

Thermally-sensitive controls
for electric heaters

This invention relates to thermally-sensitive electrical controls for electrical heaters of containers such as electric kettles, jugs, urns, pans, coffee percolators, laboratory equipment and the like.

- 5 Such heaters may be immersion heaters or similarly constructed heaters secured in good thermal contact with the underside of the container base, and traditionally terminate in so-called cold leads by means of which electrical connections are made to the heater.
- 10 Such heaters are referred to hereinafter as "heaters of the kind described".

- Thermally-sensitive electrical controls for such heaters are well-known which include switch means adapted and arranged to make electrical contact
- 15 with the cold leads of the heater and operable in use to interrupt the power supply to disable the heater when the element thereof overheats for example after having boiled dry or having been switched on with insufficient liquid within the
- 20 container to cover the element. Such controls thus include a thermally-responsive actuating means, such as a bimetal, mounted in thermal contact with part of the element and operable at a certain critical temperature to open contacts of the switch means.
- 25 Optionally, controls of this general type may also include further switching means operable to disable the heater in response to liquid in the container boiling.

- Thermally-sensitive controls of this type
- 30 generally include a thermoplastics body portion or portions to which electrical parts of the control are mounted, and traditionally such controls are secured in place with the thermally-sensitive actuating

means thereof in good thermal contact with the heater by means of internally threaded mounting studs fixed to part of the container or, more commonly, to part of the heater itself, the studs extending
5 through apertures in the control body portion and being threadedly engaged by bolts which clamp the body portion thereto. In the case of an immersion heater such studs are typically brazed to a head part of the heater, but in other heater configurations
10 they may be secured e.g. to a mounting bracket provided adjacent the cold leads of the heater.

In recent years safety requirements with such heaters and controls have become increasingly stringent, and much attention has been given to
15 the possibility of serious overheating occurring consequent upon the primary protector switch means of the control failing to operate in the event of e.g. the heater being energised with insufficient liquid in the container to cover the element.
20 Such overheating can be particularly dangerous in the case of plastics hot water jugs, which have become increasingly popular in recent years. To this end, thermally-sensitive controls have been proposed incorporating a back-up protecting means
25 adapted for one-shot operation to disable the heater and prevent potentially dangerous overheating in the event of failure of the primary protector switch; one such means is described in British Patent Specification No. 2181598.

30 However, in the case of controls having a thermo-plastic body portion clamped to threaded studs as aforesaid, even where a suitable emergency back-up protector is provided, the studs, being secured directly or in close proximity to part
35 of the heater, can become so hot as a result of the so-called overshoot heating of the element occurring before or immediately after the back up protector operates that the control body in the

region surrounding the apertures thereof which receive the studs softens to the extent that there is a risk of the heads of the mounting bolts engaged with the studs being pulled through such apertures.

5 Depending on the configuration of heater and control concerned, this can result in the heater sagging away from the control and/or the control being released from its mounting location e.g. in the event of the user attempting to disable the heater
10 when overheating by disengaging the mains lead and connector therefrom. Consequently there is a greater risk of fire or at least of leaving live electrical parts of the control exposed.

Viewed from one aspect the invention provides
15 a mounting arrangement for a thermally-sensitive control of an electric heater of the kind described, such arrangement comprising an internally threaded metal stud located in an aperture formed in a thermo-plastics body portion of the control, a bolt engaged
20 with the stud to secure the control thereto, and a retaining clip having a base part engaged between the head of the bolt and the end of the stud, and a lug which is stepped with respect to the base part and which engages a region of the body portion which is
25 both axially in a direction away from the stud and radially spaced with respect to the end of the stud.

In accordance with the invention, the possibility of release of the control due to softening of the plastic in the event of serious overheating is
30 reduced since the stud is connected via the retaining clip to a region of the body portion which is spaced from the stud and which is less vulnerable to the effect of heating therefrom. In particular, since the lug is stepped with respect to the base part
35 of the clip it is thus axially or forwardly spaced from the end of the stud, and the region of the body portion engaged by the lug is not directly exposed to the effect of radial heating of the plastic surrounding the stud.

Traditionally, controls of this sort may be secured to three internally threaded studs, one or all of which can have associated therewith a retaining clip as aforesaid. In one known arrangement
5 the studs are fixedly secured to the head part of an associated heater whereby the mounting of the control thereby is also effective to clamp the heater head in or adjacent an opening formed in a container wall; such an arrangement is well
10 known in the case e.g. of electric kettles and hot water jugs. In such an arrangement, there has previously been the problem of the heater sagging under its own weight in the event of serious overheating consequent upon an upper one or ones of the mounting
15 bolts being pulled through the softening plastic material, and with this configuration it is therefore important that at least the upper such bolt or bolts are engaged with a retaining clip or clips as discussed above. In another configuration,
20 the studs may be secured to e.g. a heater mounting plate forming part of or secured to the container.

In a preferred embodiment, the body portion is formed with a recess which is enlarged with respect to the stud-receiving aperture and which
25 intersects such aperture so as to define a location for the base part of the retaining clip which bears against the step formed between the recess and aperture so as to clamp the control to the stud when the bolt is threadedly engaged therewith. The shape
30 and configuration of the retaining clip may vary depending on the nature of the control concerned, although it is desirable that whilst the lug itself defines a sufficiently large bearing surface with respect to the region of the body portion it engages,
35 an intermediate part of the clip connecting the lug to the base part should be of only limited width so that the radial heating effect thereof is minimised. In a preferred embodiment, the lug

is therefore wider than the intermediate part of the clip.

In a preferred embodiment the clip may include two opposed lugs each connected to the base part
5 by means of a respective intermediate part.

Viewed from a second aspect the invention provides a combination of electric heater of the kind described and thermally-sensitive control wherein the control is mounted to or adjacent the
10 heater by means of a mounting arrangement as aforesaid.

Viewed from a further aspect the invention provides a container incorporating an electric heater of the kind described and a thermally-sensitive control therefor, wherein the control is mounted
15 to or adjacent the heater by means of a mounting arrangement as aforesaid.

Viewed from a still further aspect the invention provides a method of mounting a thermally-sensitive control to or adjacent an electric heater of the
20 kind described, the method comprising engaging an internally threaded metal stud, fixed with respect to the heater, in an aperture formed in a thermo-plastics body portion of the control, and clamping the control to the stud by means of a bolt, wherein a
25 retaining clip having a base part and a lug stepped with respect to the base part, has its base part engaged between the head of the bolt and the end of the stud so that said lug engages a region of the body portion which is both axially in a direction away
30 from the stud and radially spaced with respect to the end of the stud.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:

35 Figure 1 illustrates in rear elevation a thermally-sensitive control mounted to an electric heater, the cover of the control being removed so as to illustrate the mounting therefor;

Figure 2 illustrates in cross-section the engagement of a stud secured to the heater head in an aperture formed in the control body portion, and

5 Figure 3 is a perspective view of a retaining clip.

As shown in the drawings, a thermally-sensitive control 1 is secured to the head portion 2 of an electric heater 3 so that in use the control and
10 heater are mounted in an aperture formed in the wall 4 of an associated container such as an electric kettle or hot water jug with a suitable resilient sealing means 5 interposed therebetween. The arrangement
15 is such that a hot return portion of the element is mounted in good thermal contact with a bimetallic actuator of a protector switch of the control, whilst electrical connection is made with so-called "cold leads" of the element. As shown in Figure
20 1, the control includes terminal pins 6 adapted for engagement with a removable female socket connector for the supply of mains power, and an overcentre lever mechanism 7 co-operates with a further bimetallic actuator exposed to steam or vapour resulting from
25 liquid in the container boiling and actuable to open a further switch means to disable the heater upon boiling. This general form of control is very well-known, and the internal components may be similar to, for example, the control described in U.K. patent specification No. 2181598. The
30 details of the internal workings of the control do not however form part of this invention and will not be described further.

As shown in the drawings, the head 2 of the heater mounts three internally threaded studs 8
35 which are brazed to the head. These studs extend through corresponding apertures 9 formed in the thermo-plastics body portion of the control 10. Enlarged recesses 11 intersect the apertures 9

so as to define a step on which the heads of fixing bolts 12 bear against to clamp the control to the studs when the bolts are threadedly engaged therewith.

Retaining clips 13,14 are provided, each
5 of which includes an apertured base part 15 and at least one stepped lug 16 connected to the base part via an intermediate part 17. As shown in Figure 2, each clip 13,14 is mounted with its base part 15 engaged between the head of the bolt 12
10 and the end of the stud 8 and arranged so that the lug or lugs 16 are engaged with a region of the body portion 10 which is both axially, i.e. forwardly, and radially spaced from the end of the corresponding stud 8.

15 As discussed above, in the event of serious over-heating of the heater consequent upon failure of the primary protector switch, engagement of the lugs 16 with a region of the body portion which is not directly exposed to the effect of radial
20 heating from the studs 8 is effective to prevent the control being released from the heater head owing to softening of the plastic around the studs.

As shown in the drawings, the upper one 13 of the retaining clips includes two opposed lugs
25 16, whilst the lower clips 14 include only a single stepped lug. As shown in Figure 3, the lugs 16 are preferably wider than the intermediate part 17 of the clip so as to provide a larger bearing surface between the respective lug and the body
30 portion with respect to the region of the body portion exposed to the effect of heating by the intermediate part 17 of the lug itself.

Modifications to the arrangements described herein may be envisaged by those of relevant skill.
35 which retain one or more of the advantages envisaged. The disclosure hereof is intended to encompass such modifications, regardless of whether any particular feature or features presently described and/or illustrated is/are omitted, which lie within the scope of the claims appended hereto.

Claims:

1. A mounting arrangement for a thermally-sensitive control of an electric heater of the kind described, said arrangement comprising an internally threaded metal stud located in an aperture formed in a thermo-
5 plastics body portion of said control, a bolt engaged with the stud to secure the control thereto, and a retaining clip having a base part engaged between the head of the bolt and the end of the stud, and a lug which is stepped with respect to the base part and which engages
10 a region of the body portion which is both axially in a direction away from the stud and radially spaced with respect to the end of the stud.
2. An arrangement as claimed in claim 1, wherein the body portion of said thermally sensitive control
15 is formed with a recess which is enlarged with respect to the stud-receiving aperture and which intersects said aperture so as to define a location for the base part of the retaining clip which bears against the step formed between the recess and
20 aperture so as to clamp the control to the stud when the bolt is threadedly engaged therewith.
3. An arrangement as claimed in claim 1 or 2, wherein said lug is wider than an intermediate part of said clip connecting the lug to the base
25 part.
4. An arrangement as claimed in claim 1, 2 or 3, wherein said clip includes two opposed lugs each connected to the base part by means of a respective intermediate part.
- 30 5. A combination of an electric heater of the kind described and a thermally sensitive control, said thermally sensitive control including a thermally-reponsive actuating means arranged in use in good thermal contact with a part of the element of said
35 electric heater and coupled to a set of switch contacts of electrical switch means of the control



so that the actuating means is operable at a certain critical temperature to open contacts of said switch means, wherein said control is mounted to or adjacent the heater by means of a mounting arrangement comprising
5 an internally threaded metal stud located in an aperture formed in a thermo-plastics body portion of the control, a bolt engaged with the stud to secure the control thereto, and a retaining clip having a base part engaged between the head of the bolt and the end of
10 the stud, and a lug which is stepped with respect to the base part and which engages a region of the body portion which is both axially in a direction away from the stud and radially spaced with respect to the end of the stud.

15 6. A container incorporating an electric heater of the kind described and a thermally-sensitive control for said electric heater, said thermally sensitive control including a thermally-reponsive actuating means arranged in use in good thermal
20 contact with a part of the element of said electric heater and coupled to a set of switch contacts of electrical switch means of the control so that the actuating means is operable at a certain critical temperature to open the contacts of said switch
25 means, wherein said control is mounted to or adjacent the heater by means of a mounting arrangement comprising an internally threaded metal stud located in an aperture formed in a thermo-plastics body portion of the control, a bolt engaged with the stud to secure
30 the control thereto, and a retaining clip having a base part engaged between the head of the bolt and the end of the stud, and a lug which is stepped with respect to the base part and which engages a region of the body portion which is both axially in a direction away from the stud
35 and radially spaced with respect to the end of the stud.

7. A method of mounting a thermally-sensitive control to or adjacent an electric heater of the



- kind described, comprising engaging an internally threaded metal stud, fixed with respect to the heater, in an aperture formed in a thermo-plastics body portion of the control, and clamping the control
- 5 to the stud by means of a bolt, wherein a retaining clip having a base part and a lug which is stepped with respect to the base part, has its base part engaged between the head of the bolt and the end of the stud so that said lug engages a region of the
- 10 body portion which is both axially in a direction away from the stud and radially spaced with respect to the end of the stud.
8. A mounting arrangement substantially as herein described with reference to the accompanying drawings.
- 15 9. A combination of electric heater, thermally-sensitive control and mounting arrangement substantially as herein described with reference to the accompanying drawings.
10. A container incorporating an electric heater,
- 20 a thermally-sensitive control therefor, and a mounting arrangement substantially as herein described with reference to the accompanying drawings.
11. A method of mounting a thermally-sensitive control substantially as herein described with
- 25 reference to the accompanying drawings.



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