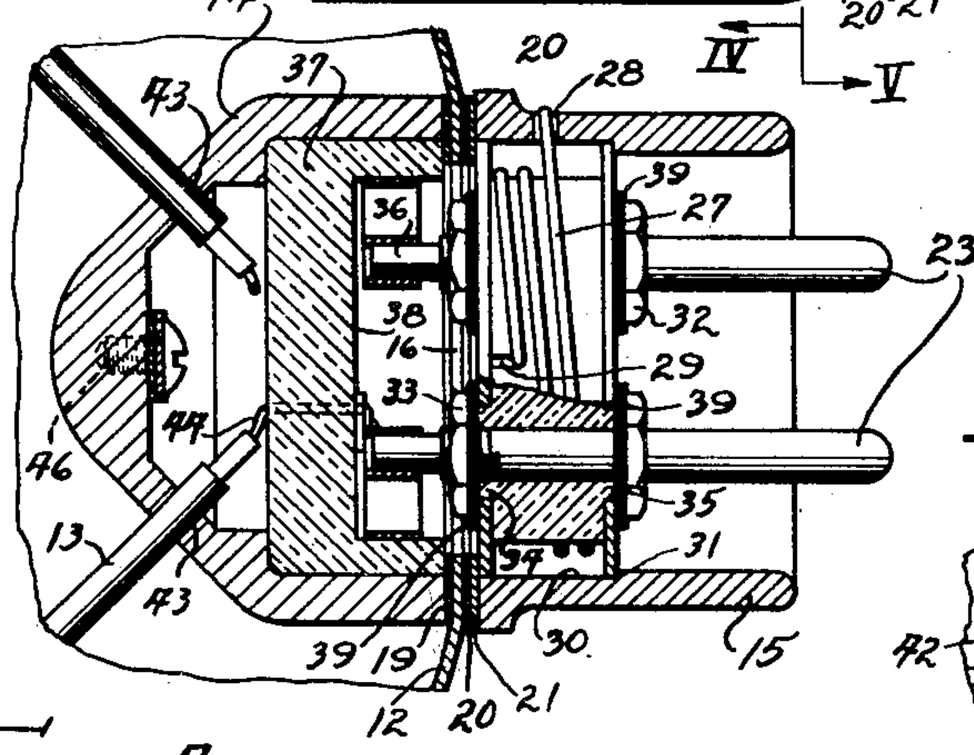


Fig. 6

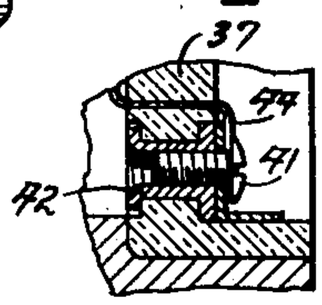


Fig. 4

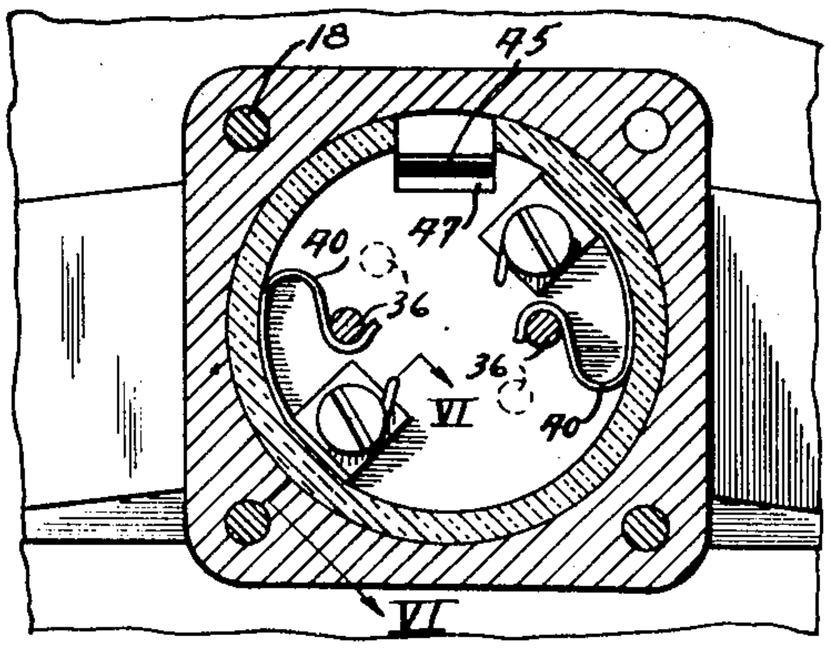
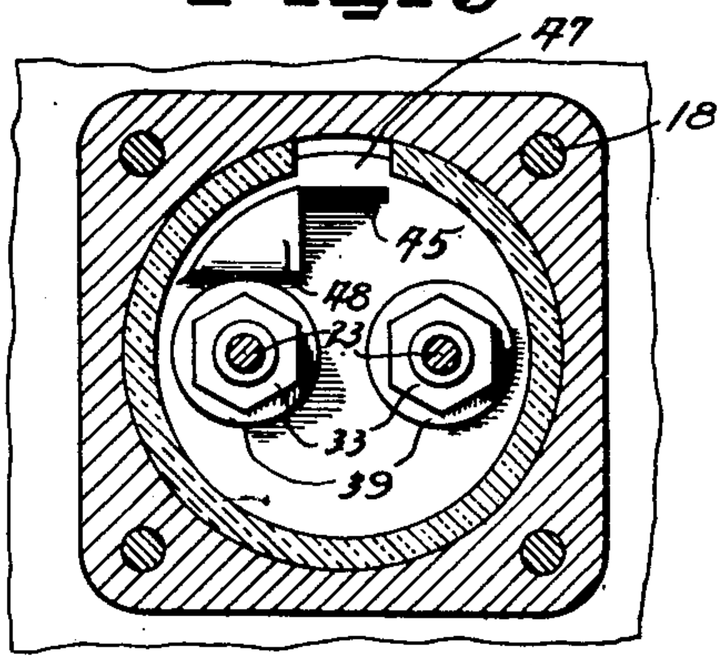


Fig. 5



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Patented July 6, 1948 2,444,680

UNITED STATES PATENT OFFICE

2,444,680

TERMINAL SWITCH WITH THERMOSTATIC SAFETY RELEASE

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Application May 5, 1945, Serial No. 592,246

10 Claims. (Cl. 200—136.5)

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This invention relates to an electrical appliance and more particularly to a thermally controlled electrical connector especially adapted for use with a heating element.

An object of this invention is to provide an improved thermally controlled switching device adapted to automatically break the circuit when a predetermined temperature is reached in apparatus associated therewith.

Another object of this invention is to provide an improved electrical connector and switching device for use with an electrically heated device, such, for example, as a teakettle, etc.

Another object of the invention is to provide a safety electrical connector for use with a device in which liquid is being electrically heated and which will automatcally switch off the current when the lquid in the device has been evaporated so that the device will not be damaged by excessive heat.

A still further object of the invention is to provide an improved electrical plug connector which includes in a very simple form an automatic thermally controlled electrical switch.

In accordance with the general features of this invention, there is provided in a thermally controlled electrical connector adapted for use with a heating element and as a safety device, a first housing member for connection to a heating element and a second housing member including a connector for connection to an electrical circuit, the connector including electrical terminal means journalled in the second housing member and spring means for rotating the terminal means, said first housing member having associated with it thermally responsive means normally cooperating with the terminal means to hold the same against rotation so that said terminal means is maintained in electrical cooperation with contact means in the first housing member; the thermally responsive means upon being subjected to a predetermined temperature releasing the terminal means for rotation by the spring means to disconnect the terminal means from the contact means and thus to break the circuit for the heating element.

A further feature of the invention relates to the novel construction of the rotatable terminal or plug means of the connector.

Still another feature of the invention relates to the simplicity of the aforesaid structure which facilitates its application to an electrical heating appliance, such as a teakettle.

Other objects and features of this invention will more fully appear from the following detailed

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description taken in connection with the accompanying drawings which illustrate a single embodiment thereof, and in which

Figure 1 is a horizontal sectional view through an electrical heating vessel, such as a teakettle, provided with a combination plug connector and switch embodying the features of this invention;

Figure 2 is an enlarged fragmentary sectional view taken on the line II—II of Figure 1, looking upwardly and showing the switch in its closed position;

Figure 3 is a fragmentary sectional view taken on the line III—III of Figure 2 looking downwardly and still showing the switch in its closed position;

Figure 4 is a cross sectional view taken on the line IV—IV of Figure 2 looking in the direction indicated by the arrows and showing by dotted circles the positions to which the plug terminals are moved when the switch is open.

Figure 5 is a fragmentary sectional view taken on the line V—V of Figure 2 looking in the direction indicated by the arrows, and showing how the free extremity of the bimetallic element latchingly cooperates with the rotary terminal or plug means; and

Figure 6 is a fragmentary detailed sectional view taken on the line VI—VI of Figure 4 looking in the direction indicated by the arrows and showing the construction of one of the contacts to which one end of the electrical heating element is fastened.

As shown on the drawing:

The combination electrical connector and switch of my invention is designated generally by the reference charatcer **10** (Figure 1), and is illustrated as being used in conjunction with an electrically heated appliance in the form of a teakettle, designated generally by the reference character **11**, which includes a metallic vessel **12** having positioned in the bottom thereof an electrical heating element **13**, which is to be connected to an electrical circuit through the connector **10**.

While I have illustrated this invention as being applied to a teakettle in which water is to be heated, it is, of course, to be understood that my invention may be used with equal advantage in connection with other electrial appliances, and particularly those in which liquid is being heated and where a safety device is desired. In such electrical appliances when the liquid evaporates or the vessel boils dry, there should be provided some automatic device for turning off the power supply so as to prevent overheating and damage

to the appliance. My present connector has been developed to meet this requirement.

The connector 10 embraces two housing members 14 and 15, one of which is inside of the vessel 11 and the other of which is on the exterior thereof. These two housing members may comprise suitable metallic castings. For illustration, the member 14 may comprise a bronze forging or casting, whereas the member 15 may comprise a zinc or an aluminum alloy die casting. Each of them is of a hollow construction and is secured to the wall 12 of the vessel 11 about an opening 16 therein by means of four screws 18 (Figures 4 and 5). Suitable water resistant or fibre gaskets 19 and 20 are positioned between the flanges of these members 14 and 15 and the wall 12; one gasket being on the inner side of the wall and the other on the outer. In addition, between the gasket 20 and the cooperating end of the housing member 15, there is disposed a metallic thrust plate or ring 21 which may be made of hard brass or the like. The purpose of this plate will become more apparent hereinafter.

Positioned and journaled within the housing member 15 is a rotary switch member designated generally by the reference character 22 and which carries spaced metallic prongs 23 for attachment in the usual way to a socket or the like, from which a source of electrical current is to be supplied to the heating element 13 of the electrical appliance. I preferably make the prongs 23—23 of metal, such as brass.

The rotary switch element 22 is of a spool-like construction and comprises two spaced discs 24 and 25, which may be made of brass or stainless steel. Positioned between these plates 24 and 25 is a porcelain insulator 26 which may be said to define the hub of the spool, and about which is disposed a coiled spring 27 made of spring steel wire. One end of the spring as shown in Figure 3 is anchored in a hole at 28 to the housing member 15; the other end of the spring, as shown in Figures 2 and 3, is anchored in a hole at 29 in the porcelain member 26. This arrangement is such that rotation of the member 22 to close the switch will place the spring 27 under tension.

The peripheries of the two discs 24 and 25 are rotatably journaled in a recessed portion 30 on the interior surface of the housing member 15. The outer disc 25 is held against longitudinal displacement by a shoulder 31 in the member 15. The inner or cam disc 24 has its outer margin bearing against the thrust plate or ring 21 so that the disc as it rotates will not engage or wear out the gasket 20.

The two discs 24 and 25 and the intermediate insulator member 26 are all bolted together on the prong terminals 23 by means of suitable lock nuts 32—33.

It should be noted that the intermediate insulator 26 has not only holes therethrough for receiving the prong terminals 23—23; but in addition, is provided with insulating ring like bosses 34 and 35 on opposite sides thereof and which extend into the holes of the two discs 24 and 25 to insulate the prongs from the metallic discs. In addition insulating washers 39—39 are used to insulate the nuts 32—33 from the metal discs 25 and 24.

The inner extremities of the prong terminals 23—23 are designated by the reference character 36—36 and are of a somewhat reduced cross sectional shape. These extremities 36—36 project into the interior of the inner housing member 14 for cooperation with contact means to be described hereinafter.

The inner housing member 14 has suitably secured or keyed thereto a stationary porcelain contact base 37, which is recessed on its side facing the hole 16 and it is into this recess 38 that the prong extremities 36—36 project.

Positioned in the recess are a pair of oppositely facing goose-neck like contact blades 40—40 (Figure 4), which may be made of suitable resilient material, such, for example, as Phosphor bronze strip. These stationary contacts are engaged by the reduced extremities 36 of the prongs 23—23 when the switch is in closed position, as shown in both houses in Figure 4. When the switch is in open position the extremities 36—36 of the prongs are out of engagement with the fixed contact blades 40, as shown by the dotted circles in Figure 4.

As shown in Figures 4 and 6 each of the plates 40 is secured in place by the square head of a ferrule 42 anchored by spinning to the porcelain base 37. This ferrule is threaded to receive a screw 41 for attaching an end of the heating element 13 thereto.

The ends of the heating element 13 project through suitable apertures into the rear of the hollow housing member 14, as shown in Figure 3, and the copper sheath which encompasses the heating or resistor element is suitably brazed at 43 to the housing member 14.

The ends 44 of the resistance wire in the heating element 13 are exposed on the interior of the housing member 14 and are extended through suitable apertures in the porcelain base 37 so that they are secured by the screws 41 to the fixed contact blades 40, thus establishing an electrical connection between the ends of the heating element 13 and the two stationary contact blades 40—40.

The means for controlling the operation of the switch comprises a bimetallic element or strip 45 which, as shown in Figure 2, has one end secured to the inner side of the rear portion of the housing member 14 by means of screws 46. This bimetallic element is of an angular construction and has one leg projecting from the screws 46 through an aperture 47 in the porcelain base 37 so that its free end can cooperate with latching means in the form of a tang or lug 48 punched from the cam disc 24 of the rotary member 22.

Now it will be appreciated that when the member 22 is turned to close the switch by bringing the prong ends 36—36 into engagement with the spring fixed blades 40—40, the spring 27 is placed under tension and is so held by the latching of the lug or tang 48 against the free end of the bimetallic strip 45 (Figure 5).

The switch will be held in this position until such time as the bimetallic element is subjected to a predetermined temperature which results in a flexure of the outer end of the bimetallic element out of the path of the cam lug 48 thereby enabling stored up energy in the spring 37 to rotate the prongs clockwise to the dotted positions shown in Figure 4 and out of engagement with the blades 40—40 thus breaking the circuit to the heating element 13.

When this combination switch and connector is used in conjunction with a teakettle, for example, the free end of the bimetallic element will move upward when the temperature in the vessel reaches some point above 212° F. This condition may arise when the liquid in the container has evaporated or has been boiled dry, in which

event it is imperative that this safety device function so as to turn off the power supply to the heating element and thereby prevent damage to the appliance.

The total amount of movement of the rotary member 22 in being moved from closed or open positions is approximately 45°, and during this entire movement the discs 24 and 25 act as bearings for the rotating mechanism.

All of the parts of this combination connector and switch may be economically manufactured on a large production basis, and can be readily assembled and applied to the vessel or appliance which is to be protected.

I claim as my invention:

1. In a thermally controlled electrical connector, a first housing member and a second housing member which comprises a connector for connection to an electrical circuit and includes rotary electrical terminal means therein, as well as spring means for rotating said terminal means, thermally responsive means associated with said first member and normally cooperating with said terminal means to hold same against rotation and contact means in said first member engageable by said terminal means, said thermally responsive means upon being subjected to a predetermined temperature releasing said terminal means for rotation by said spring means to disconnect said terminal means from said contact means.

2. The electrical connector of claim 1 further characterized by the terminal means including a cam disc for latching cooperation with the thermally responsive means.

3. The connector of claim 1 further characterized by the thermally responsive means comprising an angular bimetallic element having an extremity normally projecting into latching cooperation with said rotary terminal means.

4. The connector of claim 1 further characterized by the rotary terminal means comprising a spool-like assembly including spaced metallic discs having their flanges journaled in said second housing member and a hub of insulating material between said discs and about which said spring means is disposed between the same and the cooperating housing member.

5. The connector of claim 1 further characterized by the rotary terminal means comprising a spool-like assembly including spaced metallic discs having their flanges journaled in said second mentioned housing member and a hub of insulating material between said discs and about which said spring means is disposed between the same and the cooperating housing member, one of said discs having a tang punched therefrom for latching cooperation with said thermally responsive means.

6. The connector of claim 1 further characterized by said rotary terminal means including a disc journaled in the second mentioned housing member and having formed thereon a latching tang and said thermally responsive means comprising a strip of bimetallic material disposed in said first mentioned housing member and having a free extremity in latching cooperation with said tang.

7. The connector of claim 1 further characterized by said contacting means comprising a pair of oppositely facing spring clips mounted in said first mentioned housing member and by said terminal means including a pair of prongs projecting into the interior of the first mentioned housing member and in engagement with said clip means, but movable out of engagement therewith upon rotation of said terminal means by said spring means.

8. In a thermal plug switch including a housing having prongs for insertion in a socket, a rotary member in said housing to which said prongs are connected for rotation therewith, electrical contact means in said housing for connection to said prongs, means for holding said member against rotation with said prongs electrically connected to said contact means, thermally responsive means for releasing said holding means and means for rotating said member to disconnect said prongs from said contact means.

9. In a thermal plug switch including a housing having prongs for insertion in a socket, a rotary member in said housing to which said prongs are connected for rotation therewith, electrical contact means in said housing for connection to said prongs, means for holding said member against rotation with said prongs electrically connected to said contact means, thermally responsive means for releasing said holding means and means for rotating said member to disconnect said prongs from said contact means, said thermally responsive means comprising a bimetallic element mounted in said housing and having a free end in latching cooperation with said rotary member but deflectible out of engagement therewith upon being subjected to a predetermined temperature.

10. In a thermal plug switch including a housing having prongs for insertion in a socket, a rotary member in said housing to which said prongs are connected for rotation therewith, electrical contact means in said housing for connection to said prongs, means for holding said member against rotation with said prongs electrically connected to said contact means, thermally responsive means for releasing said holding means and means for rotating said member to disconnect said prongs from said contact means, said rotary member including a disc journaled in said housing member and having projecting therefrom a latching lug for cooperation with said thermally responsive means.

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