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54 **Heating boiler.**

57 The boiler which is the object of the present invention comprises a vertical metallic vessel occupied by a mass of thermal fluid and with connection pieces connected to a closed heating circuit. The vessel houses two conical deflectors having vertical axis connected at their vertices and determining a zone of reduced cross section in the middle portion of the internal space of the vessel which comprises in its lower portion a heat generator of any kind and a serpentine pipe with valves at the ends thereof, and in the upper portion another serpentine pipe with valves at the ends thereof, one of said valves being in correspondence with the base of the upper deflector and the other with the exit conduit. The head of the vessel also comprises an air discharge valve.

The invention is based on the improvement of the performance and the increase of energy which results from the zero-gravity within the installation system in case that the boiler is adapted to work under said conditions.

Thus, it is obvious that for obtaining the maximum efficiency of the boiler which is the object of the invention the disclosed system must function in a zero-gravity state.

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The present invention refers to a heating boiler of the type provided with a fluid to be circulated through a conduit system associated to a closed circuit heating installation.

Various types of heating boilers are known which are heated by electric current or by various fuels and which produce a flow of heated water or other fluid for its circulation through the conduits associated to closed heating circuits. Although efforts are made to provide such apparatus with a good thermal insulation all known heating boiler systems actually have energy losses through the insulation due to defects in the design and in the construction thereof as well as by losses in the conduits or other parts of the circuit which result in a relatively low efficiency of the whole installation.

The heating boiler defined by the present invention is characterized by working under conditions which increase its caloric capacity and as a consequence increase the total efficiency of the installation. The thermal insulation has been designed in a manner that it totally includes the portion to which the supplied thermal energy is applied at the portion of transfer of said energy to the thermal fluid which circulates through the installation circuit, and in an important part of the associated elements. The rest of the installation is also provided with a suitable thermal insulation in order to reduce the thermal losses in the conduits, the connecting elements and the couplings of the circulation pump and fittings to a minimum in order to obtain a maximum efficiency.

The supply is effected by any kind of thermal energy, said input energy being directly used for heating of the mass of a thermal fluid which occupies the interior of a thermally insulated reservoir, and in which interior a circulation zone in form of a double cone is provided. From the upper portion of the vessel extends the conduit which is directed to the closed circuit in order that the heating fluid circulates with the aid of a driving pump, creating a system operating as a unit, such as a heating installation. In this installation we establish a zero-gravity state in utilization of which the fluid to be heated expands, and in the upper portion of the vessel an outlet valve permitting to vent the air eventually present in the mass of the fluid to be processed at the introduction thereof into the vessel is provided as well.

Thus, the operation of the boiler and of the installation performs in a zero-gravity state in the conduit from which - exactly speaking, by effect of the fluid circulation - originates a resulting vacuum in the conduits which converts into a considerable increase of the caloric energy, improves the heat transmission conditions, reduces the flow resistance of the fluid circulating through the conduits and importantly reduces noise emanating from said

circulation.

In order to facilitate the explanation, the present description is accompanied by a drawing in which as an illustrative and not limiting example an embodiment of a heating boiler in accordance of the principles of the claims is shown.

The figure schematically shows the structure of the new heating boiler, constructed to operate in a zero-gravity state in which the whole installation must operate, which is required in order to obtain an increase of caloric energy and to improve the heat transmission. In the boiler, the elements designated by numerals correspond to the following indicated parts.

The vessel 1 in form of a cylindric container of resistant metal sheet and vertically arranged is occupied by a mass 2 of a thermal fluid of suitable density, fluidity, boiling point and other characteristics.

In the lower portion of the vessel 1 an electric resistance element 3 (or a heat applicator of other kind) is situated for heating the mass 2 of the fluid.

The connection piece 4 forms the entrance for returning the fluid after its circulation through the closed circuit.

In the upper portion of the vessel 1, a one-way valve 5 is provided, the object of which is to permit venting of air eventually introduced into the interior of the body 1, establishing a discharge of same which assures practically a vacuum condition within the vessel 1 not occupied by the thermal fluid. That is to say, it results therefrom that in the portions in each moment not occupied by the fluid, not only no air is existent but also a vacuum effect is obtained which contributes to the improved heat transfer.

Furthermore, in the upper portion of the vessel 1 the conduit 6 receives the warm water entering through the orifices 7 and circulating towards the conduit 8 suitably thermally insulated at its outside and comprising a circulation pump 9. The connection piece 10 is coupled to the closed circuit.

The container 11 is an expansion vessel used to even out the fluid circulation.

Characteristically, the vessel 1 comprises in its lower portion a serpentine pipe 12 the ends of which are respectively associated to valves 13 and 14, whereas in the upper portion another serpentine pipe 15 is located the ends of which comprise valves 16 and 17.

The serpentine pipes 12 and 15 serve to establish minimum temperature differences acting as probes for actuating the valves 13, 14, 16 and 17.

When being at a higher temperature than the fluid of the boiler, the valves 16 and 17 open in the same manner as conventional safety valves do and, in turn, to eject the warmer fluid towards the tubing, the valves 13 and 14 open simultaneously

to fill with fluid. The valves 16 and 17 are actuated by expansion, as converted to pressure, and the valves 13 and 14, inversely connected, are actuated by vacuum. In each serpentine pipe a valve is mounted inversely with respect to the other.

Furthermore, it is a characterizing feature of the disclosed boiler that in the interior of the body 1 two baffles or deflector elements of conical shape for the thermal fluid are provided, designated by numerals 18 and 19 and mounted with their vertices opposing each other, defining there a restricted central zone 20 which determines, according to the venturi principle, an increase of the circulation velocity of the heated fluid circulating vertically in the upward direction. Said conical elements are supported within the body 1 by a plurality of rods 21 extending from the portion where the lower and upper conical elements are joined with each other. The conical elements 18 and 19 are closed at their bases. However, said bases are penetrated by said lower and upper serpentine pipes 12 and 15, respectively, enabling a flow of fluid into and out of the interior of said conical elements 18 and 19 upon opening of the aforementioned valves. It is essential that the position of the valve 14 enabling an input flow into the lower conical element 18 is as depicted in the drawing or at a similar suitable location in order that a temperature difference between the interior of conical element 18 and the zone where said valve 14 is situated develops upon supply of heat by heater 3. Said conical elements serve to even out the circulation of the thermal fluid and to obtain a homogenization between the different portions thereof, in order that the temperature differences between the fluid returning from the lower connection piece 4 and the fluid leaving by the upper conduit 7 affect the uniformity to a minimum.

The essential aspects of the patent can be brought to practice in other forms of realization which differ in their details from that given as an example in the description and which likewise will fall under the protection as claimed. Thus, it can be constructed in any form or size and from the most adequate materials, remaining all within the scope of the following claims.

Claims

1) Heating boiler of the type being provided with a heating fluid for a thermal generator and circulating in a closed circuit, characterized essentially by working in a zero-gravity state; comprising a vertical cylindrical vessel having an efficient thermal insulation, said vessel being occupied by a thermal fluid heated by any type of caloric energy situated in the lower portion of the vessel; and

circulating through the upper portion to a conduit associated to the installation system, two conical deflectors being disposed in the interior of the vessel to control the circulation of the thermal fluid, the zones of smaller diameter opposing each other to determine a zone of reduced cross section, an air discharge valve being disposed in the upper portion being necessary to establish a zero-gravity state, and separate serpentine pipes being provided in the upper and lower portions of the vessel, the ends of said serpentine pipes being associated to respective valves opening and closing simultaneously.

2) Heating boiler according to claim 1, characterized in that the lower conical deflector is open at its lower base in correspondence to the zone of heating the thermal fluid by means of electric resistance or any other kind of caloric energy and in correspondence as well to the lower serpentine pipe, whereas the upper conical deflector is open at its base in correspondence to the serpentine tube of the upper portion and the exit conduit of the thermal fluid.

3) Heating boiler according to claim 1, characterized in that the air discharge valve of the upper portion is of a one-way type, preventing a return of the ejected air.

4) Heat generating or heating system with heat exchanger in closed circuit, characterized in that the circulating fluid is in a zero-gravity (vacuum) state or without atmospheric pressure in order to create physical conditions therein which increase the heat generation and the caloric transmission.

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