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U1S S1788 S1976

(56) Documents Cited
GB 2299454 A **GB 2292841 A** **GB 2290210 A**
GB 2045588 A

(58) Field of Search
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INT CL⁶ **A47J**

(54) **Electrically heated water boiling vessels**

(57) An electrically heated water boiling vessel incorporating a planar heating element 2 has an element protector control 9 for switching off the supply of electricity to the heating element 2 in response to a sensed element overtemperature condition and a steam sensor 10 for switching off the heating element 2 in response to the generation of steam when water is boiled in the vessel. The element protector control 9 and the steam sensor 10 are located in a bottom part of the vessel which is compartmentalized so as to segregate the potentially wetted environment of the steam sensor 10 from the element protector control 9 and thereby avoid electrical problems. The planar heating element 2 is affixed into an aperture in a bottom wall 1 of the vessel by means of a clamping ring 3. The ring 3 is formed by top (4, Fig 1D) and bottom 5 rings which clamp therebetween the edges of the heating element 2 and vessel aperture.

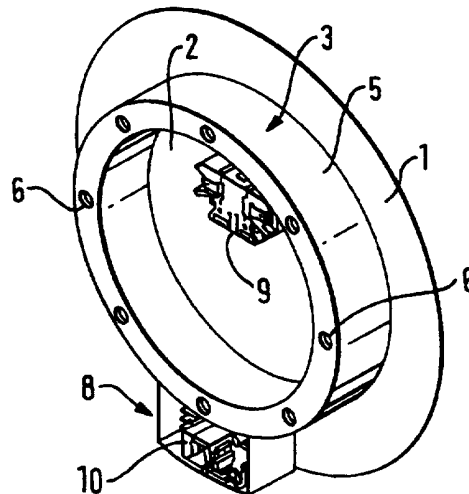
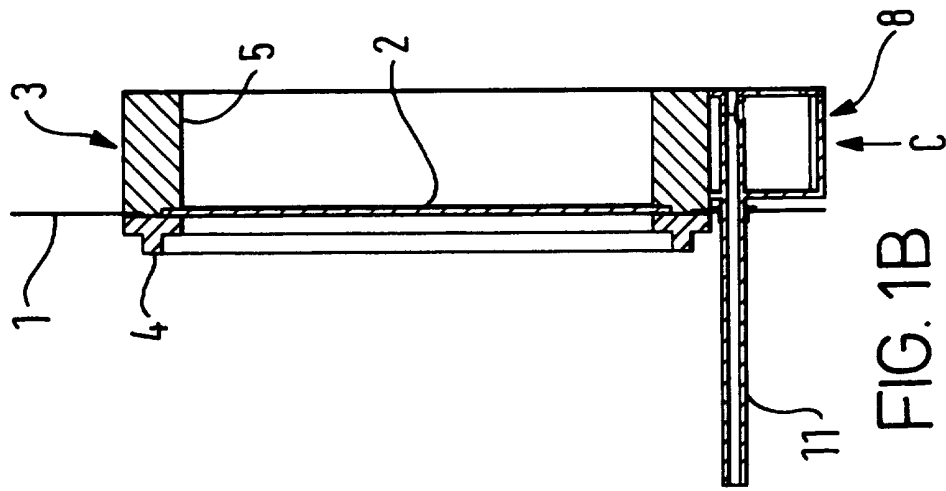
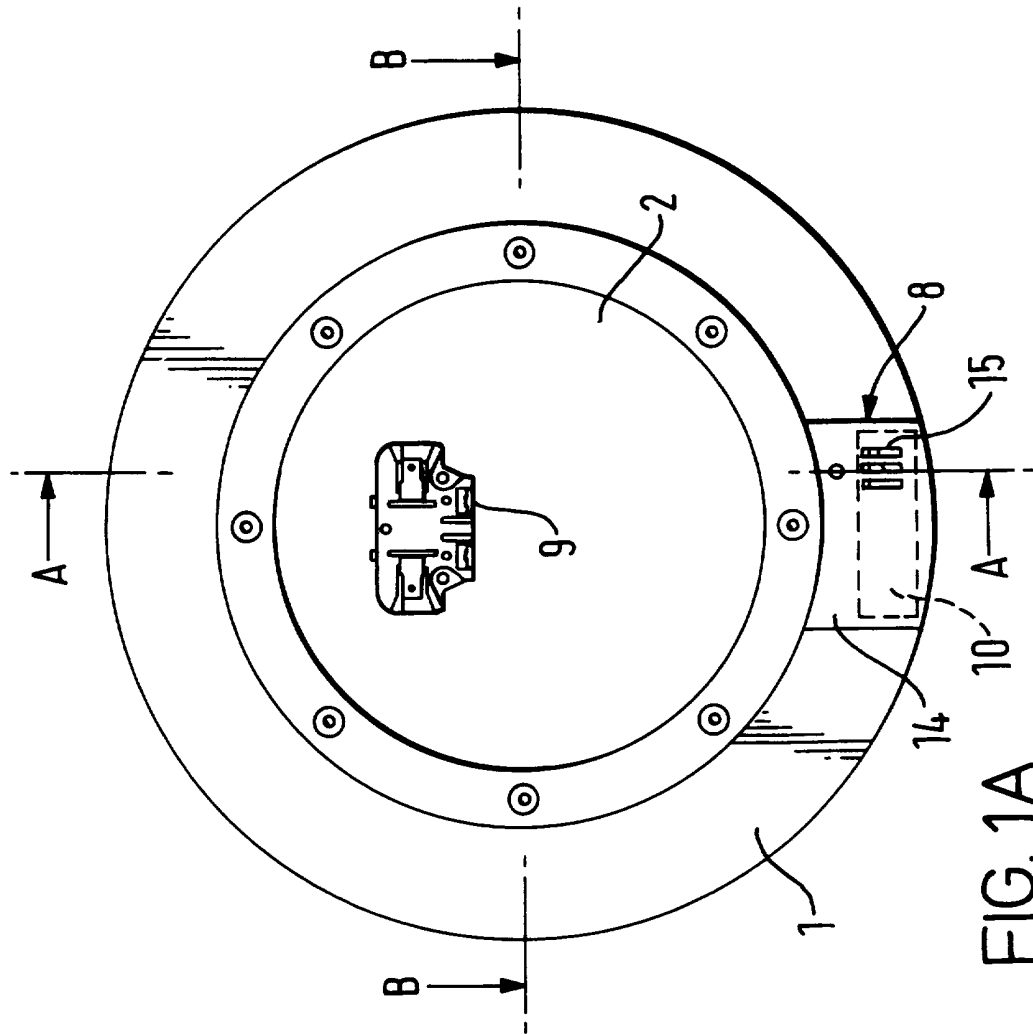


FIG. 1E

GB 2 318 452 A



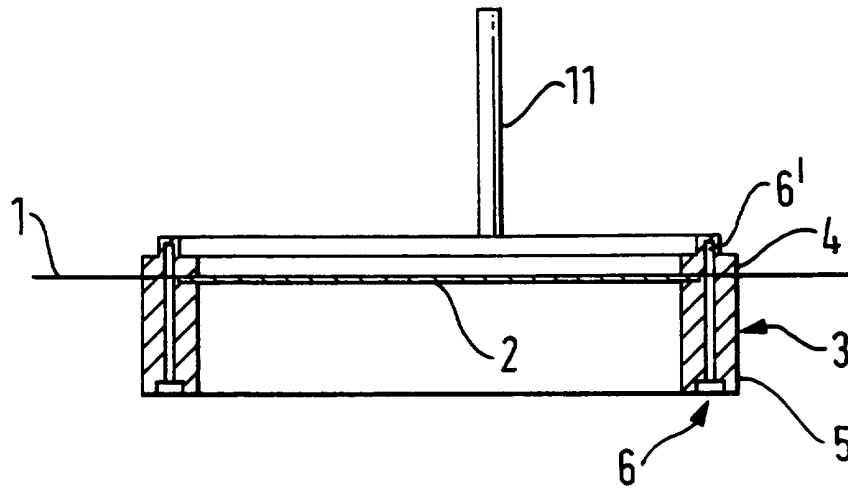


FIG. 1C

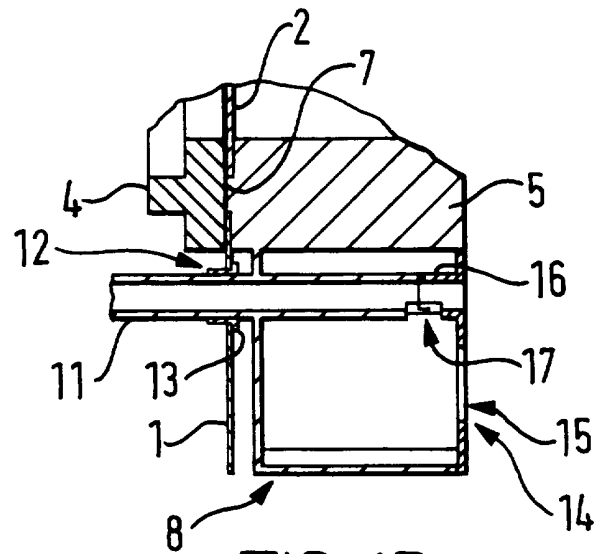


FIG. 1D

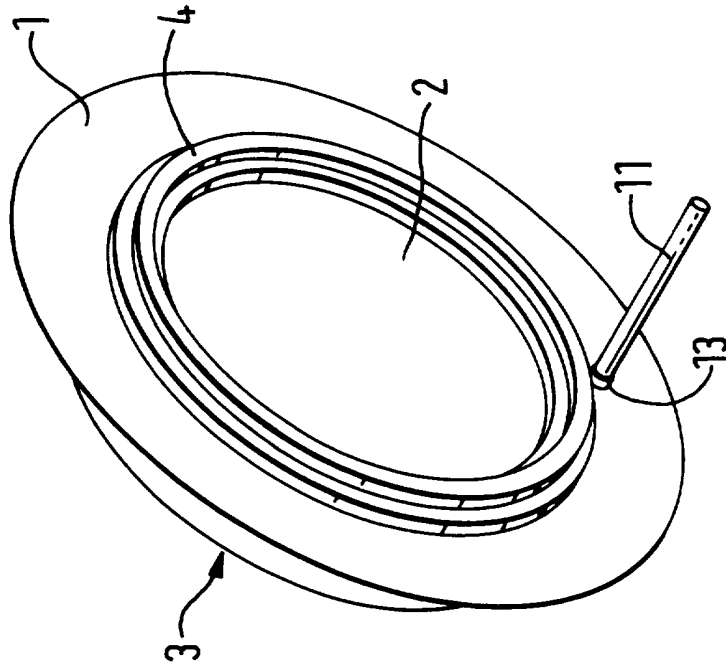


FIG. 1F

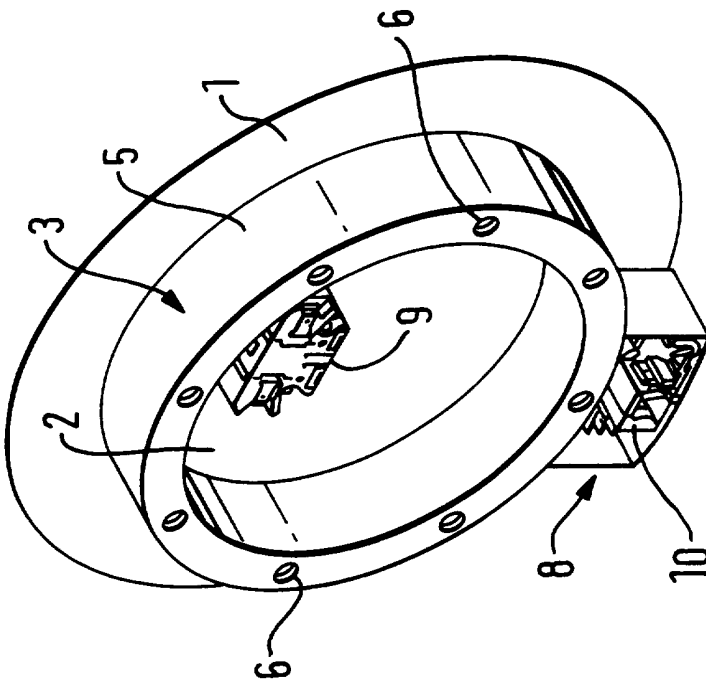


FIG. 1E

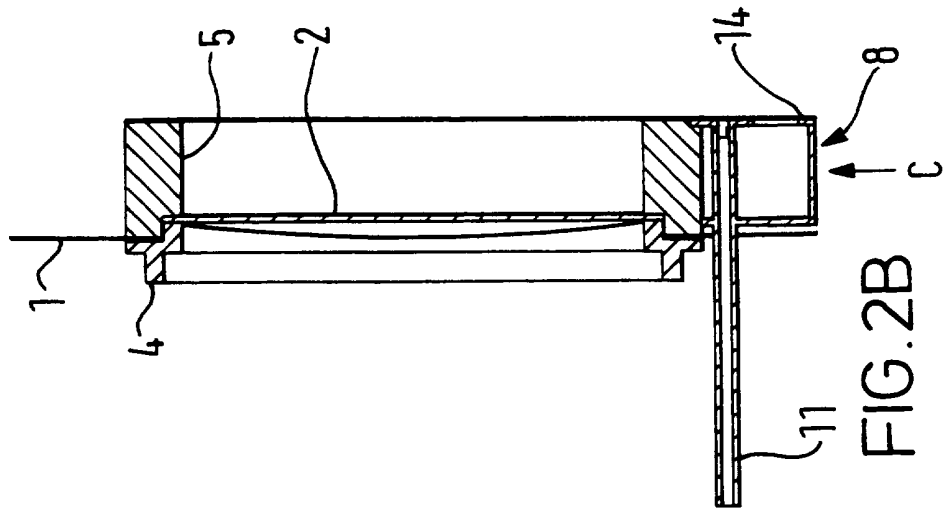
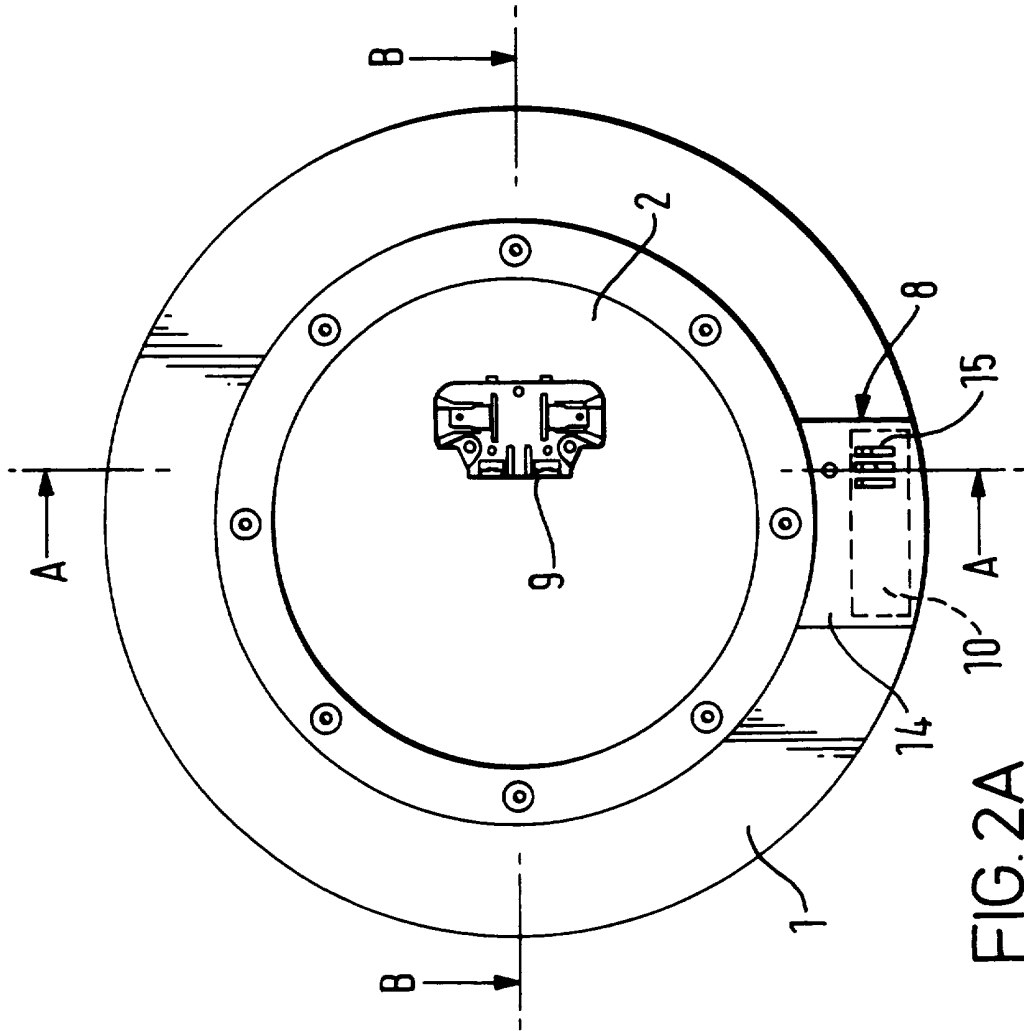


FIG. 2B

FIG. 2A

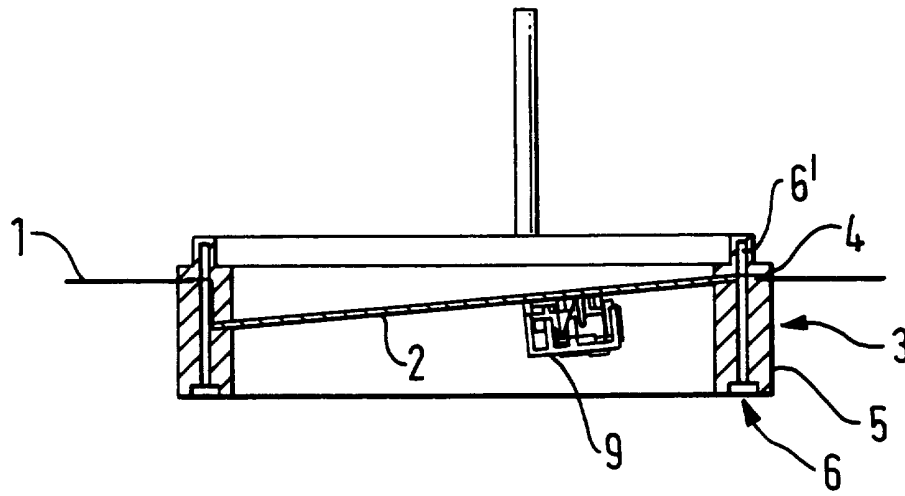


FIG. 2C

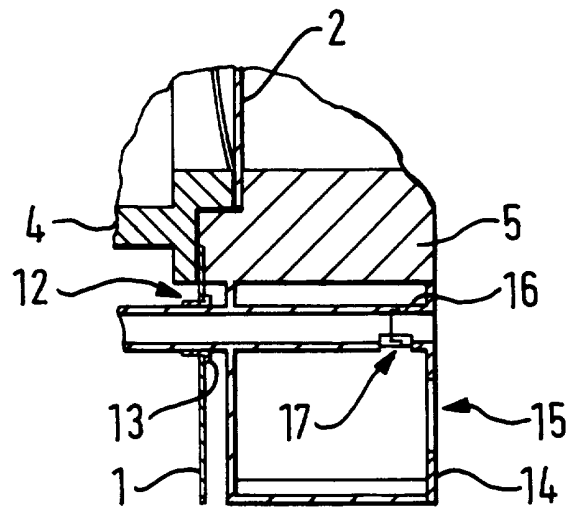


FIG. 2D

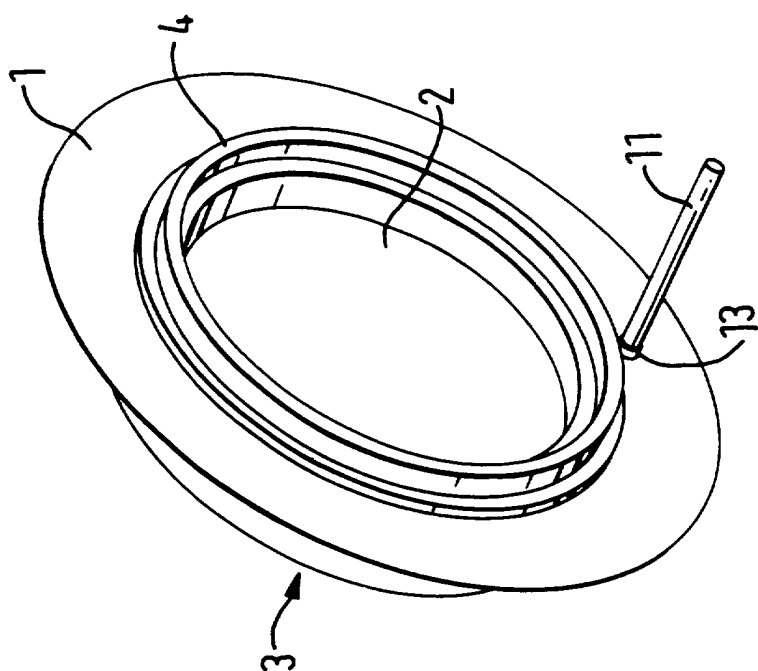


FIG. 2F

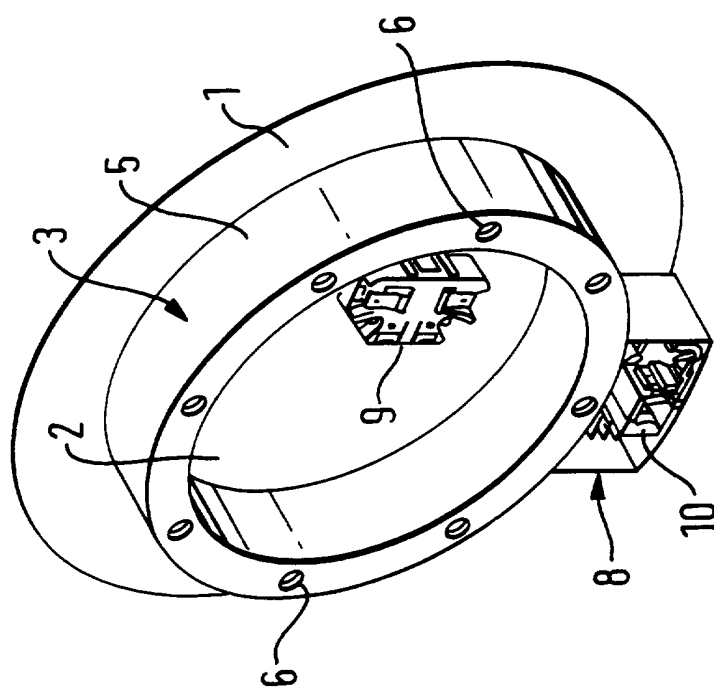


FIG. 2E

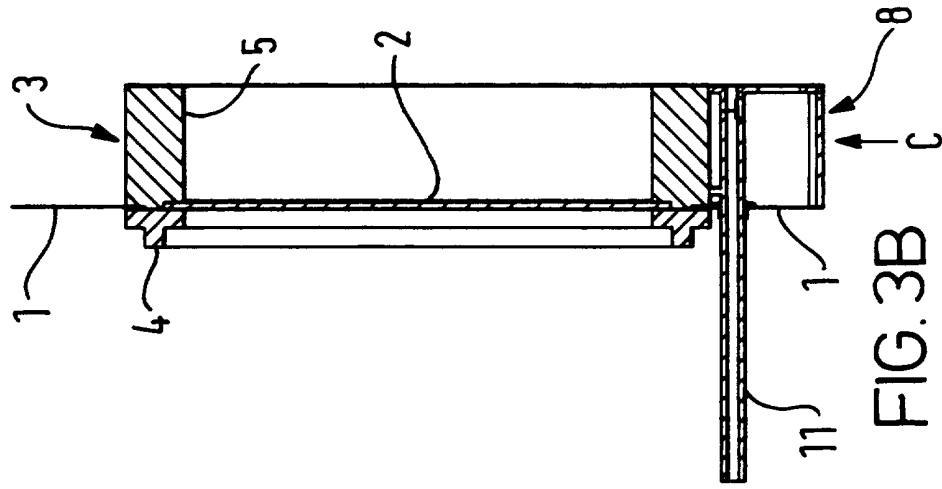
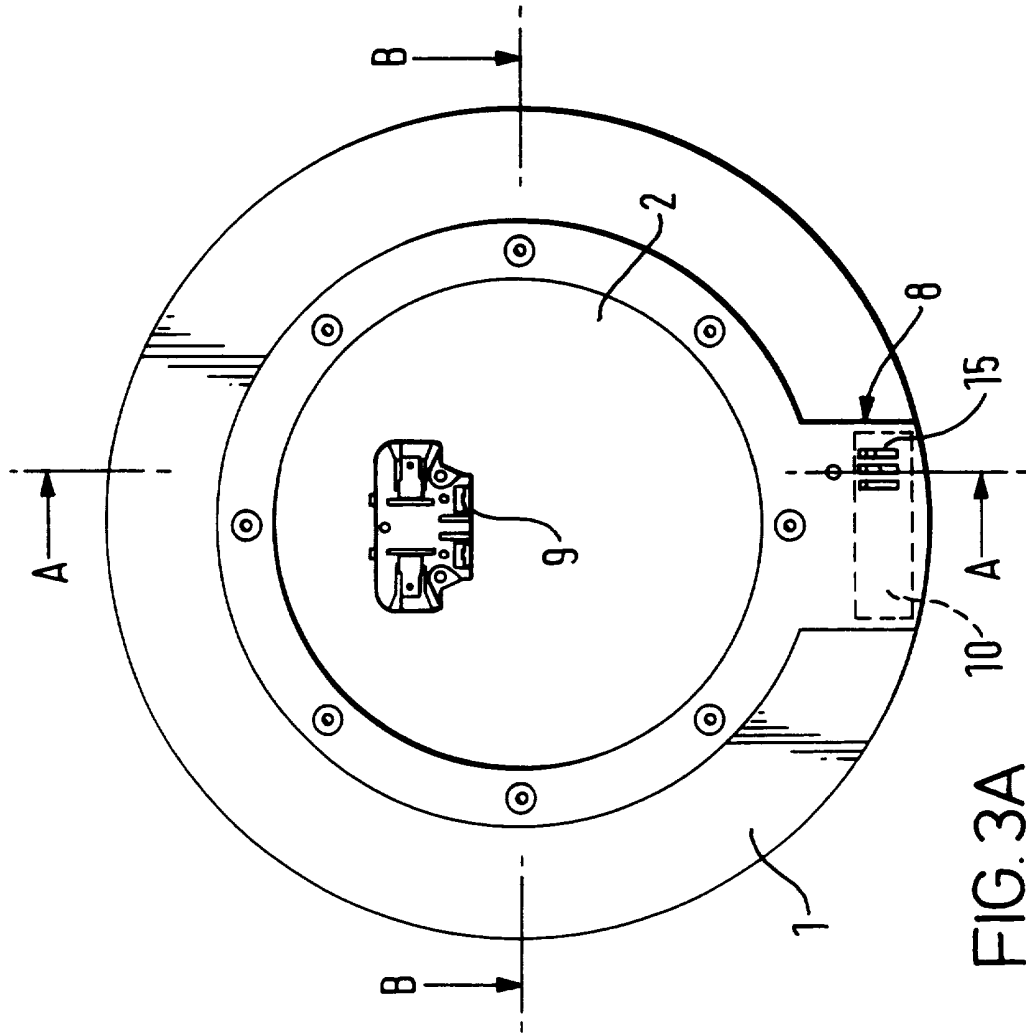


FIG. 3B

FIG. 3A

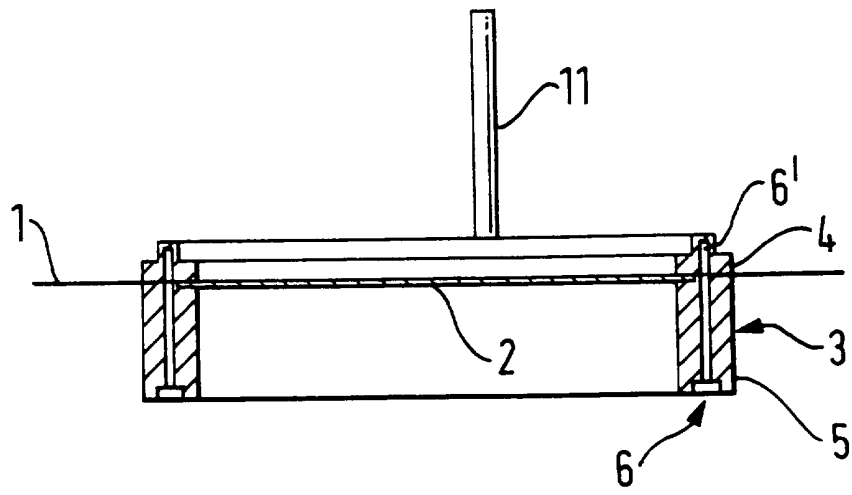


FIG. 3C

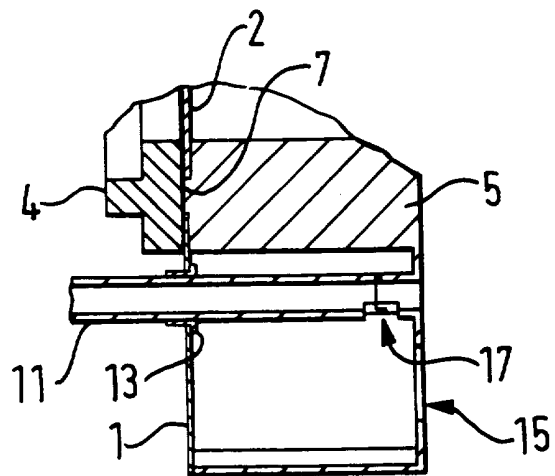


FIG. 3D

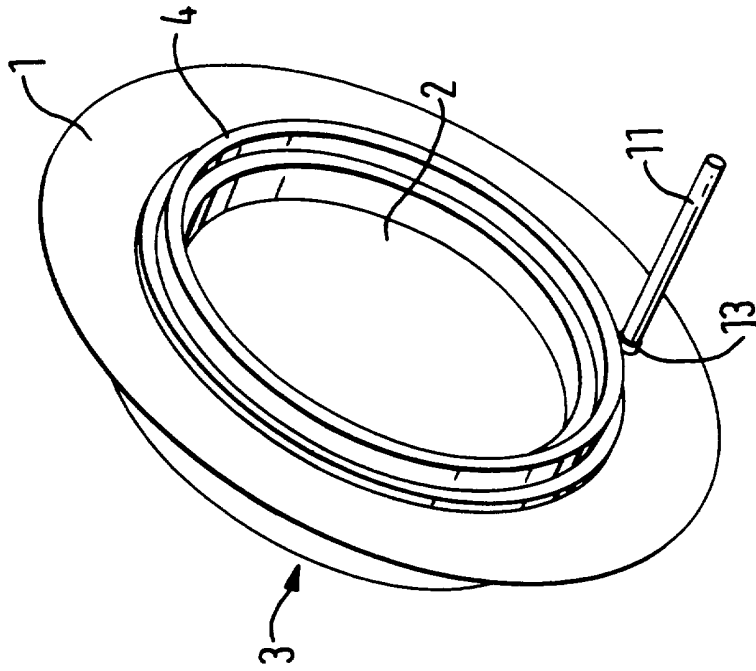


FIG. 3F

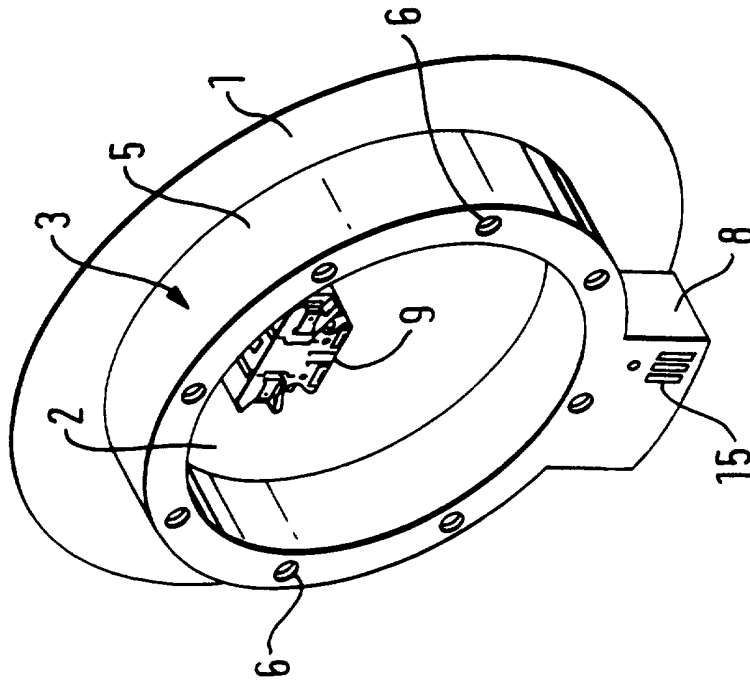


FIG. 3E

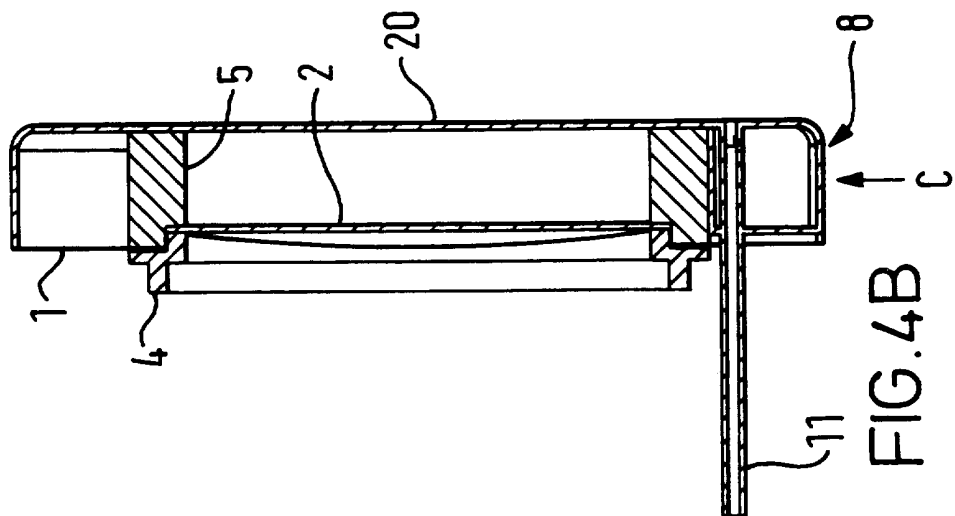
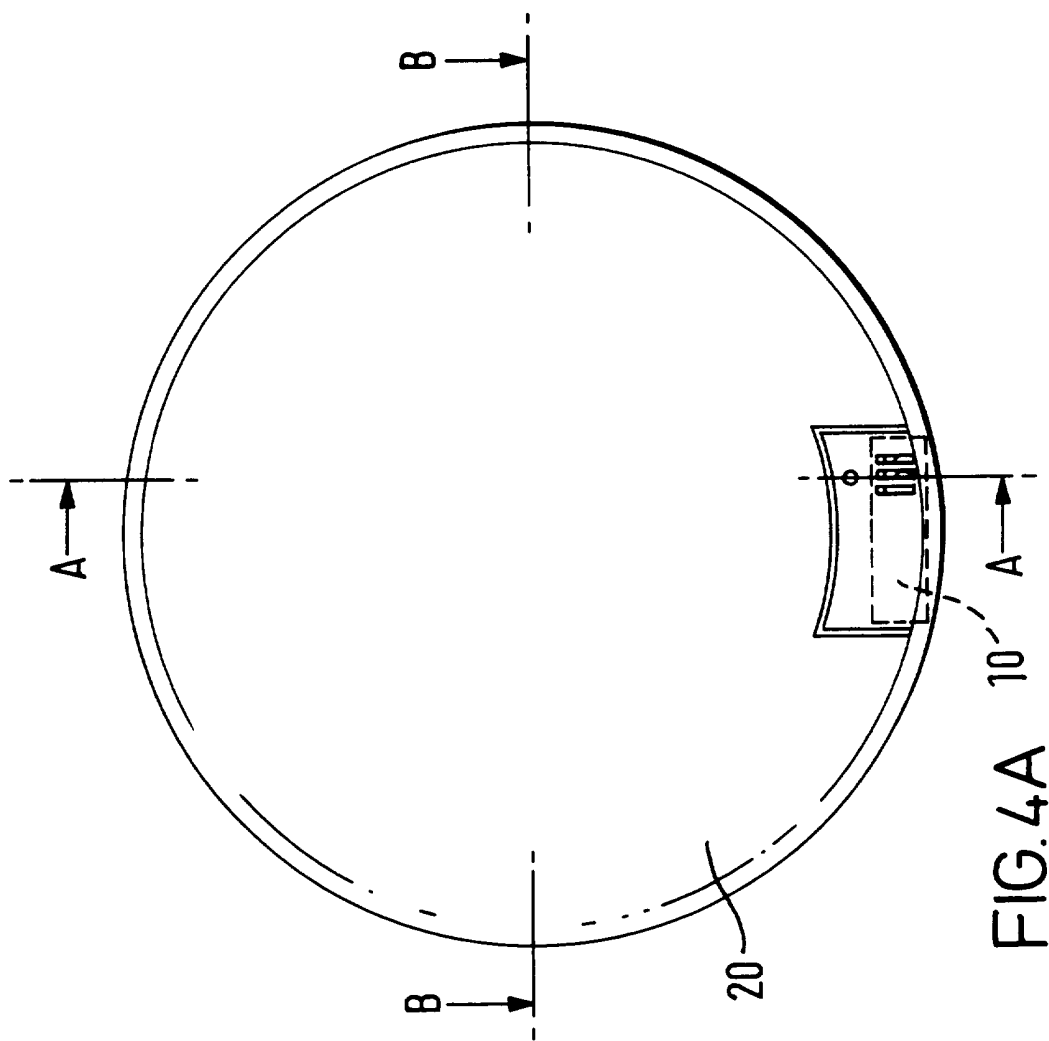


FIG. 4B

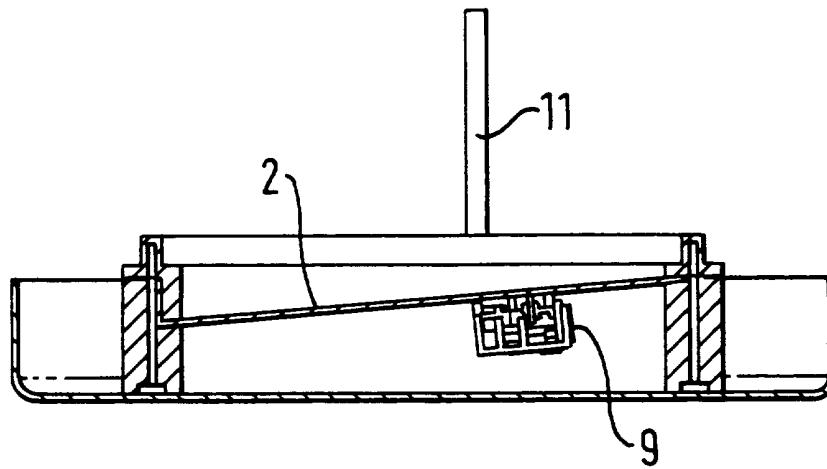


FIG. 4C

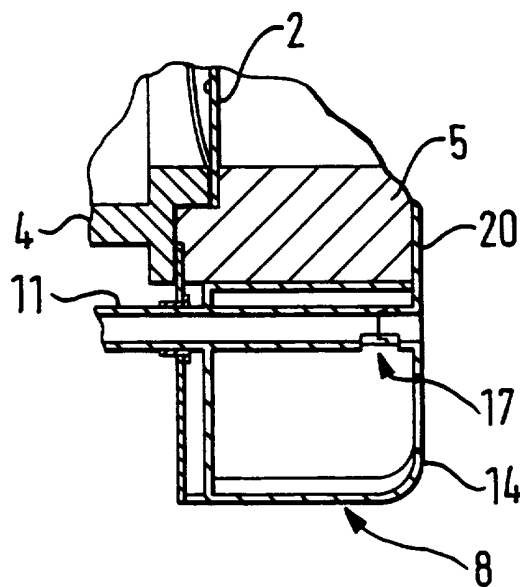


FIG. 4D

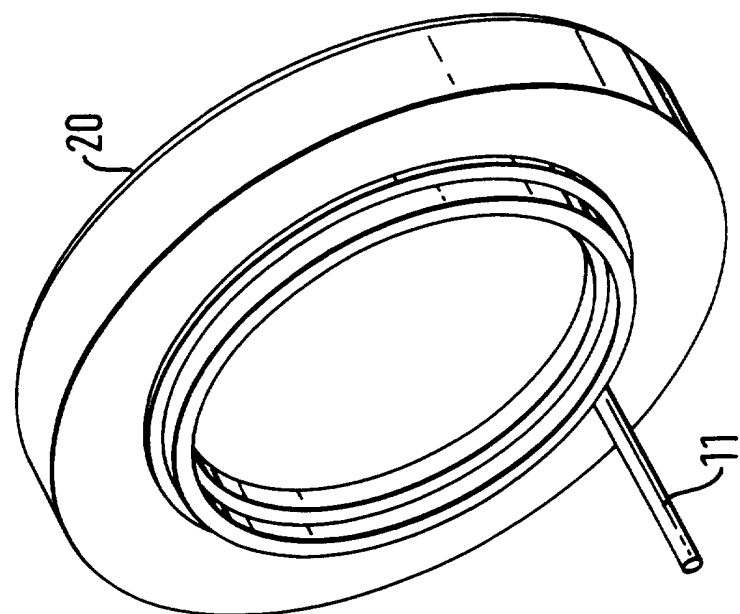


FIG. 4F

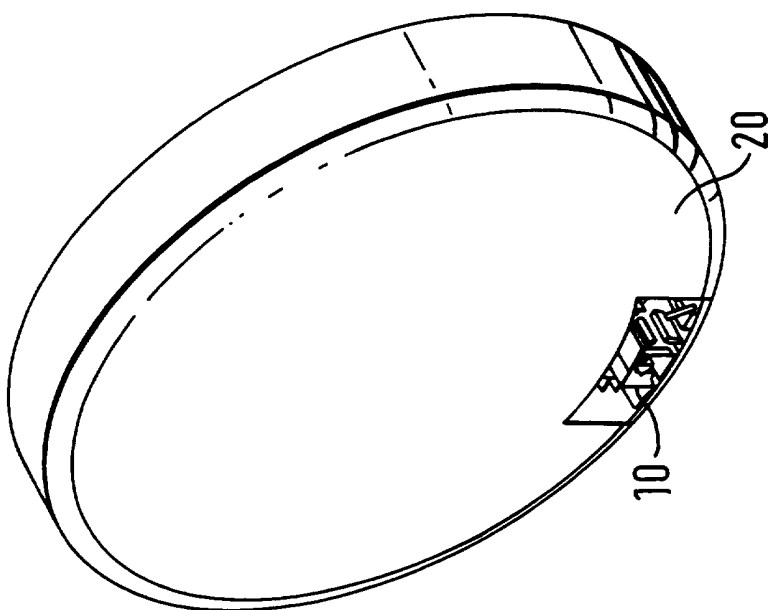


FIG. 4E

IMPROVEMENTS RELATING TO ELECTRICALLY
HEATED WATER BOILING VESSELS

Field of the Invention:

5 This invention concerns improvements relating to
electrically heated water boiling vessels such as
electric kettles and hot water jugs for example.

Background of the Invention:

10 Electric kettles and hot water jugs and the like
have conventionally incorporated electric immersion
heating elements in the form of a wire wound, mineral
insulated, metal sheathed heating element proper
affixed to an element head plate serving for the
attachment of the heating element to the vessel,
commonly at an aperture in a side wall thereof.
15 Recently, however, planar heating elements have been
proposed which comprise a substrate on one side of
which there is provided a resistance heating element
in the form of a printed or otherwise formed resistive
track or layer. The substrate might for example
20 comprise a thin sheet of stainless steel on one side
of which there is formed an electrically insulating
dielectric layer, of glass for example, and the
resistance heating element might be formed on the

dielectric layer with another protective electrically insulating dielectric layer, also of glass for example, formed on top of the resistance heating element.

5 It has been common to provide electric kettles and hot water jugs and the like with an element protector control adapted and arranged to switch off the power to the heating element in a sensed element overtemperature situation, and it has been common also
10 to provide a steam sensor adapted and arranged to switch off the power to the heating element in response to the generation of steam when water is boiled in the vessel. Element protector controls have commonly comprised one or more bimetallic elements
15 arranged in close heat transfer relationship with the heating element and arranged to operate an electric switch in the control in response to the element temperature rising above a predetermined normal operating range, and steam sensors have commonly
20 comprised a bimetallic or other thermally sensitive element, a shape memory effect (SME) device for example, arranged at a location of the vessel whereat steam will impinge upon the thermally sensitive element when water boils in the vessel. With
25 conventional electric immersion heating elements as abovementioned, the element protector control has

conventionally been coupled to the heating element head plate on the side thereof opposite to the heating element proper, namely the dry side of the head plate, and the steam sensor has commonly been accommodated at an upper location of the vessel, commonly in a handle structure, adjacent to an aperture in the vessel wall permitting steam generated within the vessel to access the thermal sensor of the steam control.

Integrated element protector and steam sensor controls are also known which associate in a unitary structure an element protector control as aforesaid and a steam sensor control as aforesaid. Also known is the X-type element protector control manufactured and marketed by us which is described in GB 2 194 099 with reference particularly to Figures 3A, 3B and 3C of the drawings thereof and the J-type steam sensor manufactured and marketed by us which is described in GB 2 212 664. The X-type element protector control and the J-type steam sensor can be utilized in stand alone manner, or the J-type steam sensor can be plugged into the top of the X-type element protector to form an integrated combination.

With the advent of the new planar heating elements aforementioned, proposals have been made for the association of element protector and steam sensor controls with the heating element and with the

associated vessel. Problems have arisen with these proposals as can readily be seen by reference to GB 2 222 025 or WO95/34187 which, at least in our opinion, exhibit poor segregation between the steam control and the element protector control which could lead to premature failure due to water vapour contaminating the element protector control.

Objects and Summary of the Invention:

It is accordingly the principal object of the present invention to overcome or at least substantially reduce the aforementioned problem.

According to the present invention, the base of an electrically heated water boiling vessel incorporating a planar electric heating element is compartmentalized to provide segregation between steam sensor and element protector controls associated with the heating element and a steam tube is provided for admitting to the steam sensor location steam that is generated when water is boiled in the vessel.

Exemplary embodiments will hereinafter be described in which the vessel includes a bottom or base moulding providing for the attachment of the planar heating element to a vessel body part so as to constitute the bottom of the vessel or at least part thereof, the said moulding including a compartment for

locating the steam sensor segregated from the element protector control and provision being made for admitting steam to the said compartment from the vessel interior.

5 The above and further features of the present invention are set forth with particularity in the appended claims and will be made clear in the following description given with reference to the accompanying drawings.

10 Brief Description of the Drawings:

 Figures 1A to 1F show a first exemplary embodiment of the invention, Figure 1A being an underside plan view of the base of an exemplary water boiling vessel, Figures 1B and 1C being sectional side
15 elevation views on the lines A...A and B...B of Figure 1A respectively, Figure 1D being an enlarged view of part of Figure 1B showing in more detail a steam sensor compartment, and Figures 1E and 1F being perspective views from opposite sides of the
20 embodiment;

 Figures 2A to 2F show a second exemplary embodiment of the invention in views respectively similar to the corresponding views in Figures 1A to 1F;

25 Figures 3A to 3F show similar views of a third

exemplary embodiment of the invention; and

Figures 4A to 4F show similar views of a fourth exemplary embodiment of the invention.

Detailed Description of the Embodiments:

5 Referring first to Figures 1A to 1F, these illustrate the form of the base or bottom of an electrically heated water boiling vessel configured according to an embodiment of the present invention. Only part of a base or bottom wall 1 of the vessel is
10 shown and it will be appreciated that the remainder of the vessel will be designed by the appliance manufacturer.

A planar electric heating element 2 is secured within an aperture formed in the bottom 1 of the
15 vessel by means of a moulded plastics material chassis ring 3 which is formed of two parts, namely a top or upper chassis ring 4 and a bottom or lower chassis ring 5, which are adapted to be secured together by means of self-tapping screws introduced into
20 registering bores 6 and 6' formed in the two parts, the bores in the top part 4 being closed at their innermost ends as shown in Figure 1C. As shown most clearly in the enlarged detail view of Figure 1D, the top and bottom chassis rings 4 and 5 are formed with
25 opposed surfaces which serve to clamp therebetween the

edges of the planar heating element 2 and the surrounding edges of the aperture that is formed in the bottom 1 of the vessel, the respective opposed surfaces being spaced apart from each other by a distance appropriate to the thickness of the heating element 2 and of the vessel wall 1. A seal 7 is provided between the opposed surfaces of the top and bottom chassis rings 4 and 5.

As shown most clearly in Figures 1A, 1B, 1D and 1E, the bottom chassis ring 5 is formed with an integral extension 8 defining an enclosure for accommodating a steam sensor with positive segregation from an element protector control mounted on the heating element 2. Figures 1A and 1E show an exemplary form of element protector control 9 mounted to the underside of the heating element 2 and further show an exemplary form of steam control 10 accommodated in the enclosure 8. The illustrated element protector control is the X2 control manufactured and sold by us and this control is substantially as described in GB 2 283 156. The illustrated sensor 10 is a J-type steam sensor manufactured and sold by us and this steam sensor is substantially as described in GB 2 212 664. Alternative forms of element protector and steam sensor controls are available and could be employed in

the practice of the present invention.

The extension part 8 which defines the enclosure for the steam sensor has an integrally formed steam pipe 11 which extends outwardly of the enclosure through an aperture 12 provided in the vessel bottom 1. A grommet seal 13 of suitable heat resistant material ensures that the passage of the steam pipe 11 through the aperture 12 does not result in leakage from the vessel. Within the vessel, the steam pipe 11 will extend to above the operating full water level of the vessel and may be provided with a flotation type valve to protect against water flooding into the steam pipe if the vessel is overfilled. The steam pipe serves to deliver to the steam sensor enclosure 8 steam which is generated when water boils within the vessel, so as to cause the steam sensor to operate.

The enclosure 8, as moulded integrally with the bottom chassis ring 5, is open on its underside to enable installation of the steam sensor 10. A moulded plastics cover 14 is however provided which fits into the open underside of the enclosure as best shown in Figure 1D. The cover 14 is apertured at 15 to allow steam condensing in the enclosure 8 to drain therefrom and furthermore includes a hollow spigot 16 which is adapted to fit into the open lower end of the steam pipe 11. A vent 17 is formed in that side of the

conjoined spigot and steam pipe which faces the interior of the enclosure 8 for allowing steam in the steam pipe to access the steam sensor 10. The cover 14 could be part of an appliance bottom moulding of the vessel, rather than a separate part as illustrated.

By virtue of the described arrangement, the steam sensor 10 and its wetted environment within the enclosure 8 is well separated and segregated from the dry environment of the element protector control 9, thereby obviating or at least minimizing any risk of premature failure occasioned by water vapour or condensate reaching the element protector control.

The precise form of the heating element 2 is not central to the present invention. As mentioned hereinbefore, the element could for example be constructed as a resistance heating track or layer formed, with appropriate electrical insulation, on a substrate such as for example a stainless steel disc. The element could alternatively be constructed as a plate, formed of aluminium for example, having clamped or clenched to its under surface a heating element proper of the wire wound, mineral insulated, metal sheathed type, such elements being known per se.

The water boiling vessel could be of the cordless type in which the vessel is adapted to be powered via

a base unit when the vessel is set upon the base, the vessel part and the base part having co-operating electrical connector systems which come together to enable the heating element in the vessel to be powered via the base when the vessel part is set on the base part. Such electrical connector systems are known per se and include systems which enable the vessel to be set upon the base in any relative rotational orientation, one such system being described in GB 2 285 716.

Figures 2A to 2F show an embodiment which is similar to the embodiment of Figures 1A to 1F and differs principally therefrom in that the heating element 2 is mounted in the chassis moulding 3 at an inclination, with the chassis parts 4 and 5 and the seal 7 correspondingly differently shaped. The mounting of the heating element 2 at an angle in this manner, and with the element protector control 9 mounted to the element at or near to its uppermost edge, ensures that the heating element portion nearest to the control 9 begins to overheat first if, for example, the vessel lid is left off and the vessel begins to boil dry, the falling water level first exposing the upper part of the heating element whereat the control 9 is located. Note that the same reference numerals are used in Figures 2A to 2F as

were used in Figures 1A to 1F to designate like parts.

Figures 3A to 3F show yet another embodiment which is very similar to the embodiment of Figures 1A to 1F, the principal difference in this case residing in the fact that the enclosure 8 for accommodating the steam sensor 10 is open on its upper side and is adapted to be closed by juxtapositioning of the enclosure with the vessel bottom 1 during assembly. The steam vent 17 within the enclosure 8 can be formed by use of suitable cores during the moulding operation for forming the bottom chassis part 5. Again the same reference numerals are used in Figures 3A to 3F to denote parts corresponding to like parts in the embodiment of Figures 1A to 1F.

Figures 4A to 4F show yet another embodiment having distinct similarities to the embodiments described in the foregoing. In the embodiment of Figures 4A to 4F, wherein the same reference numerals are employed as were employed in the previous figures, the enclosure 8 for the steam sensor 10 is defined as an integral part of a bottom moulding 20 of the vessel which fits over the lower chassis ring 5 and may be secured thereto. The enclosure 8 is open on its underside, as in the embodiment of Figures 1A to 1F, and a closure 14 is provided. The steam pipe 11 in this embodiment is also formed as an integral part of

the bottom moulding 20. The heating element 2 is shown mounted at an inclination, as in the second embodiment, but it could be mounted on the level as in the first embodiment. This embodiment is presently preferred, inter alia because the polypropylene material generally used for moulding of vessel body parts is very suitable for the forming of the steam pipe 11 whereas the material of the lower chassis ring 5 may not be so suitable on account of its rigidity and drinking water compatibility. A separate steam pipe, rather than one formed integrally with the lower chassis ring 5, could be used in the previously described embodiments, the separate steam pipe being appropriately supported and sealed with respect to the steam enclosure 8.

The invention having been described in the foregoing with reference to particular embodiments, it is to be appreciated that modifications and variations are possible without departure from the spirit and scope of the invention as set forth in the appended claims. Thus, for example, the inclined heating element arrangement of Figures 2A to 2F and 4A to 4F could be incorporated into the embodiments of Figures 1A to 1F and 4A to 4F. With such an inclined heating element arrangement, or indeed with the alternative level arrangement of Figures 1A to 1F, the heating

element 2 could be arranged to have a different ,
preferably lower, power output density in the regions
thereof which is juxtaposed with the bimetallic sensor
of the element protector control 9 for the purpose of
5 achieving better compatibility between the operating
temperature of the element and the temperature at
which the element protector control will operate.
Other modifications that might occur to the skilled
reader might be to form the seal 7 as an integral part
10 of one or other or both of the upper and lower chassis
rings 4 and 5.

The electrical connections to the heating element
2 via the element protector control 9 have not been
shown and neither have the electrical connections to
15 the steam sensor 10. These electrical connections
will however cause no difficulty to the skilled
reader. Furthermore, none of the figures shows the
provision of an external operating knob for the steam
control, it being appreciated that the described
20 J-type steam control has to be manually reset after
operation, but again no difficulties are believed to
be presented to the skilled reader by these omissions
which are for the avoidance of excessive detail. The
skilled reader will be aware that the provision of an
25 operating knob for the steam control externally of the
vessel should desirably be without prejudice to the

segregation which the invention obtains between the potentially wet environment of the steam sensor and the dry environment of the element protector control. Sealing would be desirable of any wires or other parts
5 extending through the walls of the steam sensor enclosure.

CLAIMS:

1. An electrically heated water boiling vessel incorporating a planar heating element, an element protector control for switching off the supply of electricity to the heating element in response to a sensed element overtemperature condition and a steam sensor for switching off the heating element in response to the generation of steam when water is boiled in the vessel, the element protector control and the steam sensor being located in a bottom part of the vessel and said bottom part being compartmentalized so as to segregate the potentially wetted environment of the steam sensor from the element protector control.
2. An electrically heated water boiling vessel as claimed in claim 1 wherein the planar heating element is affixed into an aperture formed in the bottom of the vessel.
3. An electrically heated water boiling vessel as claimed in claim 2 wherein a two part clamping ring serves to clamp the heating element into the vessel aperture, the two parts of the clamping ring being adapted to be secured together so as to entrap

therebetween the outer periphery of the heating element and the inner periphery of the aperture in the bottom of the vessel.

4. An electrically heated water boiling vessel as
5 claimed in claim 3 wherein sealing means are provided between the two parts of the clamping ring.

5. An electrically heated water boiling vessel as
claimed in claim 3 or 4 wherein the lower part of the
two part clamping ring is formed to define an
10 enclosure for the steam sensor which is segregated from the element protector control.

6. An electrically heated water boiling vessel as
claimed in any of the preceding claims wherein a steam
pipe extends from a location within the vessel above
15 the normal water level to the location of the steam sensor in the bottom part of the vessel.

7. An electrically heated water boiling vessel as
claimed in claim 6 as dependent upon claim 3 or 4
wherein the steam pipe is formed as an integral part
20 of one of the two parts, at least, of the clamping ring.

8. An electrically heated water boiling vessel as claimed in claim 6 wherein the steam pipe is formed as part of a base moulding of the vessel.
9. An electrically heated water boiling vessel as claimed in any of the preceding claims wherein the planar heating element is mounted in the vessel at an inclination to the horizontal and the element protector control is arranged to be sensible to the temperature of the heating element at a location thereof which is relatively uppermost.
10. An electrically heated water boiling vessel as claimed in claim 9 wherein the power output of the heating element at the said location is different to the power output of the heating element at other locations.
11. An electrically heated water boiling vessel as claimed in any preceding claim wherein the element protector control and/or the steam sensor include a bimetallic thermally responsive element.
12. An electrically heated water boiling vessel as claimed in any of the preceding claims wherein the planar heating element comprises a substrate having

formed thereon an electrical resistance track or layer.

13. An electrically heated water boiling vessel substantially as herein described with reference to
5 any of the accompanying drawings.

14. An electrically heated water boiling vessel as claimed in any of the preceding claims which is configured as a cordless appliance.

15. An electrically heated water boiling vessel as
10 claimed in claim 14 wherein the electrical connector system between the vessel part and the base part of the cordless appliance is such as to permit the vessel part to be operatively coupled with the base part in any, or substantially any, relative rotational
15 orientation of the two parts.

16. An electrically heated water boiling vessel comprising a planar heating element affixed into an aperture in a bottom wall of the vessel by means of a clamping ring.



Application No: GB 9621517.3
Claims searched: 1-15

Examiner: Peter Corbett
Date of search: 8 October 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.O): A4A (AB2); H1N (NBG,NDP,NDQ,NDT,NDX,NDY); H5H (HAH)
Int CI (Ed.6): A47J
Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2299454 A (STRIX) see Fig 3 & page 15 line 35 to page 16 line 15	1,6,8,11, 14,15
X	GB 2292841 A (STRIX) see Fig 1	1,6,8,11, 12,14
X	GB 2290210 A (STRIX) see Figs 7 & 8	1,6,8,11, 12,14
X	GB 2045588 A (TAYLOR) see Fig 3	1,6,11

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.