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Jug kettles and electrical controls therefor

5 This invention relates to jug kettles and
electrical boiling controls therefor incorporating
thermally-responsive actuators. More particularly the
invention relates to electrical controls incorporating
such actuators (hereinafter termed actuators or controls
10 of the kind referred to) incorporating an actuating
member of sheet bimetal of dished or domed configuration
such that it will reverse its curvature with a snap
action upon a sufficient rise in temperature consequent
upon exposure to steam or vapour. Such an actuating
15 member may be constructed automatically to reset with a
fall in temperature but more usually it requires to be
reset by a force being applied thereto to cause it to
snap back to its original state.

 Actuators or controls of the kind referred to are
20 commonly employed in so-called automatic electric
kettles or jugs for interrupting the electric supply to
the heating element of such a kettle or jug upon the
water in the kettle or jug boiling. The force generated
by the actuating member may be used directly to move a
25 switch contact or it may be used to operate a switch
actuating mechanism such as a sprung over-centre lever
mechanism. An electrical control of the kind referred
to may incorporate an electrical switch for interrupting
the power supply to the heating element. Alternatively
30 an actuator of the kind referred to may operate an
electrical switch which is separate from the actuator, a
switch actuating mechanism serving operatively to
interconnect the actuator and the switch.

 The space available in liquid heating vessels for
35 actuators or controls of the kind referred to is often
limited both on account of the limited size of such
vessels and particularly as regards domestic household

appliances on account of styling considerations. Further there is always the problem associated with the use of such actuators or controls of providing for access of steam or vapour thereto whilst avoiding as a consequence thereof penetration of vapour or condensation into the electrical system of the vessel. Our co-pending application No. 8900199.4 (published as GB 2213646) describes an actuator comprising two plastic mouldings which when superimposed define between them a shallow enclosure housing an actuating member of the type referred to. One of the mouldings has an inlet opening opening which provides direct access for vapour to enter the enclosure and contact the actuating member. The other moulding has an outlet opening for the egress of vapour from the enclosure. The mouldings make sealing contact at their interface so the arrangement allows the flow of vapour through the enclosure without allowing escape of vapour through the interface and thence to electrical parts. As part of an electrical control, the actuating member is arranged to act upon a push-rod when its curvature changes, thereby to open a set of switch contacts. The switch contacts are conveniently housed in a second enclosure formed between the mouldings, which is also sealed to prevent moisture entering.

In a particular embodiment of the above application for use with a jug kettle the control is mounted in a hollow portion in the flat top portion of the handle. In the base of the top portion there is a steam chamber which communicates with the interior of the jug via a slot in the jug wall. Extending through the base of the chamber are two air inlets. When in place the lower moulding of the actuator provides at least a partial closure for the steam chamber. A cover is fitted over the entire control but a hole in this cover aligns with the steam outlet opening in the upper moulding so that vapour can escape through the top surface of the handle

to the atmosphere. In operation, steam enters the steam chamber through the slot in the kettle wall and passes through the inlet opening in the lower moulding. When the water in the kettle boils the bimetal actuator snaps
5 to the opposite curvature, moving the push-rod and thereby opening the switch contacts and cutting off power to the heating element of the kettle. The steam in the enclosure vents through the outlet opening in the upper moulding. Provision is made for condensate to
10 flow back into the main body of the kettle.

The two air inlets provide for a flow of cooling air into the steam chamber which will pass over and around the bimetal and out to atmosphere through the outlet opening. By thus cooling the bimetal the time
15 within which the control may be reset is reduced. However, the switch mechanism associated with the push-rod assembly must be mounted above and to one side of the bimetal, because of the steam outlet opening located directly above the bimetal. This arrangement
20 limits the possible configurations of the control and, in particular, means that the device requires a reasonably long mounting space along the top of the handle.

It is an object of this invention to provide a
25 thermally-responsive control of the kind referred to which is more compact in a direction parallel to the medial plane of the actuating member.

According to a first aspect of the present invention there is provided a jug kettle comprising an
30 electrical control of the kind referred to comprising a thermally-responsive actuator and an electrical switch for interrupting power to a heating element of the kettle operable by said thermally-responsive actuator, said thermally-responsive actuator comprising first and
35 second plastic mouldings, the mouldings being superimposed and defining between them a shallow enclosure housing an actuating member, one moulding

being provided with an inlet opening therein opposite said actuating member providing direct access for vapour to contact said actuating member, the other moulding closing said enclosure against the escape of vapour, the
5 mouldings making sealing contact at their interface to prevent escape of vapour or condensate therebetween; and a push rod slidably and sealingly mounted in an aperture extending through said other moulding and arranged to be acted upon by said actuating member upon operation
10 thereof with rise in temperature, said control closing a steam chamber formed at or adjacent the top of a handle of the kettle.

By providing no outlet opening for vapour on the opposite side of the actuating member to the inlet
15 opening, control parts associated with the push rod assembly can be mounted in large part overlying the actuating member. The whole control of which the thermally-responsive actuator forms a part can thus be made very compact, particularly in a direction parallel
20 to the medial plane of the actuating member.

Also within the scope of the invention is an electrical control of the kind referred to for use in a jug kettle comprising a thermally-responsive actuator and an electrical switch for interrupting power to a
25 heating element of the kettle operable by said thermally-responsive actuator, said thermally-responsive actuator comprising first and second plastic mouldings, the mouldings being superimposed and defining between them a shallow enclosure housing an actuating member,
30 one moulding being provided with an inlet opening therein opposite said actuating member providing direct access for vapour to contact said actuating member, the other moulding closing said enclosure against the escape of vapour, the mouldings making sealing contact at their
35 interface to prevent escape of vapour or condensate therebetween; and a push rod slidably and sealingly mounted in an aperture extending through said other

moulding and arranged to be acted upon by said actuating member upon operation thereof with rise in temperature, said control having a downwardly depending skirt for engagement with the steam chamber of the kettle.

5 Preferably the two mouldings co-operate to define between them a switch chamber, the mouldings preferably making sealing contact at their interface around said switch chamber, to prevent ingress of moisture.

10 A second push rod may extend slidably and sealingly through an aperture in one of said mouldings into said chamber to act upon a movable contact of a pair of switch contacts housed within. The contacts may be carried by leaf springs which extend into said chamber and which have integrally formed therewith
15 electrical terminals. The second push rod will then serve to open the switch contacts by displacing the movable contact against the resilience of its respective leaf spring which will ensure the remaking of the switch contacts once the force acting on the second push rod is
20 removed.

25 A switch actuating mechanism may be mounted on the control and can conveniently take the form of a sprung over-centre lever mechanism pivotally mounted to said other moulding in which both push rods are slidably
30 mounted, said mechanism overlying both push rods and being operated by displacement of the first push rod by the actuating member thereby to displace the second push rod and open the switch. Preferably the switch actuating mechanism is such as to require resetting e.g.
35 manually, to allow the switch to close. Resetting of the actuating mechanism may also serve to reset the actuating member through the agency of the push-rod associated therewith. The switch actuating mechanism is preferably mounted so as generally to overlie the
actuator. The compact stacked configuration of the control thus formed is such that it may conveniently be

accommodated in or adjacent a jug kettle handle with the medial plane of the actuating member either vertical or horizontal.

5 The control forms the closure of a steam chamber which itself communicates with the interior space of the jug kettle in which liquid is heated. Vapour thus passes from the interior space into the steam chamber and via said inlet opening into said enclosure to contact said actuating member. The steam chamber is formed at or
10 adjacent the top of the handle of the kettle.

Preferably the communication between the steam chamber and the interior space is such that condensate formed in the steam chamber drains into the interior space.

One or more air inlets are preferably provided in
15 the walls of the steam chamber. Preferably a pair of such inlets are provided sited generally opposite each other in the side wall of the steam chamber such that air may be drawn into the steam chamber, thence to the interior of the jug kettle via the communication
20 provided therebetween for the passage of vapour or condensate and out to atmosphere via a vessel outlet e.g. the kettle spout. A chimney effect can thus be created which serves quickly to cool the actuating member to enable it to be reset.

25 The air inlet or inlets may be sited at an appreciable distance relative to the depth of the actuator vertically below the actuating member, to create a strong chimney effect.

Embodiments of the invention will now be described,
30 by way of example only, with reference to the accompanying drawings, of which:-

Figure 1 is a side elevation in cross-section of an electrical control in accordance with the present invention;

35 Figure 2 is a cross-section on the line II- II of Figure 1 to an enlarged scale;

Figure 3 is an underneath plan view of the control;

Figure 4 is a cross-sectional side elevation of a jug kettle handle incorporating the control (shown in elevation) of Figures 1 to 3;

5 Figure 5 is a perspective scrap view partly broken away showing the steam chamber in the jug kettle handle of Figure 4; and

Figure 6 shows an alternative form of jug kettle handle incorporating the control of Figures 1 to 3.

10 Referring to Figures 1 to 3, the control shown is similar to that described in Patent Application No. 8900199.4 both in construction and manner of operation. The body of the control comprises an upper main moulding 1 and a lower moulding 2 both made of plastics. When
15 the two mouldings are superimposed as shown in Figure 1 a shallow cylindrical enclosure 23 is formed which houses a bimetallic actuating member 3. The lower moulding has an inlet opening 15 therein through which vapour or steam can access the actuating member 3 and is
20 provided with retaining lugs 15a for retaining the member 3 within the enclosure 23. A depending skirt 20 of moulding 2 surrounds the opening 15.

 The upper main moulding 1 has an apertured ear 65 (see Fig. 4) depending from each side thereof opposite
25 respective shoulders 12, which ears are spaced to embrace the lower moulding 2 and resiliently to snap over lugs 66 respectively provided on opposite side edges of the lower moulding 2 so that the lugs locate in the apertures in the ears. In this way the mouldings 1,
30 2 are held together. A rectangular cavity 8 formed by the upper moulding engaging the lower moulding around a rectangular rib 17 defines a moisture tight switch chamber which encloses a switch comprising leaf springs 25, 26 (see Figure 2) carrying contacts 25a and 26a
35 which are integral with electrical terminals 21a, 22a housed within terminal housings 21, 22. As also shown in Figure 2 mouldings 1, 2 are shaped to hold and locate

between them the leaf springs 25, 26.

A knob 27 for actuating the switch is pivotally mounted on shoulders 12 of the main moulding 1 by means of V-shaped pivots 27a on each side of knob 27 which
5 engage V-shaped notches 12a in shoulders 12 . The knob 27 is sprung into position on shoulders 12 by a wire spring 28 which is held in compression between V-shaped notches 12b in shoulders 12 and an end support on the knob 27 where it overlies a first aperture 7 in main
10 moulding 1. The relative positions of notches 12a and 12b and the end support provide an over-centre lever mechanism.

A first push rod 29 is slidably and sealingly mounted in first aperture 7 so that its bottom end
15 engages actuating member 3.

The actuating member 3 is a domed circular disc of sheet bimetal from which a U-shaped portion has been removed to leave a tongue 3a. Such an actuating member is described and claimed in U.K. Specification No.
20 1542252. The member 3 is constructed to reverse its curvature from that shown in Fig. 1 with a snap action upon a rise in its temperature and the end of the tongue 3a, which the push rod 29 engages, then displaces push-rod 29 to cause the knob 27 to move to the position
25 shown in Figures 4 and 6.

A second push rod 30 is mounted slidably and sealingly in a second aperture 9 so that its bottom end engages leaf spring 25 (Figure 2). In use the knob 27 has two stable positions. In the first stable position
30 illustrated in Figures 1 and 2 the knob 27 pushes down on the push rod 29 which in turn pushes down on the actuating member 3. In the second stable position illustrated in Figures 4 and 6 the knob 27 pushes down on second push rod 30 which in turn pushes down on leaf
35 spring 25 thereby holding the switch contacts 25a, 26a open. Thus if one manually actuates the knob 27 into its first position with the push rod 29 pushing down on

the actuating member 3 then the contacts 25a and 26a will close. If the actuating member 3 is then heated by, for example, exposure to steam, then upon a sufficient rise in temperature it will reverse its curvature pushing the first push rod 29 upward against knob 27, thereby causing knob 27 to snap into its second stable position in which the switch contacts 25a and 26a are opened and held open by push rod 30.

Actuating member 3 is heated by steam entering the shallow cylindrical enclosure 23 through the inlet opening 15 in the lower moulding 2. When the control is used in a jug kettle then when the water boils the steam generated is used to heat the actuating member 3 causing knob 27 to change position thereby opening contacts 25a and 26a and switching the kettle off. When the actuating member 3 has cooled sufficiently then it is possible to reset the control by manually moving knob 27 to its first stable position thereby moving push rod 29 downwards and thus reversing the curvature of actuating member 3. This would allow contacts 25a and 26a to close thereby switching the kettle back on.

In one embodiment, the control is mounted in the flat top of the handle of the jug kettle. Figures 4, 5 and 6 illustrate this.

Referring to Figures 4 and 5 the jug kettle has a handle 45 including a vertical hollow portion 46 opening into a flat top portion 47. In the base of the top portion 47 there is a steam chamber 33 which communicates with the interior 48 of the jug via a slot 49 in the jug wall 50 which slot extends downwardly from the top of the jug and also extends through the side wall 32 of steam chamber 33. Two opposed air inlets 36 are formed in the side wall 32. The base 51 of steam chamber 33 runs through slot 49 into jug interior 48 so condensate within steam chamber 33 can drain into the jug or out through the air inlets 36.

A handle cover 52 (Figure 4) has a depending finger

portion 53 which is a close sliding fit within slot 49 but terminates short of the bottom thereof to define a steam opening 34 connecting the interior of jug 48 with the steam chamber 33. The chamber 33 corresponds in shape to the skirt 20 of the lower moulding 2 which closely fits within side wall 32 to provide a seal against escape of steam or vapour. A slot 20a in skirt 20 aligns with the steam opening 34. An O-ring seal may additionally be provided between lower moulding 2 and the chamber 33. When in place the lower moulding 2 of the control provides a closure for steam chamber 33.

In use with contacts 25a and 26a closed and the jug kettle switched on, water is heated. When the water boils the steam produced passes from the kettle interior 48 into steam chamber 33 via the opening 34. From steam chamber 33 the steam passes through inlet opening 15 into the enclosure 23 where it heats actuating member 3.

The heating of actuating member 3 causes the control to switch the kettle off in the manner previously described. Any condensate forming within the cylindrical enclosure 23 or the steam chamber 33 drains back into the vessel through opening 34. Air inlets 36 in side wall 32 aligned with slots 20b in skirt 20 provide for a flow of cooling air into the steam chamber 33 which will pass through and around the actuating member 3 and, through the steam opening 34 and via the kettle body, out to atmosphere through the spout thus enabling the actuating member 3 to cool rapidly, and thereby speeding the time at which the control may be reset. The dimensions of the inlets 36 can be determined empirically so that the control operates to switch off the kettle quickly once the water has boiled without an unduly long delay before the control can be reset. In fact, the combined volume of the enclosure 23 and the steam chamber 33 may be very small such that the actuating member 3 can be cooled sufficiently quickly for convenience of use without providing for a vertical

through- draught past the actuating member. Instead the warmed air and any uncondensed vapour either return to the main kettle body through the inlet 15, the slot 20a and the opening 34 and vent to the atmosphere through the spout, or escape through inlets 36.

Figure 6 shows an alternative construction in which a hollow portion 40 is provided adjacent the side wall of the kettle and the control is mounted above this hollow portion 40 rather than above the space within the jug handle. The steam chamber 33 extends a substantial distance down the hollow portion 40 and the air inlets 36 are provided at the bottom of the side walls 32 of the steam chamber. An extended chimney is thus constructed, cool air being drawn in through the inlets 36 and up the steam chamber 33 to the enclosure 23. Any condensate accumulating in chamber 33 can escape by inlets 36.

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Claims

1. A jug kettle comprising an electrical control of
5 the kind referred to comprising a thermally-responsive
actuator and an electrical switch for interrupting power
to a heating element of the kettle operable by said
thermally-responsive actuator, said thermally-responsive
10 actuator comprising first and second plastic mouldings,
the mouldings being superimposed and defining between
them a shallow enclosure housing an actuating member,
one moulding being provided with an inlet opening
therein opposite said actuating member providing direct
15 access for vapour to contact said actuating member, the
other moulding closing said enclosure against the escape
of vapour, the mouldings making sealing contact at their
interface to prevent escape of vapour or condensate
therebetween; and a push rod slidably and sealingly
20 mounted in an aperture extending through said other
moulding and arranged to be acted upon by said actuating
member upon operation thereof with rise in temperature,
said control closing a steam chamber formed at or
adjacent the top of a handle of the kettle.
- 25 2. An electrical control of the kind referred for use
in a jug kettle as claimed in claim 1 comprising a
thermally-responsive actuator and an electrical switch
for interrupting power to a heating element of the
kettle operable by said thermally-responsive actuator,
30 said thermally-responsive actuator comprising first and
second plastic mouldings, the mouldings being
superimposed and defining between them a shallow
enclosure housing an actuating member, one moulding
being provided with an inlet opening therein opposite
35 said actuating member providing direct access for vapour
to contact said actuating member, the other moulding
closing said enclosure against the escape of vapour, the



mouldings making sealing contact at their interface to prevent escape of vapour or condensate therebetween; and a push rod slidably and sealingly mounted in an aperture extending through said other moulding and arranged to be acted upon by said actuating member upon operation thereof with rise in temperature, said control having a downwardly depending skirt for engagement with the steam chamber of the kettle.

10 3. A kettle or an electrical control as claimed in claims 1 or 2 wherein the mouldings co-operate to define between them a switch chamber.

15 4. A kettle or an electrical control as claimed in claim 3 wherein the mouldings make sealing contact at their interface around said switch chamber, to prevent ingress of moisture.

20 5. A kettle or an electrical control as claimed in claim 3 or 4 including a second push rod extending slidingly and sealingly through an aperture in one of said mouldings into said chamber to act upon a movable contact of a pair of switch contacts housed within.

25 6. A kettle or an electrical control as claimed in claim 5 wherein the contacts are carried by leaf springs which extend into said chamber and which have integrally formed therewith electrical terminals.

30 7. A kettle or an electrical control as claimed in claim 5 or 6 including a switch actuating mechanism mounted on the control.

35 8. A kettle or an electrical control as claimed in claim 7 wherein said switch actuating mechanism takes the form of a sprung over-centre lever mechanism pivotally mounted to said other moulding in which both



push rods are slidably mounted, said mechanism overlying both push rods and being operated by displacement of the first push rod by the actuating member thereby to displace the second push rod and open the switch.

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9. A kettle or an electrical control as claimed in claim 7 or 8 wherein the switch actuating mechanism is such as to require resetting e.g. manually, to allow the switch to close.

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10. A kettle or an electrical control as claimed in claim 11 wherein resetting of the actuating mechanism serves to reset the actuating member through the agency of the push-rod associated therewith.

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11. A kettle or an electrical control as claimed in any of claims 7 to 10 wherein said switch actuating mechanism is mounted so as to generally overlie the actuator.

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12. A kettle as claimed in claim 11 wherein the communication between the steam chamber and the interior of the kettle is such that condensate formed in the steam chamber drains into the interior of the kettle.

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13. A kettle as claimed in claim 11 or 12 further comprising a pair of air inlets sited generally opposite each other in the side wall of the steam chamber such that air may be drawn into the steam chamber, thence to the interior of the kettle via the communication provided therebetween for the passage of vapour or condensate and out to atmosphere via a jug outlet.

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14. A kettle as claimed in claim 13 wherein said air inlet or inlets are sited at an appreciable distance relative to the depth of the actuator vertically below the actuating member, to create a strong chimney effect.

35



15. An electrical control of the kind referred to substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.
- 5 16. A jug kettle substantially as hereinbefore described with reference to Figures 1 to 5 or Figures 1 to 3 and 6 of the accompanying drawings.
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