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(54) **OVERHEATING PROTECTION CONTROLLER ASSEMBLY OF LIQUID HEATING VESSEL**

(57) The present invention provides an overheat protection controller assembly of a liquid heating vessel, which comprises a control body, a monolithic conjoined double-actuating thermal sensitive bimetal actuator arranged on the upper surface of the control body, and two groups of switch contacts arranged on the control body correspondingly, each group of the switch contacts cooperate with a corresponding actuating unit. The monolithic conjoined double-actuating thermal sensitive bimetal

actuator is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, the edge lines of the two actuating units are separated from each other, a unit outer auxiliary connection part is arranged between the adjacent edge lines of the two actuating units, the unit outer auxiliary connection part is located outside of the edges lines of the two actuating units and effectively makes the two actuating units form a monolithic conjoined double-actuating thermal sensitive bimetal actuator.

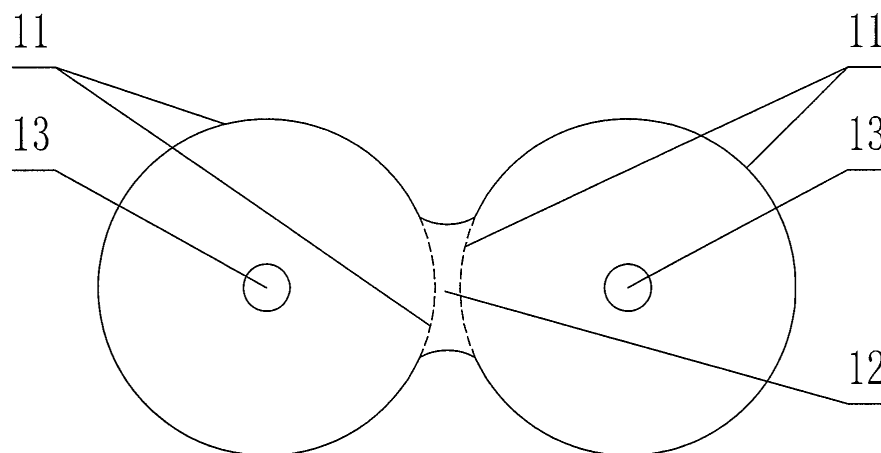


FIG. 4

Description

FIELD OF THE INVENTION

[0001] The present invention relates to an overheat protection control means, and more particularly, to an overheat protection controller assembly of a liquid heating vessel.

BACKGROUND OF THE INVENTION

[0002] The existing overheat protection control means (also called boil-dry protection control means) of liquid heating vessels are mostly used and mounted under the bases of liquid heating vessels, especially water boiling vessels, the base of each said vessel is provided with an electrical heating element. There are mainly two types of such overheat protection control means: one type provided with only one thermal sensitive bimetal actuator, and the other type provided with two thermal sensitive bimetal actuators. Because the first type has only one actuator, if it goes wrong or fails to operate, the heating vessel is easy to boil dry and overheat and then be burned out. On the other hand, because the two actuators of the second type are made of different materials, the two actuators will operate at different temperatures, the actuator operable at a higher temperature will produce an actuation movement so as to overheat and burn out the heating vessel when the temperature of the heating vessel is too high, while the actuator operable at a lower temperature is easy to produce an actuation movement so as to influence the normal use of the heating vessel when the temperature of the heating vessel is not high.

SUMMARY OF THE INVENTION

[0003] An object of the present invention is to provide an overheat protection controller assembly of a liquid heating vessel, characterized by reliable overheat protection and accurate and consistent actuations.

[0004] In order to achieve the above object, the following technical solution is provided in the present invention: an overheat protection controller assembly of a liquid heating vessel comprises: a control body; a monolithic conjoined double-actuating thermal sensitive bimetal actuator arranged on the upper surface of the control body, the monolithic conjoined double-actuating thermal sensitive bimetal actuator is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, each of the two actuating units which are adjacent to each other and conjoined has a close edge line of the actuating unit, the bimetal sheet enclosed by each said actuating unit's edge line forms a relatively independent actuating unit and has a relatively independent function of overheat actuation, the edge lines of the two actuating units are completely separated from each other, a unit outer auxiliary connection part is arranged between the adjacent edge lines of the two actuating

units, the unit outer auxiliary connection part is located outside of the edges lines of the two actuating units and effectively makes the two actuating units form the monolithic conjoined double-actuating thermal sensitive bimetal actuator. The monolithic conjoined double-actuating thermal sensitive bimetal actuator generally may be mounted on the control body via the central or peripheral portions of the actuating units, and correspondingly the peripheries or centers of the actuating units will produce an actuation movement so as to control a corresponding group of switch contacts. The small portions of the edge lines in the conjoined parts of the actuating units' edge lines as indicated in the technical solution can be reasonably derived from the large portions of the edge lines which are explicit and the geometrical rule of the entire shape of each said actuating unit.

[0005] In the above technical solution, the monolithic conjoined double-actuating thermal sensitive bimetal actuator may be mounted on the control body via a central mount point of each said actuating unit, the periphery of each said actuating unit kicks downwards to produce an actuation movement on an overheat condition; and two groups of switch contacts are further arranged on the control body correspondingly, each group of the switch contacts cooperate with the periphery of a corresponding actuating unit, and a downward actuation movement of the periphery of any of the actuating units will open a corresponding group of the switch contacts and cut off the power supply of the heater of the liquid heating vessel.

[0006] In the above technical solution, the monolithic conjoined double-actuating thermal sensitive bimetal actuator may be mounted on the control body via a peripheral mount point of each said actuating unit, the center of each said actuating unit kicks downwards to produce an actuation movement on an overheat condition; and two groups of switch contacts are further arranged on the control body correspondingly, each group of the switch contacts cooperate with the center of a corresponding actuating unit, and a downward actuation movement of the center of any of the actuating units will open a corresponding group of the switch contacts and cut off the power supply of the heater of the liquid heating vessel.

[0007] Likewise, when the edge lines of the two actuating units of the monolithic conjoined double-actuating thermal sensitive bimetal actuator are completely separated from each other except the adjoining point in the above-mentioned technical solution concerning an overheat protection controller assembly of a liquid heating vessel, a unit outer auxiliary connection part is arranged between the adjacent edge lines of the two actuating units, the unit outer auxiliary connection part is located outside of the edges lines of the two actuating units and effectively makes the two actuating units form the monolithic conjoined double-actuating thermal sensitive bimetal actuator, and the two actuating units of the thus-obtained overheat protection controller assembly of a liquid heating vessel also must be joined by means of the

unit outer auxiliary connection part. Hence, an overheat protection controller assembly of a liquid heating vessel in which the edge lines of the two actuating units are completely separated from each other and a unit outer auxiliary connection part is arranged between the adjacent edge lines of the two actuating units and an overheat protection controller assembly of a liquid heating vessel in which the edge lines of the two actuating units are completely separated from each other except the adjoining point and a unit outer auxiliary connection part is arranged between the adjacent edge lines of the two actuating units must have a common special technical feature—a unit outer auxiliary connection part, so the parallel technical solutions introduced hereinabove naturally belong to a single general inventive concept.

[0008] In the above technical solution, the thermal sensitive actuator mounted on the control body and cooperating with the switch contacts is a monolithic conjoined double-actuating thermal sensitive bimetal actuator, which functionally provides a reliable dual-overheat protection since it comprises two actuating units. Meanwhile, since the two actuating units form the monolithic conjoined double-actuating thermal sensitive bimetal actuator via the unit outer auxiliary connection part arranged between the adjacent edge lines of the two actuating units on the same bimetal sheet, the materials of the two actuating units will be highly consistent, i.e. they may produce actuation movements at the same accurate temperature point; moreover, since the two actuating units are integrated in a single body, it is convenient to assemble them and the assembly efficiency of the controller assembly can be improved as well. On the premise of reliable overheat protection, a controller assembly with such structure may be designed to be more compact to thereby save materials, and a compact heating vessel with reliable overheat protection can be produced. Because the edge lines of the two actuating units of the monolithic conjoined double-actuating thermal sensitive bimetal actuator are completely separated from each other, each of the actuating units will have a more outstanding independence when operating.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a view showing the 3D structure of a first overheat protection controller assembly of a liquid heating vessel.

[0010] FIG. 2 is a view showing the 3D structure of a second overheat protection controller assembly of a liquid heating vessel.

[0011] FIG. 3 is a view showing the 3D structure of a third overheat protection controller assembly of a liquid heating vessel.

[0012] FIG. 4 is a first plan view of the monolithic conjoined double-actuating thermal sensitive bimetal actuator having a unit outer auxiliary connection part according to the present invention.

[0013] FIG. 5 is a second plan view of the monolithic

conjoined double-actuating thermal sensitive bimetal actuator having a unit outer auxiliary connection part according to the present invention.

[0014] FIG. 6 is a third plan view of the monolithic conjoined double-actuating thermal sensitive bimetal actuator having a unit outer auxiliary connection part according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0015] The invention is further described in detail hereinafter, by way of example, with reference to the drawings.

[0016] Wherein: 1. control body; 2. monolithic conjoined double-actuating thermal sensitive bimetal actuator; 3. outer kick limb; 4. internal tongue; 5. tongue root; 6. switch contact; 7. push rod; 8. retaining plate; 9. hole for internal tongue; 10. rivet; 11. actuating unit's edge line; 12. unit outer auxiliary connection part; 13. mounting hole; and 14. adjoining point.

[0017] As shown in FIG. 1 and FIG. 2, the overheat protection controller assembly of a liquid heating vessel includes: a control body 1; a monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 arranged on the upper surface of the control body 1, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, each said actuating unit includes its own outer kick limb 3, internal tongue 4 and tongue root 5 that connects the outer kick limb 3 and the internal tongue 4, the two actuating units are adjacent to each other and conjoined at their tongue roots 5, the tongue tip of the internal tongue 4 and the outer kick limb 3 of one actuating unit are remote from those of the other actuating unit, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is mounted on the control body 1 via the internal tongues 4 of the actuating units, and the outer kick limb 3 of each said actuating unit will produce an actuation movement downwards on an overheat condition; and two groups of switch contacts 6 arranged on the control body, each group of the switch contacts 6 cooperate with the outer kick limb 3 of a corresponding actuating unit, and a downward actuation movement of the outer kick limb 3 will open a corresponding group of the switch contacts 6 and cut off the power supply of the heater of the liquid heating vessel. In FIG. 1, the internal tongues 4 of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 are mounted within the holes for internal tongues 9 in the retaining plate 8 of the control body 1; whereas, in FIG. 2, one internal tongue 4 of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is inserted into the hole for internal tongue 9 in the retaining plate 8 arranged on the upper surface of the control body 1, while the other internal tongue 4 is riveted to the retaining plate 8 arranged on the upper surface of the control body 1 via a rivet 10.

[0018] As shown in FIG. 3, the overheat protection controller assembly of a liquid heating vessel includes: a control body 1; a monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 arranged on the upper surface of the control body 1, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, each said actuating unit includes its own outer kick limb 3, internal tongue 4 and tongue root 5 that connects the outer kick limb 3 and the tongue root 5 of each said actuating unit forms the periphery of the actuating unit, the two actuating units are partially adjacent to each other and conjoined at their peripheries, the two actuating units are mounted on the control body 1 by means of their peripheries via rivets 10, the internal tongues 4 of the two actuating units will produce a downward actuation movement on an overheat condition; and two groups of switch contacts 6 arranged on the control body, each group of the switch contacts 6 cooperate with the internal tongue 4 of a corresponding actuating unit, a downward actuation movement of the internal tongue 4 will open a corresponding group of the switch contacts 6 and cut off the power supply of the heater of the liquid heating vessel.

[0019] On the basis of the technical conception of the overheat protection controller assembly of a liquid heating vessel according to the present invention as illustrated in FIG. 1, FIG. 2 and FIG. 3 hereinbefore, two series of embodiments regarding the overheat protection controller assembly of a liquid heating vessel are formed.

[0020] The first series of embodiments are as follows.

[0021] As shown in FIG. 1, FIG. 2, FIG. 4 and FIG. 5, an overheat protection controller assembly of a liquid heating vessel that can achieve the object of the present invention may be obtained by substituting the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 4 or FIG. 5 for the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 1 and FIG. 2. Such overheat protection controller assembly of a liquid heating vessel includes: a control body 1; a monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 arranged on the upper surface of the control body 1, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, each of the two actuating units which are adjacent to each other and conjoined has a close edge line 11 of the actuating unit, the bimetal sheet enclosed by each said actuating unit's edge line 11 forms a relatively independent actuating unit and has a relatively independent function of overheat actuation, the edge lines of the two actuating units are completely separated from each other, a unit outer auxiliary connection part 12 is arranged between the adjacent edge lines of the two actuating units, the unit outer auxiliary connection part 12 is located outside of the edges lines of the two actuating units and effec-

tively makes the two actuating units form the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is mounted on the control body 1 via a central mount point of each said actuating unit, the periphery of each said actuating unit kicks downwards to produce an actuation movement on an overheat condition; and two groups of switch contacts 6 arranged on the control body correspondingly, each group of the switch contacts 6 cooperate with the periphery of a corresponding actuating unit, a downward actuation movement of the periphery of any of the actuating units will open a corresponding group of the switch contacts 6 and cut off the power supply of the heater of the liquid heating vessel. The central mount points of the actuating units in FIG. 4 and FIG. 5 may be connected to the control body 1 by riveting or in another connection manner. For the sake of a stable and reliable arrangement of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 on the control body 1, generally a retaining plate 8 is first arranged on the upper surface of the control body 1, and the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 only needs be mounted on the retaining plate 8. When the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in the foregoing embodiment stated in this paragraph is replaced by the those illustrated in FIG. 6 or FIG. 7, the edge lines of the two actuating units are completely separated from each other except the adjoining point 14 and a unit outer auxiliary connection part 12 is arranged between the adjacent edge lines of the two actuating units to form a monolithic conjoined double-actuating thermal sensitive bimetal actuator 2, whereby another similar technical solution that also makes it possible to achieve the object of the present invention can be obtained.

[0022] As shown in FIG. 5 and FIG. 1, an overheat protection controller assembly of a liquid heating vessel that makes it easier to achieve the object of the present invention may be obtained by substituting the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 5 for the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 1. Each actuating unit of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 includes its own outer kick limb 3, internal tongue 4 and tongue root 5 that connects the outer kick limb 3 and the internal tongue 4, the two actuating units are adjacent to each other and conjoined at their tongue roots 5, the unit outer auxiliary connection part 12 of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is located outside of the edge lines at the tongue roots 5 of two actuating units, the tongue tip of the internal tongue 4 and the outer kick limb 3 of one actuating unit are remote from those of the other actuating unit, the outer kick limb 3 and the tongue root 5 of each said actuating unit forms the periphery of the actuating unit, the internal tongue 4 of each said actuating unit is surrounded by the outer

kick limb 3 and the tongue root 5 of the actuating unit, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is mounted on the control body 1 via the internal tongues 4 of the actuating units, and a downward actuation movement of the outer kick limb 3 of any of the actuating units will open a corresponding group of the switch contacts 6, thereby resulting in an overheat protection. In this embodiment, a monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 having internal tongues 4 and outer kick limbs 3 is adopted and the switch contacts 6 are controlled by the actuation movement of the outer kick limb 3. Thus, this embodiment is characterized by a long actuation stroke and a reliable overheat protection control. In this embodiment, when the orientations of the internal tongues 4 of the two actuating units of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 form an angle of 180°, the two actuating units each have a better actuation independence.

[0023] As shown in FIG. 4 and FIG. 1, another overheat protection controller assembly of a liquid heating vessel that makes it easier to achieve the object of the present invention may be obtained by substituting the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 4 for the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 1. Each actuating unit of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is a sheet-like actuating unit, a mounting hole 13 is arranged in the geometric center of each said actuating unit, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is mounted on the control body 1 via the mounting holes 13 in the geometric centers of the actuating units, the unit outer auxiliary connection part 12 of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is located between the mounting holes 13 of the two actuating units, and the peripheries of the two actuating units which are remote from the unit outer auxiliary connection part 12 cooperate with the two groups of switch contacts 6, respectively. Because the actuating unit is a sheet-like actuating unit, this embodiment is characterized by a large actuation force and a reliable action of controlling the switch contacts 6.

[0024] In the above-mentioned series of embodiments, a push rod 7 may further be arranged between each group of the switch contacts 6 and the periphery of a corresponding actuating unit, a downward actuation movement of the periphery of the actuating unit pushes the push rod 7 to move, and the movement of the push rod 7 opens the switch contacts 6, so that an actuation movement of an actuating unit can travel a long distance to be transmitted to the switch contacts 6, and the switch contacts 6 are safely insulated from the actuating unit due to the insulating push rod 7.

[0025] As shown in FIG. 4 and FIG. 5, the two actuating units of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 are symmetrical when they are placed laterally side by side, i.e. the two actuat-

ing units have the same shape and the same configuration, so that it can be better guaranteed that the two actuating units produce actuation movements at the same temperature, and it can be ensured that the two actuating units have the same actuation force, whereby the resultant overheat protection controller assembly of a liquid heating vessel can operate more reliably.

[0026] Next is an introduction of the other series of embodiments.

[0027] As shown in FIG. 3, FIG. 4 and FIG. 5, an overheat protection controller assembly of a liquid heating vessel that also can achieve the object of the present invention may be obtained by substituting the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 4 or FIG. 5 for the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 3. Such overheat protection controller assembly of a liquid heating vessel includes: a control body 1; a monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 arranged on the upper surface of the control body 1, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, each of the two actuating units which are adjacent to each other and conjoined has a close edge line 11 of the actuating unit, the bimetal sheet enclosed by each said actuating unit's edge line 11 forms a relatively independent actuating unit and has a relatively independent function of overheat actuation, the edge lines of the two actuating units are completely separated from each other, a unit outer auxiliary connection part 12 is arranged between the adjacent edge lines of the two actuating units, the unit outer auxiliary connection part 12 is located outside of the edges lines of the two actuating units and effectively makes the two actuating units form the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2, the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is mounted on the control body 1 via a peripheral mount point of each said actuating unit, the center of each said actuating unit kicks downwards to produce an actuation movement on an overheat condition; and two groups of switch contacts 6 arranged on the control body 1 correspondingly, each group of the switch contacts 6 cooperate with the center of a corresponding actuating unit, a downward actuation movement of the center of any of the actuating units will open a corresponding group of the switch contacts 6 and cut off the power supply of the heater of the liquid heating vessel. In this embodiment, the mounting holes 13 of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 as shown in FIG. 4 may be omitted. Since one reliable property of the bimetal sheet material is that it produces an actuation movement when the environmental temperature is too high, when the peripheries of the actuating units are secured to the retaining plate on the upper surface of the control body 1 by riveting or in another connection manner, the center of an actu-

ating unit will produces a downward actuation movement to open corresponding switch contacts 6 on an overheat condition. When the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in the foregoing embodiment stated in this paragraph is replaced by the those illustrated in FIG. 6 or FIG. 7, the edge lines of the two actuating units are completely separated from each other except the adjoining point 14 and a unit outer auxiliary connection part 12 is arranged between the adjacent edge lines of the two actuating units to form a monolithic conjoined double-actuating thermal sensitive bimetal actuator 2, whereby another similar technical solution that also makes it possible to achieve the object of the present invention can be obtained.

[0028] As shown in FIG. 5 and FIG. 3, an overheat protection controller assembly of a liquid heating vessel that makes it easier to achieve the object of the present invention may be obtained by substituting the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 5 for the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 3. Each actuating unit of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 includes its own outer kick limb 3, internal tongue 4 and tongue root 5 that connects the outer kick limb 3 and the internal tongue 4, the outer kick limb 3 and the tongue root 5 of each said actuating unit forms the periphery of the actuating unit, the two actuating units are partially adjacent to each other and conjoined at their peripheries, and the internal tongues 4 of the two actuating units will produce a downward actuation movement on an overheat condition, thereby resulting in an overheat protection. In this embodiment, a monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 having internal tongues 4 and outer kick limbs 3 is adopted and the switch contacts 6 are controlled by the actuation movement of the internal tongue 4. Thus, this embodiment is characterized by a long actuation stroke.

[0029] As shown in FIG. 4 and FIG. 3, another overheat protection controller assembly of a liquid heating vessel that makes it easier to achieve the object of the present invention may be obtained by substituting the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 4 for the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 in FIG. 3. Each actuating unit of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is a sheet-like actuating unit, the unit outer auxiliary connection part 12 of the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 is located between the geometric centers of the two actuating units, and the two groups of switch contacts 6 cooperate with the geometric centers of the two actuating units, respectively. In this embodiment, the mounting holes 13 shown in FIG. 4 may be omitted. Because the actuating unit is a sheet-like actuating unit, this embodiment is characterized by a large actuation force.

[0030] In the above-mentioned series of embodiments

describing that the monolithic conjoined double-actuating thermal sensitive bimetal actuator 2 has a unit outer auxiliary connection part 12 and the switch contacts 6 are opened by a downward actuation movement of the center of the actuating unit, a push rod 7 may further be arranged between each group of the switch contacts 6 and the center of a corresponding actuating unit, a downward actuation movement of the center of the actuating unit pushes the push rod 7 to move, and the movement of the push rod 7 opens the switch contacts 6, so that an actuation movement of an actuating unit can travel a long distance to be transmitted to the switch contacts 6, and the switch contacts 6 are insulated from the actuating unit due to the insulating push rod 7.

Claims

1. An overheat protection controller assembly of a liquid heating vessel, comprising:

a control body (1);
a monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) arranged on the upper surface of the control body (1), the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, each of the two actuating units which are adjacent to each other and conjoined has a close edge line (11) of the actuating unit, the bimetal sheet enclosed by each said actuating unit's edge line (11) forms a relatively independent actuating unit and has a relatively independent function of overheat actuation, the edge lines of the two actuating units are completely separated from each other, a unit outer auxiliary connection part (12) is arranged between the adjacent edge lines of the two actuating units, the unit outer auxiliary connection part (12) is located outside of the edges lines (11) of the two actuating units and effectively makes the two actuating units form the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2), the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is mounted on the control body (1) via a central mount point of each said actuating unit, the periphery of each said actuating unit kicks downwards to produce an actuation movement on an overheat condition; and
two groups of switch contacts (6) arranged on the control body correspondingly, each group of the switch contacts (6) cooperate with the periphery of a corresponding actuating unit, and a downward actuation movement of the periphery of any of the actuating units will open a corre-

sponding group of the switch contacts (6) and cut off the power supply of the heater of the liquid heating vessel.

2. The overheat protection controller assembly of a liquid heating vessel of claim 1, **characterized in that** each said actuating unit includes its own outer kick limb (3), internal tongue (4) and tongue root (5) that connects the outer kick limb (3) and the internal tongue (4), the two actuating units are adjacent to each other and conjoined at their tongue roots (5), the unit outer auxiliary connection part (12) of the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is located outside of the edge lines at the tongue roots (5) of two actuating units, the tongue tip of the internal tongue (4) and the outer kick limb (3) of one actuating unit are remote from those of the other actuating unit, the outer kick limb (3) and the tongue root (5) of each said actuating unit forms the periphery of the actuating unit, the internal tongue (4) of each said actuating unit is surrounded by the outer kick limb (3) and the tongue root (5) of the actuating unit, the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is mounted on the control body (1) via the internal tongues (4) of the actuating units, and a downward actuation movement of the outer kick limb (3) of any of the actuating units will open a corresponding group of the switch contacts (6).
3. The overheat protection controller assembly of a liquid heating vessel of claim 2, wherein the orientations of the internal tongues (4) of the two actuating units of the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) form an angle of 180°.
4. The overheat protection controller assembly of a liquid heating vessel of claim 1, wherein each said actuating unit is a sheet-like actuating unit, a mounting hole (13) is arranged in the geometric center of each said actuating unit, the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is mounted on the control body (1) via the mounting holes (13) in the geometric centers of the actuating units, the unit outer auxiliary connection part (12) of the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is located between the mounting holes (13) of the two actuating units, and the peripheries of the two actuating units which are remote from the unit outer auxiliary connection part (12) cooperate with the two groups of switch contacts (6), respectively.
5. The overheat protection controller assembly of a liquid heating vessel of claim 1, wherein the two actuating units of the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) are sym-

metrical when they are placed laterally side by side.

6. The overheat protection controller assembly of a liquid heating vessel of any of claims 1 to 5, further comprising a push rod (7) which is arranged between each group of the switch contacts (6) and the periphery of a corresponding actuating unit, a downward actuation movement of the periphery of the actuating unit pushes the push rod (7) to move, and the movement of the push rod (7) opens the switch contacts (6).
7. An overheat protection controller assembly of a liquid heating vessel, comprising:
 - a control body (1);
 - a monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) arranged on the upper surface of the control body (1), the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, each of the two actuating units which are adjacent to each other and conjoined has a close edge line (11) of the actuating unit, the bimetal sheet enclosed by each said actuating unit's edge line (11) forms a relatively independent actuating unit and has a relatively independent function of overheat actuation, the edge lines of the two actuating units are completely separated from each other except an adjoining point (14), a unit outer auxiliary connection part (12) is arranged between the adjacent edge lines of the two actuating units, the unit outer auxiliary connection part (12) is located outside of the edges lines (11) of the two actuating units and effectively makes the two actuating units form the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2), the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is mounted on the control body (1) via a central mount point of each said actuating unit, the periphery of each said actuating unit kicks downwards to produce an actuation movement on an overheat condition; and
 - two groups of switch contacts (6) arranged on the control body correspondingly, each group of the switch contacts (6) cooperate with the periphery of a corresponding actuating unit, and a downward actuation movement of the periphery of any of the actuating units will open a corresponding group of the switch contacts (6) and cut off the power supply of the heater of the liquid heating vessel.
8. An overheat protection controller assembly of a liquid heating vessel, comprising:

a control body (1);
 a monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) arranged on the upper surface of the control body (1), the monolithic conjoined double-actuating thermal sensitive bimetal actuator (2) is comprised of two conjoined actuating units which are relatively independent and formed of a bimetal sheet, each of the two actuating units which are adjacent to each other and conjoined has a close edge line (11) of the actuating unit, the bimetal sheet enclosed by each said actuating unit's edge line (11) forms a relatively independent actuating unit and has a relatively independent function of
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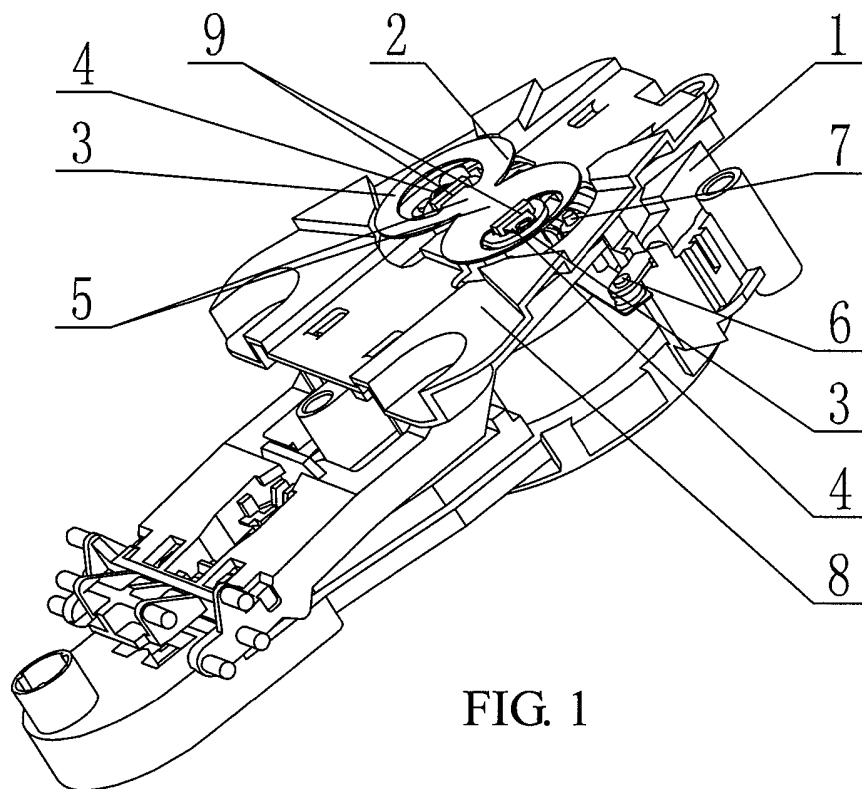


FIG. 1

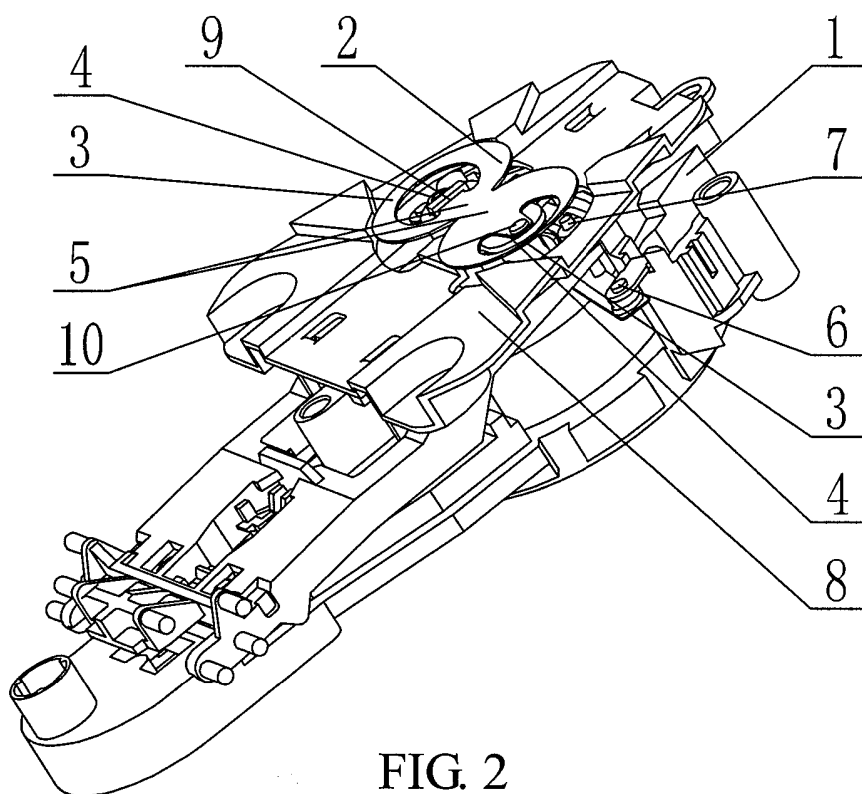


FIG. 2

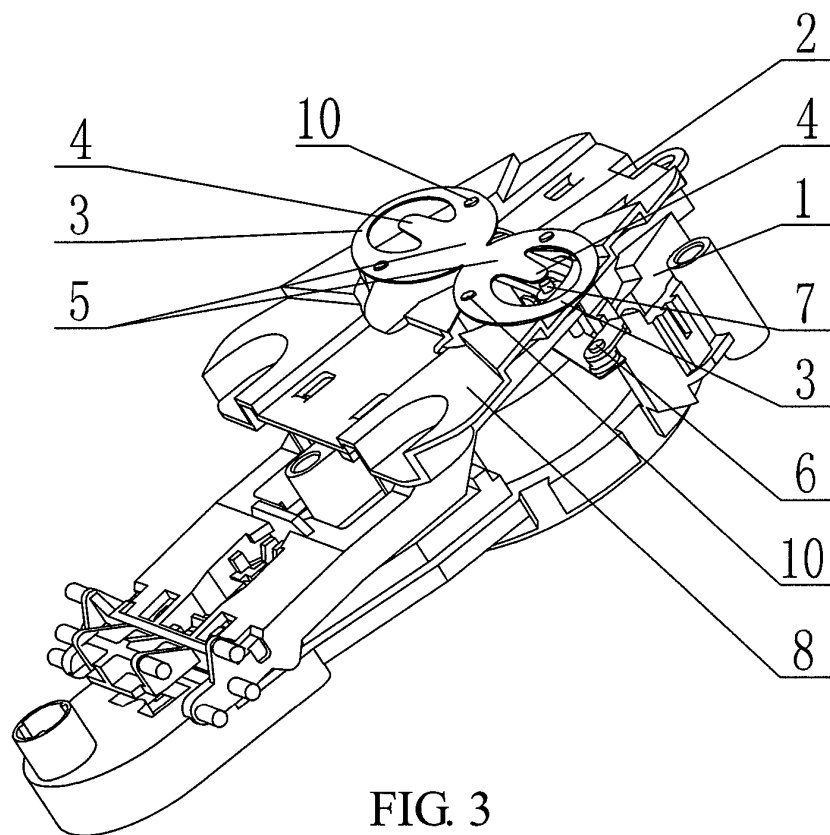


FIG. 3

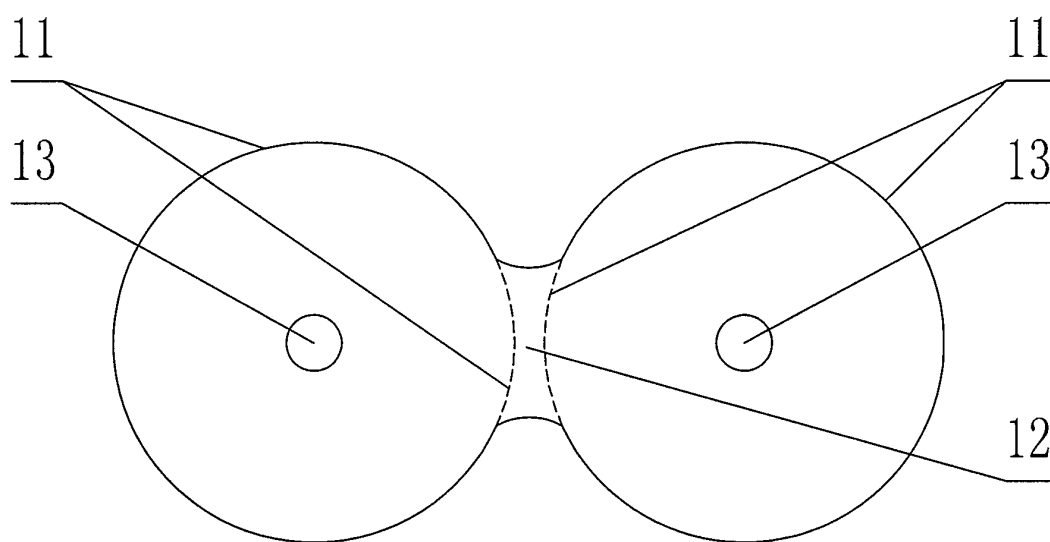
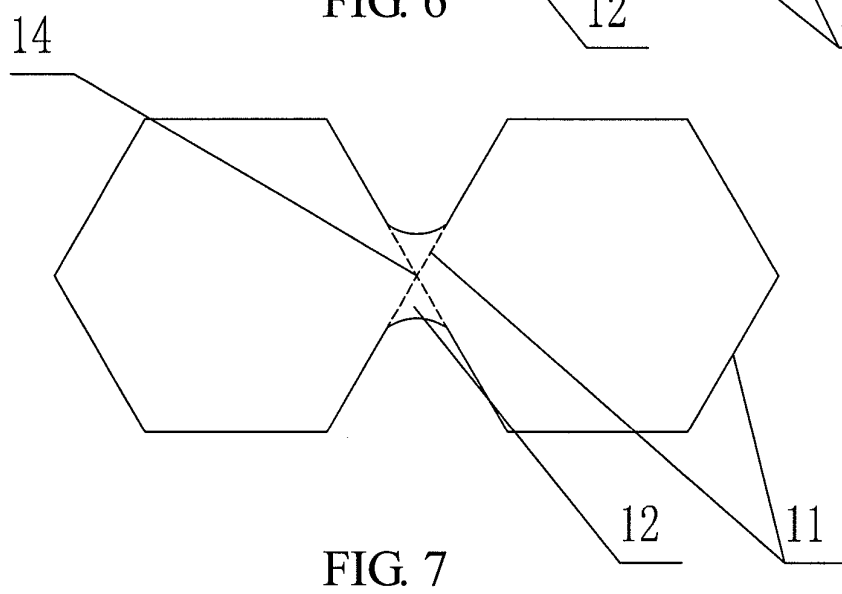
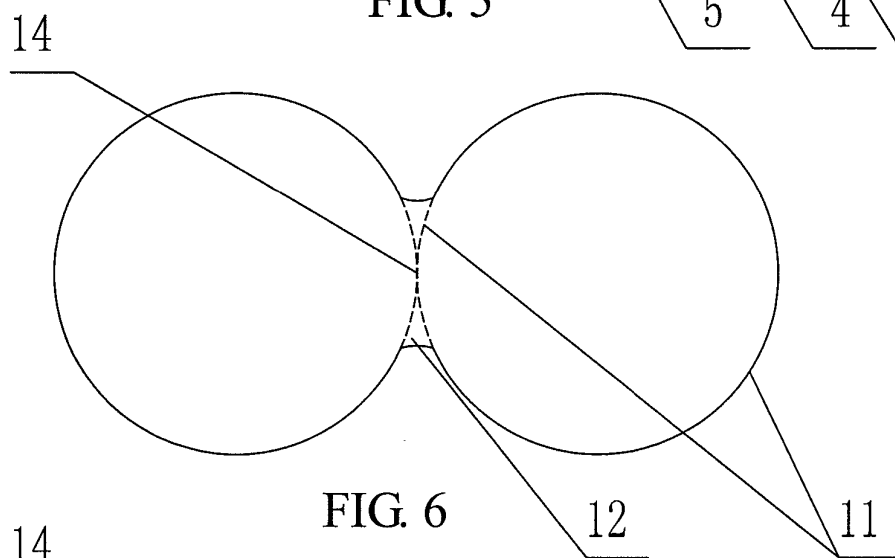
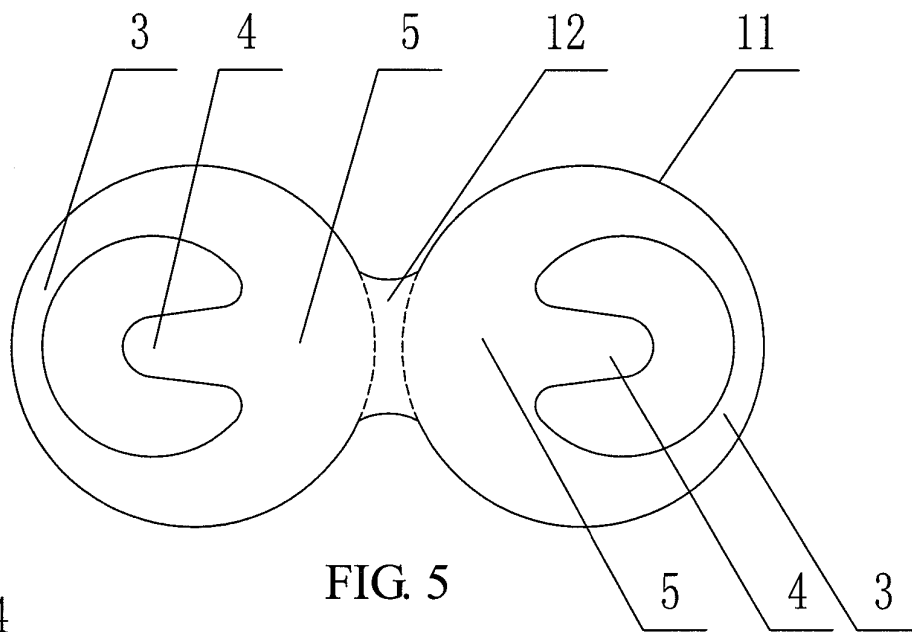


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2009/000760

A. CLASSIFICATION OF SUBJECT MATTER

see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H01H;F24H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WP;EPODOC;PAJ;CNKI;CNPAT;LIQUID,LIQUOR,HEAT,HOT,BIMETAL,THERMOMETAL,COMBINE,LINK,UNITE,JOIN,

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 201246899 Y (JIATAI ELECTRIC APPLIANCE MFR CO LTD) 27 May 2009 (27.05.2009) claims 1-12	1-12
A	CN 1545966 A (SHAO Z) 17 November 2004 (17.11.2004) the whole document	1-12
A	CN 2641804 Y (LIZHIWEN) 15 September 2004 (15.09.2004) the whole document	1-12
A	US 5274525 A (SECAP SOC ETUD CONS) 28 December 1993 (28.12.1993) the whole document	1-12

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
07 Sep. 2009 (07.09.2009)

Date of mailing of the international search report
01 Oct. 2009 (01.10.2009)

Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R.China
6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China
100088
Facsimile No. 86-10-62019451

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LIU,Jingjing
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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Form PCT/ISA /210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2009/000760

A. CLASSIFICATION OF SUBJECT MATTER

H01H 37/52 (2006.01) i

F24H 1/00 (2006.01) i