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PATENT SPECIFICATION (11)

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(21) Application No. 5387/76 (22) Filed 11 Feb. 1976 (19)

(23) Complete Specification filed 11 Feb 1977

(44) Complete Specification published 11 June 1980

(51) INT. CL.⁸ H01R 13/70

(52) Index at acceptance

H1N 25Y 263 281 54X 611 700 704
H2E 3A10B4 3A2 3E8A1 3E8B2

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(54) THERMAL CUT-OUT

(71) We, GREENPOINT CONTROLS AND ELEMENTS LIMITED, a British Company of Manor House Avenue, Millbrook Industrial Estate, Southampton, SO1 0LF, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a resettable, thermally responsive, electrical cut-out assembly for use with a liquid heating device. The term "liquid heating device" is used herein to mean a device which is fitted with current supply terminals and with a vapour tube, communicating between the interior and the exterior of the device, to conduct vapour therethrough when liquid, contained by the device, has reached its boiling point. The cut-out assembly is provided to cause the electrical supply to be interrupted or reduced when the liquid boils and is particularly suitable for use with holloware, such as electric kettles, jugs, percolators, laboratory equipment and the like, to provide automatic control.

25 Electric kettles are known which are provided with a so-called "steam tube" for conducting steam from the dome of the kettle to an external point, such as an immersion heater head, to operate a thermally responsive cut-out which interrupts the current supply when the water boils. Most of these arrangements include an assembly which, during manufacture, is secured to the kettle body and is subsequently connected to the mains supply by the usual kettle connecting socket. Assembly of such arrangements, during manufacture, is often complicated or time-consuming and therefore expensive. Moreover, the design of many arrangements does not generally facilitate adaption of existing holloware to provide an automatic kettle because the shape of the holloware must, to some degree, match the shape of a control mounting plate and it is necessary to perforate the holloware to accommodate the steam tube.

According to one previous arrangement, a steam actuated cut-out is contained in a

housing secured to an immersion heater head, the housing having a smaller cross-sectional dimension than a flange, on the head, which abuts the rim of an opening in the kettle body. The immersion heater head is fitted from within the kettle, to simplify manufacture, but assembly is still time-consuming and the design of the head does not allow the kettle to be provided for either automatic, or non-automatic operation. Furthermore, any failure must be rectified by repairing or fitting a new head.

Yet another previous arrangement includes an immersion heater head fitted with a steam pipe and a housing containing a steam actuated cut-out. The housing is connected to the mains supply by a conventional kettle socket. This arrangement includes the disadvantage of a separate cut-out and conventional socket.

An object of the present invention is to provide a resettable, thermally responsive, electrical cut-out assembly which can be removably connected to a liquid heating device (as herein defined) in the manner of a simple plug and socket connection thereby taking the place of a conventional socket for connection to a mains lead or cable.

It is related object of the invention to provide, in combination, such a cut-out assembly and a heating element assembly which facilitate the manufacture of automatic kettles or similar liquid heating devices (as herein defined). In the case of an automatic kettle employing a steam tube to operate the thermal cut-out, an automatic kettle can be produced almost as simply as a non-automatic kettle. All the manufacturer needs to do is to select the appropriate heating element assembly or immersion heater head for automatic operation, fit it to the standard immersion heater aperture and then provide a thermal cut-out assembly according to the invention, which is simply fitted to the kettle in the manner of a plug and socket.

If the manufacturer wishes to produce non-automatic kettles, then he need only select a conventional heating element assembly or immersion heater head, or close off

the steam tube and then fit a conventional socket.

The kettle manufacturer is thereby not involved in the assembly or part assembly of a cut-out for automatic operation and manufacture is simplified because no special holloware or handle design is necessary. Regarding the manufacture of the thermal cut-out assembly and the immersion heater head, each of these can be separately produced and/or serviced.

According to the present invention, there is provided a resettable thermally responsive, electrical cut-out assembly for use with a liquid heating device (as herein defined), the cut-out assembly comprising a housing without any terminals projecting externally thereof, the housing being provided with (a) means to receive and to secure an electrical supply lead, (b) terminals to mate with the current supply terminals of the liquid heating device, (c) a passageway for communication with the vapour tube of the liquid heating device, and (d) a cut-out including a thermally responsive member and a switch actuated thereby, said member being located adjacent an outlet of said passageway and said switch being connected to at least one of the terminals in the housing whereby, in use, said switch interrupts the current supply to the liquid heating device when said member responds thermally to vapour escaping from the outlet of said passageway; the terminals of the cut-out assembly which mate with the terminals of the liquid heating device being such that the cut-out assembly is detachable from the liquid heating device in the manner of a plug and socket connector.

The invention also provides a combination of the above thermal cut-out assembly and a heating element assembly, the heating element assembly comprising an electrical heating element and a vapour tube both fitted to a flanged head, said head being adapted for location in an opening in the liquid heating device and being fitted with an excess temperature switch between the heating element and an externally connectable terminal pin.

An embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a partly section, elevational view of a thermal cut-out assembly,

Fig. 2 is a partly sectioned, part detail of a heating element assembly for use with the cut-out assembly shown in Fig. 1 and

Fig. 3 is a partly sectioned, end elevation of the cut-out assembly shown in Fig. 1.

Referring to the drawings, a thermal cut-out assembly 1 is adapted for removable attachment to a heating element assembly 2.

The assembly 2 includes a mounting head 3 having a threaded cylindrical portion 4 fitted with a flange 5. The cylindrical portion 4 is

plugged with a body 4' of electrical insulating material. The head 3 supports a sheathed wire heating element 6 and a vapour or steam tube 7. In this embodiment, heating element 6 is configured to a shape to fit within a kettle body (not shown) and the steam tube 7 extends upwardly to the dome of the kettle body above the normal water level. Thus, when the water boils in the kettle, steam is conducted by tube 7 to its lower exit end 8.

The plug of insulating material 4' is recessed (not shown) to accommodate a boil-dry switch or excess temperature cut-out (not shown) of known construction. The boil-dry switch responds to an excess element temperature to prevent damage should the kettle be connected to the mains without containing water. The heating element 6 is connected, via the boil-dry switch, to terminal pins 9 which, together with the end 8 of steam tube 7, project rearwardly from the mounting head 4.

The thermal cut-out assembly 1 has an end face 10 which is apertured to receive pins 9 and the exit end 8 or the steam tube 7. The steam tube aperture 11 is flared to facilitate connection, and it communicates with a passageway 12 in the body of a housing 13. The housing 13 includes a recess 14 which accommodates a snap-acting switch 15. The switch 15 is actuated into two respective stable positions by a push-rod 16 and a reset button 17. The push-rod 16 is slidably mounted in a cross member 18 within the housing 13.

The housing 13 contains another recess 19 which accommodates a bimetallic blade 20. Blade 20 abuts one end of push-rod 16 and is deformed by heat to cause the push-rod 16 to operate switch 15. Blade 20 is also located opposite the exit of passageway 12. Recess 19 is open to the atmosphere to provide a vent for steam escaping from passageway 12.

The rear of the housing 13 includes a further recess 21 which accommodates terminals 22 for connection to the conductors of a main supply cable. An end face 23 of housing 13 is adapted to secure a flexible tubular cable guide having an end flange, which is received in recess 21. Cable clamping means (not shown) may also be provided.

Assuming that assembly 2 is fitted to a kettle body and that cut-out assembly 1 is connected by a cable to a mains supply, the cut-out 1 is plugged on to the assembly 2 to provide current. When the water boils in the kettle, tube 7 and passageway 12 conduct steam to the bimetallic blade 20. The blade 20 then deforms to open the contacts of switch 15 thereby interrupting the supply of current to the heating element 6. Switch 15 can be reset by operating button 17 when the blade 20 is cool.

For safety, an earth pin 24 is fitted to mounting head 4 and the housing 13 is adap-

ted to receive this pin and to connect it to an earth lead in the connection cable.

WHAT WE CLAIM IS:—

- 5 1. A resettable, thermally responsive, electrical cut-out assembly for use with a liquid heating device (as herein defined), the cut-out assembly comprising a housing without any terminals projecting externally thereof, the housing being provided with (a) means to receive and to secure an electrical supply lead, (b) terminals to mate with the current supply terminals of the liquid heating device, (c) a passageway for communication with the vapour tube of the liquid heating device, and (d) a cut-out including a thermally responsive member and a switch actuated thereby, said member being located adjacent an outlet of said passageway and said switch being connected to at least one of the terminals in the housing whereby, in use, said switch interrupts the current supply to the liquid heating device when said member responds thermally to vapour escaping from the outlet of said passageway; the terminals of the cut-out assembly which mate with the terminals of the liquid heating device being such that the cut-out assembly is detachable from the liquid heating device in the manner of a plug and socket connector.
- 10 20 25 30

2. A resettable thermal cut-out assembly

according to claim 1 wherein said housing is in the form of an electrical socket with a face containing apertures enabling electrical connections to be made between the current supply terminals, in the form of pins on the liquid heating device, and the terminals within said housing, in the form of sockets, said thermally responsive member being a bi-metallic member and said switch being a snap acting switch.

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3. A resettable thermal cut-out assembly for use with a liquid heating device (as herein defined) substantially as herein described with reference to the accompanying drawings.
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4. In combination, the thermal cut-out assembly according to any one of the preceding claims and a heating element assembly, the heating element assembly comprising an electrical heating element and a vapour tube both fitted to a flanged head, said head being locatable in an opening in the liquid heating device and being fitted with an excess temperature switch.
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5. An electric kettle including the cut-out assembly of any one of claims 1-3, or the combination defined by claim 4.
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ted to receive this pin and to connect it to an earth lead in the connection cable.

WHAT WE CLAIM IS:—

- 5 1. A resettable, thermally responsive, electrical cut-out assembly for use with a liquid heating device (as herein defined), the cut-out assembly comprising a housing without any terminals projecting externally thereof, the housing being provided with (a) 10 means to receive and to secure an electrical supply lead, (b) terminals to mate with the current supply terminals of the liquid heating device, (c) a passageway for communication 15 with the vapour tube of the liquid heating device, and (d) a cut-out including a thermally responsive member and a switch actuated thereby, said member being located adjacent an outlet of said passageway and said switch 20 being connected to at least one of the terminals in the housing whereby, in use, said switch interrupts the current supply to the liquid heating device when said member responds thermally to vapour escaping from the outlet of said passageway; the terminals of the 25 cut-out assembly which mate with the terminals of the liquid heating device being such that the cut-out assembly is detachable from the liquid heating device in the manner of a plug and socket connector.
- 30 2. A resettable thermal cut-out assembly

according to claim 1 wherein said housing is in the form of an electrical socket with a face containing apertures enabling electrical connections to be made between the current 35 supply terminals, in the form of pins on the liquid heating device, and the terminals within said housing, in the form of sockets, said thermally responsive member being a bi-metallic member and said switch being a snap acting switch. 40

3. A resettable thermal cut-out assembly for use with a liquid heating device (as herein defined) substantially as herein described with reference to the accompanying drawings. 45

4. In combination, the thermal cut-out assembly according to any one of the preceding claims and a heating element assembly, the heating element assembly comprising an electrical heating element and a vapour tube 50 both fitted to a flanged head, said head being locatable in an opening in the liquid heating device and being fitted with an excess temperature switch.

5. An electric kettle including the cut-out 55 assembly of any one of claims 1-3, or the combination defined by claim 4.

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