

FLAT CASING WATER HEATER

This invention concerns a water heating apparatus comprising a water tank and means for heating the water.

The invention is meant for domestic water heating.

Water heating apparatus are conventionally cylindrical and therefore occupy a great deal of space.

However, there are water heaters with flat shape such as described in document US 4551612. The water heating apparatus described here has a flat and parallelepiped shape. In order to withstand the pressure of the water contained in the apparatus, the inner walls have been formed with crenellations. The apparatus is equipped with several resistances placed perpendicular to the crenulations and at various heights.

With this apparatus, only a small quantity of water is heated since the crenelled walls must not be spaced too far apart in order to withstand the pressure.

Document GB 731.769 describes a flat water heater with vertical compartments, one compartment housing the resistance, and the other the means for collecting the hot water. Due to its structure, this apparatus leads to thermal imbalance and the compartments are not heated to the same temperature as the water movements are limited.

Document DE 4012203 describes a water heater equipped with a resistance in its low part and cylindrical compartments. This water heater has many disadvantages such as a considerable loss of heat between the compartments due to their shape. Moreover, this shape decreases the volume of water that can be stored in the water heater. Finally, the water heater has to be connected to the hot and cold water in its upper part. If the pipes are incorrectly positioned, plumbing work will be necessary.

Embodiments of the present invention seek to solve all or part of these problems.

According to an aspect of the present invention, there is provided an apparatus for heating water comprising a water tank and heating means, the tank consisting of multiple separated and adjoining conduits whose primary extremity ends in a common part for collecting hot water and secondary extremity ends in a common part for heating the water characterised in that the conduits have a rectangular section and the common part for heating the water is capable of receiving heating means arranged perpendicular to the conduits.

An advantage of the apparatus according to embodiments of the present invention is that it may be able to hold and heat a large volume of water while being of flat parallelepiped form.

Indeed, the internal structure consists of separate and juxtaposed conduits that end in a common hot water collecting part may enhance the capacity of the apparatus to withstand water pressure and improve water movements, and thus the convection that takes place within the apparatus.

In a particular embodiment, the separate and juxtaposed conduits emerged at their secondary extremity in a common water heating part.

Another advantage of the apparatus according to embodiments of the invention is the rectangular section of the conduits. Thus, the rectangular section conduits are juxtaposed and this may largely limit heat loss between the conduits. Moreover, the rectangular section of the conduits is optimal so that the apparatus may contain a larger volume of water in a predefined space.

The perpendicular position of the heating means relative to the conduits may lead to improved convection of the water inside the water heater and thus enhance its efficiency.

Moreover, the outer wall of at least one common part overlaps advantageously the outer wall around the conduits. This structure may help to increase the capacity of the apparatus to withstand the water pressure.

The two common parts may be equipped with at least one pluggable orifice to receive the heating means.

Another advantage of the apparatus according to embodiments of the invention is the possibility of using the apparatus in various positions to suit the external conditions encountered. The apparatus can be rotated 180° or 90°.

Other goals and advantages will appear during the description which follows of a preferred embodiment which is not however restrictive.

Firstly, it has to be remembered that embodiments of the invention provide a water heating apparatus comprising a water tank and heating means, characterised in that the tank consisting of multiple separated and adjoining conduits whose primary extremity ends in a common part for collecting hot water.

According to preferred embodiments of the invention, the heating apparatus is such that:

- the secondary extremity of the vertical conduits end in a common water heating part,

- the common water heating and hot water collecting parts are capable of receiving heating means positioned perpendicular to the conduits,

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- the conduits have a rectangular section,

- the conduits are formed by partitions spaced one from the other and extending transversally between two walls.

- at least two opposite sides of the partition are equipped with projecting tenons for co-acting with receiving slots arranged on the walls,

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- the conduits are made from rectangular sections tubes joined side by side,

- the conduits are made of a series of rectangular sections tubes separated one from the other by inter-tube spaces,

- the common parts for collecting hot water and for heating the water are roughly symmetrical and have identical dimensions,

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- the two common parts for collecting hot water and heating the water have at least one pluggable orifice that is able to receive the heating means,

- at least one of the common parts has an outer wall that overlaps the outer wall around the conduits,

- the apparatus is entirely wrapped in an insulating material.

20 The drawings attached are given as examples and are not restrictive. They show only one embodiment of the invention that will make it possible to easily understand it.

Figure 1 : Sectional view of the heating apparatus.

Figure 2 : Side view of the apparatus along section AA.

Figure 3 : Top view of the apparatus on section CC.

25 Figure 4 : Top view of the apparatus on section DD.

Figure 5: Diagrammatic front view of the apparatus in an orientation in which the water enters and leaves the apparatus in its lower part.

Figure 6: Diagrammatic front view of the apparatus in which water enters and leaves in the upper part.

30 Figure 7 : Front sectional view of the heating apparatus according to another embodiment.

Figure 8 : Top view of the apparatus on section AA on Figure 7.

Figure 9 : Sectional view of a partition and a wall of the heating apparatus according to the embodiment on Figure 7.

Figures 10, 11 and 12 : detailed sectional views of fitting together of a partition and a wall of the heating apparatus.

5 Heating apparatus 1 consists of separate and side-by-side conduits 5 whose primary extremity ends in a common part 2 and whose secondary extremity ends in complementary common part 3.

Advantageously, common part 2 includes the opening of the hot water discharge pipe; this is for collecting hot water, and the common complementary part 3
10 includes heating means 4, and is therefore the common water heating part.

Advantageously, conduits 5 are formed from rectangular sections tubes joined side by side.

In another embodiment, the conduits are made of a series of rectangular sections tubes separated from each other and with inter-section spaces.

15 According to yet another embodiment, conduits 5 are formed by the positioning of partitions 10 at regular intervals, preferably extending transversally between two walls 11.

Two walls 11 constitute the outer shell of heating apparatus 1.

According to one arrangement, partitions 11 have projecting tenons 13 along
20 their periphery. Advantageously, only the two opposite sides co-acting with wall 11 are equipped with projecting tenons 13.

Projecting tenons 13 are designed to cooperate with receiving slots 12 aligned on walls 11.

Once projecting tenons 13 insert into receiving slot 12, a weld 14 is executed
25 along the surface of receiving slot 12.

The advantage of this embodiment of conduits 5 is the speed of assembly and low cost since welds 14 are not executed over the entire length of partition 10 but only at the tenons 13 and slots 12.

Advantageously, common part 2 and complimentary common part 3 are roughly
30 symmetrical and identical in dimensions and both include at least one pluggable orifice (not shown) for receiving heating means 4.

Heating means 4 are preferably oriented in a direction that is perpendicular to

the orientation of conduits 5.

To enhance the resistance to water pressure of apparatus 1, the outer wall of at least one of the common parts 2 or 3 overlaps the outer wall surrounding conduits 5.

In a preferred embodiment, apparatus 1 is surrounded by an insulating material
5 to decrease the heat losses from apparatus 1.

Apparatus 1 has a short pipe 6, advantageously feed pipe of cold water according to figure 5, a long pipe 7 that is slightly shorter than the length of apparatus 1, advantageously long pipe 7 is the hot water discharge pipe according to figure 5.

Advantageously, apparatus 1 is equipped with draining means 8. In a preferred
10 embodiment, apparatus 1 is equipped with means 9 for fastening to a wall.

Advantageously, apparatus 1 has heating means 4 positioned in the angle opposite the opening of the hot water pipe.

Similarly, heating means 4 are advantageously positioned on the same side as the cold water feed pipe.

15 In a preferred embodiment, all pipes 6, 7 and 8 are positioned on the same side of the apparatus.

Example of apparatus operation according to figure 5:

The cold water feeds onto apparatus 1 in the complementary common part 3 through short pipe 6. The water is heated by heating means 4 positioned in the
20 complementary common part 3 for water heating. The hotter the water becomes, the more it will rise through conduits 5 towards common part 2 for collecting hot water. Hot water is collected by long pipe 7, the opening of which is positioned in common part 2 for collecting hot water.

Example of apparatus 1 operation according to figure 6:

25 The apparatus can be used with this orientation if the water pipes enter via the top of apparatus 1. Cold water reaches apparatus 1 in common part 2 via long pipe 7. Water is heated by heating means 4 positioned in common part 2 for water heating. The hotter the water the more it will rise through conduits 5 towards the complementary common part 3 used to collect hot water. Hot water is collected by
30 short pipe 6 whose opening is positioned in common part 2 for collecting hot water.

According to another method of operation (not shown), apparatus 1 can be placed horizontally. Surprisingly, it has been observed that the horizontal orientation

of the conduits prevents the deterioration of the water circulation in the apparatus so that convection remains just as effective.

The tank can be of rectangular or square section.

REFERENCES

- 1.Apparatus
- 2.Common part
- 5 3. Complementary common part
4. Heating means
5. Conduits
6. Short pipe
7. Long pipe
- 10 8. Draining means
9. Means for fixing to a wall
10. Partition
11. Wall
12. Receiving slot
- 15 13. Projecting tenons
14. Weld

CLAIMS

1. Apparatus for heating water comprising a water tank and heating means, the tank consisting of multiple separated and adjoining conduits whose primary extremity ends in a common part for collecting hot water and secondary extremity ends in a common part for heating the water characterised in that

conduits have a rectangular section and the common part for heating the water is capable of receiving heating means arranged perpendicular to the conduits.

2. Apparatus according to claim 1 in which the conduits are made from rectangular section tubing joined side by side.

3. Apparatus according to claim 1 in which conduits are formed of a series of rectangular section tubes separated one from the other by inter-tube spaces.

4. Apparatus according to claim 1 in which conduits are formed from partitions spaced apart and extending transversally between two walls.

5. Apparatus according to claim 4 in which partitions are equipped at their periphery with at least two opposite sides of projecting tenons that are able to cooperate with receiving slots placed on the walls.

6. Apparatus according to any one of claims 1 to 5 in which common parts for collecting hot water and heating water are roughly symmetrical and have identical dimensions.

7. Apparatus according to any one of claims 1 to 6 in which at least one of common parts has an outer wall that overlaps the outer wall around conduits.

8. Apparatus according to any one of claims 1 to 7 in which the two common parts for collecting hot water and heating the water have at least one pluggable orifice that is able to receiving the heating means.

9. Apparatus according to any one of the above claims in which apparatus is entirely enclosed by an insulating material.

10. Apparatus according to any one of the above claim in which the apparatus is reversible.