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(54) Boilers.

(57) A boiler is described comprising a heat exchanger 1 having a rear tank 2, side tanks 3 and 4, a front tank 9, a top 7 and base 13 which together define an enclosure through which products of combustion form a burner 21 (Fig. 3) are fed to an outlet 8, and a divider member 15, possibly in the form of a further tank, disposed between the top 7 and base 13, which divides the enclosure into a lower combustion chamber and an upper chamber, the divider member 15 being provided with a plurality of holes 16 for feeding the products of combustion from the lower chamber to the upper chamber. The upper chamber is provided with fins 17 and retarders 23 (Fig. 3) for increasing heat exchanger efficiency (Fig. 1).

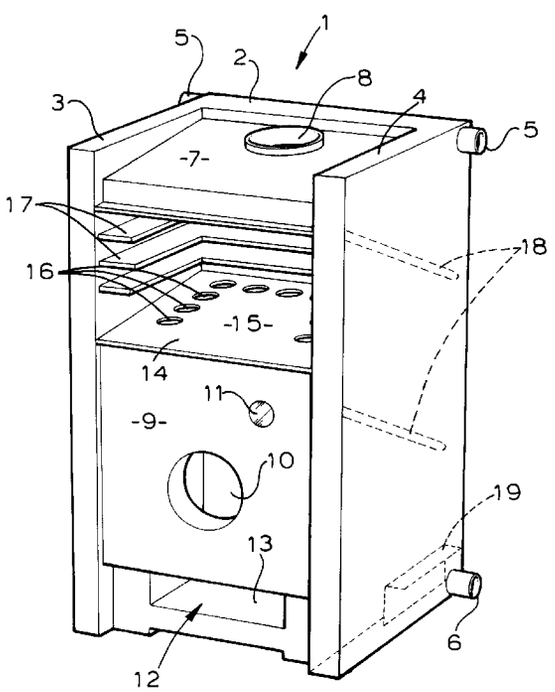

FIG 1

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This invention relates to boilers and is especially applicable to gas or oil fired boilers for use in hot water central heating systems.

Various constructions of gas or oil fired boilers are known, and there is a continuing need to achieve greater thermal efficiency and to provide accessability for cleaning and servicing purposes.

It is an object of the present invention to provide an improved form of such a boiler.

According to the present invention, there is provided a boiler comprising a liquid filled jacket-type heat exchanger having a rear tank, two spaced apart side tanks, a front tank extending between the side tanks over at least a lower part thereof, a base and a top which together define an enclosure through which products of combustion from a burner are fed to an outlet in said top, said heat exchanger further comprising a divider member disposed between said base and said top which slopes upwards from the front to the back of said heat exchanger, and divides the enclosure into a lower chamber into which the products of combustion from the burner are fed, and an upper chamber, said divider member being provided with a plurality of holes therein for feeding said products of combustion from said lower chamber to said upper chamber, and a front opening closure member disposed above said front tank for providing access to said upper chamber.

In carrying out the invention, it may be arranged that the divider member comprises a solid plate, or comprises a further liquid filled tank coupled to tanks of said heat exchanger.

In one preferred arrangement it is arranged that said plurality of holes extend adjacent one side edge of said divider member, adjacent the back edge of said divider member and adjacent the other side edge of said divider member.

In some arrangements it may be arranged that a diffuser plate is disposed above said divider member.

In another arrangement for carrying out the invention, it may be arranged that the top of said heat exchanger comprises a further liquid filled tank coupled to tanks of said heat exchanger.

Advantageously, the top of said heat exchanger may slope upwards from the front to the back of said heat exchanger, and said outlet for said products of combustion may comprise an aperture in said top disposed nearest the rear edge thereof.

In yet another arrangement in accordance with the invention, a plurality of fin members may be provided disposed in said upper chamber of said enclosure and mounted on the inner surface of said heat exchanger for increasing heat transfer, and a plurality of retarders may be provided in said upper chamber for retarding the flow of the products of combustion therein, said retarders preferably being removably mounted.

Conveniently, an aperture may be provided in said front tank for receiving an outlet of said burner, and an inspection window may also be provided in said front tank.

A removable cleaning door may also be provided disposed below said front tank.

In carrying out the invention a liquid inlet and outlet for said heat exchanger may be provided disposed in one or both of the side tanks thereof, and diverter means may be disposed in one or more of the tanks of said heat exchanger for increasing the circulation of liquid therein.

A diverter plate disposed in front of the or each liquid inlet may also be provided.

Some exemplary embodiments of the invention will now be described, reference being made to the accompanying drawings, in which:

Fig. 1 is a perspective view of a jacket-type heat exchanger for use in a boiler in accordance with the present invention; and

Fig. 2 is a front view of an alternative form of the heat exchanger of Fig. 1; and

Fig. 3 is a cross-sectional view of the heat exchanger of Fig. 2.

In Fig. 1 of the drawings there is shown a heat exchanger 1 for use in an oil fired hot water central heating boiler in accordance with the present invention.

The heat exchanger 1 is of the jacket-type and comprises a rear tank 2 and two side tanks 3 and 4 which are interconnected and may be formed integrally with one another. The side tanks 3 and 4 each have water outlet couplings 5 and return couplings 6, the return coupling 6 of tank 4 only being shown, which enable the boiler to be connected to various designs of central heating systems.

The heat exchanger 1 also comprises a top tank 7 which connects with the rear tank 2 and the side tanks 3 and 4, and which is provided with a flue outlet 8 disposed nearest the rear edge thereof. The top tank 7 is sloped upwards from front to back of the heat exchanger 1, the angle of the slope being important to encourage the flow of water and to prevent the formation of gas (air) pockets which impair the efficiency of the boiler, as well as producing noise due to localised boiling.

The heat exchanger 1 is also provided with a front tank 9 which extends between the side tanks 3 and 4 and is coupled thereto over a lower intermediate part of the heat exchanger 1, the front tank 9 being provided with an aperture 10 which is adapted to receive the outlet of a pressure jet oil fired burner (not shown) by means of which products of combustion from the burner are introduced into the heat exchanger 1. Also in the front tank 9 is disposed a flame viewing window 11.

Below the front tank 9 is provided an opening 12 for providing cleaning access to the interior of the heat exchanger 1, and which would normally be closed by a suitable door (not shown), and the heat exchanger

1 is provided with a bottom 13, which is preferably heat insulated.

The opening 14 above the front tank 9 would normally be closed by a door (not shown) which provides access to the upper part of the heat exchanger 1 for cleaning and/or servicing purposes.

The parts of the heat exchanger 1 thus far described define an enclosure through which products of combustion introduced via the aperture 10 are caused to flow in the heat exchanger 1 for the purpose of heating the water contained in the various tanks 2, 3, 4, 7 and 9 thereof.

In order to increase the heating efficiency of the heat exchanger 1, a divider member 15 is provided which effectively divides the enclosure into a lower combustion chamber into which the products of combustion from the burner (not shown) are introduced via the aperture 10 and an upper chamber corresponding essentially to the opening 14. The divider member 15 extends from the top of the front tank 9 to the inner surface of the rear tank 2 and between the inner surfaces of the side tanks 3 and 4. The divider member 15 may be either a solid plate or may take the form of a further water tank, and, as in the case to the top tank 7, it may advantageously slope upwards from front to back of the heat exchanger 1 to aid water and/or combustion product flow. The divider plate 15 is provided with a plurality of apertures 16, the number, sizing and positioning of which may take various forms such that the lower combustion chamber is pressurised to ensure that efficient combustion takes place, and to ensure that the flow of combustion products is optimised for maximum heat transfer to the heat exchanger 1. The holes 16 in the divider plate 15 of Figure 1 are disposed adjacent one side edge, adjacent the rear edge and adjacent the other side edge of the plate 15 so as to distribute the flow of combustion products around the upper chamber of the heat exchanger 1.

To the inside surfaces of the rear and side tanks 2, 3 and 4 is secured a plurality of fins 17 which are designed to have the greatest possible contact with the inside surfaces of the tanks 2, 3 and 4, and have a length and thickness which achieves the maximum possible heat transfer, thus contributing to greater output and efficiency. The fins 17 may also be arranged to support one or more plate retarders (not shown) which not only retard the flow of combustion gases but, by their design, direct the gases around every portion of the upper chamber of the heat exchanger 1, and around the fins 17, thereby again increasing the heat transfer, and subsequently the boiler output and efficiency. They can also play an important role in reducing the noise which can be generated in the boiler.

In order to increase the water flow in the various tanks 2, 3, 4, 7 and 9 of the heat exchanger 1, various water diverters, such as the diverters 18 in side tank 4, may be included, which ensure that water flows efficiently throughout the heat exchanger 1 thus preventing possible by-passes therein. A further water diverter 19 may also be provided in the vicinity of each of the return couplings 6 to aid in directing water flow, and also to reduce the possibility of cold return water impinging directly on the inner surface of the heat exchanger 1 which could otherwise cause chilling of the products of combustion and cause corrosion.

In Figs. 2 and 3 of the drawings there is depicted a heat exchanger 20 which is basically the same as that described with reference to Fig. 1, and in which the same reference numerals have been used for corresponding features. For the sake of convenience only those features which differ from those of the heat exchanger 1 of Fig. 1 will be described.

In the heat exchanger 20 of Figs. 2 and 3, the divider member 15 is in the form of a divider water tank coupled to the rear and side tanks 2, 3 and 4 of the heat exchanger 20, and the holes 16 in the divider member 15 consist of five rows of holes which extend from front to back of the member 15. The holes 16 each consist of a tube 16' which extends through the divider water tank 15, and one or more turbulators (not shown) may be located within the tubes 16' to further improve heat transfer efficiency.

In the heat exchanger 20 of Figs. 2 and 3, a pressure jet oil burner 21 is provided mounted on the front of the heat exchanger 20, and having an outlet 22 which extends through the aperture 10 in the front tank 9 to introduce the products of combustion therefrom into the lower combustion chamber of the heat exchanger 20. As an alternative to providing a pressure jet oil burner 21 a blown gas burner could be used.

Also in the heat exchanger 20 of Figs. 2 and 3 there is shown three retarders 23 located on the fins 17 and arranged to be spaced therefrom so that combustion products are caused to flow around the edges of the retarders 23. An optional diffuser plate 24 (Fig. 3) may be provided positioned above the holes 16 in the divider tank 15 to further improve efficiency.

It will be appreciated that the boiler/heat exchangers which have been described have been given by way of example only and may be modified to suit any particular application. The flue outlet 8 may be connected to a conventional flue or to a balanced flue.

Claims

1. A boiler comprising a liquid filled jacket-type heat exchanger having a rear tank, two spaced apart side tanks, a front tank extending between the side tanks over at least a lower part thereof, a base and a top which together define an enclosure through which products of combustion from

a burner are fed to an outlet in said top, said heat exchanger further comprising a divider member disposed between said base and said top which slopes upwards from the front to the back of said heat exchanger and divides the enclosure into a lower chamber into which the products of combustion from the burner are fed, and an upper chamber, said divider member being provided with a plurality of holes therein for feeding said products of combustion from said lower chamber to said upper chamber, and a front opening closure member disposed above said front tank for providing access to said upper chamber.

2. A boiler as claimed in claim 1, in which the divider member comprises a solid plate.

3. A boiler as claimed in claim 1, in which the divider member comprises a further liquid filled tank coupled to tanks of said heat exchanger.

4. A boiler as claimed in any preceding claim, in which said plurality of holes extend adjacent one side edge of said divider member, adjacent the back edge of said divider member and adjacent the other side edge of said divider member.

5. A boiler as claimed in any preceding claim, comprising a diffuser plate disposed above said divider member.

6. A boiler as claimed in any preceding claim, in which the top of said heat exchanger comprises a further liquid filled tank coupled to tanks of said heat exchanger.

7. A boiler as claimed in any preceding claim in which the top of said heat exchanger slopes upwards from the front to the back of said heat exchanger.

8. A boiler as claimed in any preceding claim, in which said outlet for said products of combustion comprises an aperture in said top disposed nearest the rear edge thereof.

9. A boiler as claimed in any preceding claim, comprising a plurality of fin members disposed in said upper chamber of said enclosure and mounted on the inner surface of said heat exchanger for increasing heat transfer.

10. A boiler as claimed in any preceding claim, comprising a plurality of retarders in said upper chamber for retarding the flow of the products of combustion therein.

11. A boiler as claimed in claim 10, in which said retarders are removably mounted.

12. A boiler as claimed in any preceding claim, comprising an aperture in said front tank for receiving an outlet of said burner.

13. A boiler as claimed in any preceding claim, comprising an inspection window in said front tank.

14. A boiler as claimed in any preceding claim, comprising a removable cleaning door disposed below said front tank.

15. A boiler as claimed in any preceding claim, comprising a liquid inlet and outlet for said heat exchanger, disposed in one or both of the side tanks thereof.

16. A boiler as claimed in any preceding claim, comprising diverter means disposed in one or more of the tanks of said heat exchanger for increasing the circulation of liquid therein.

17. A boiler as claimed in any preceding claim, comprising a diverter plate disposed in front of the or each liquid inlet.

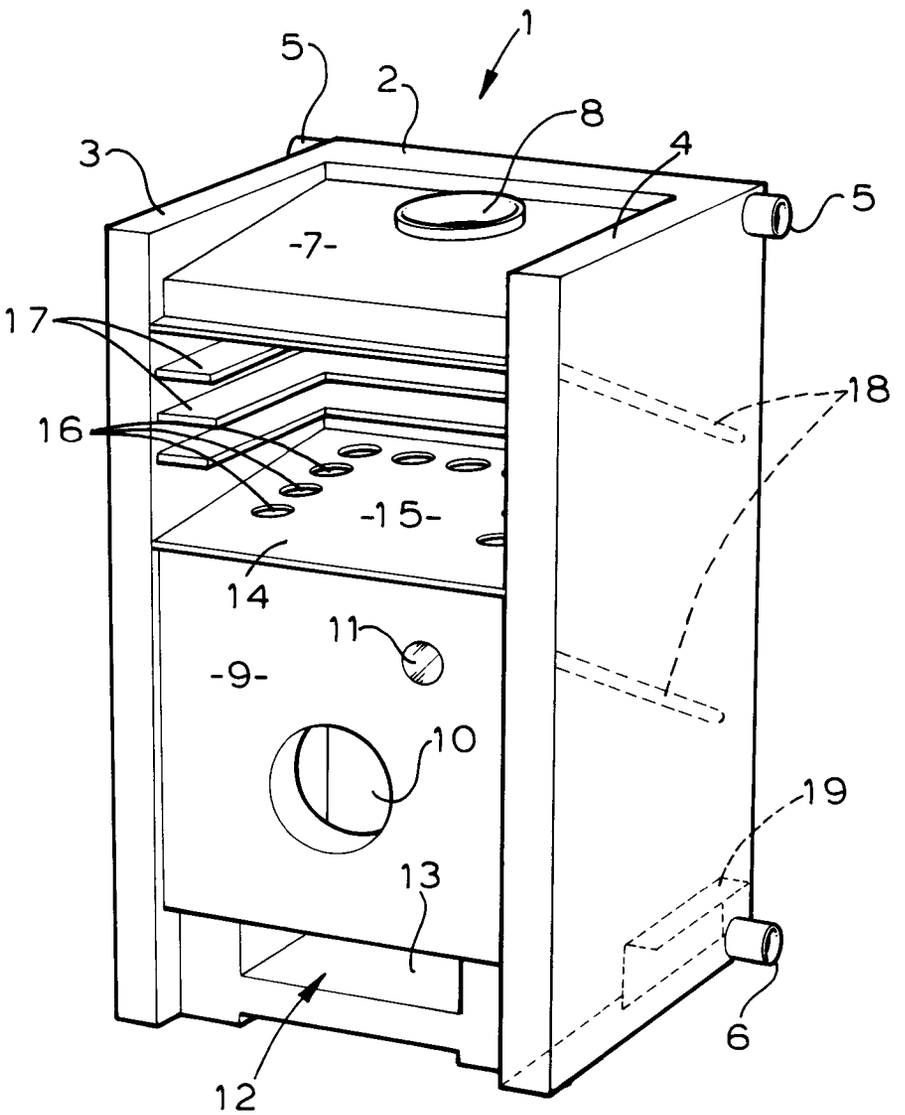

FIG 1

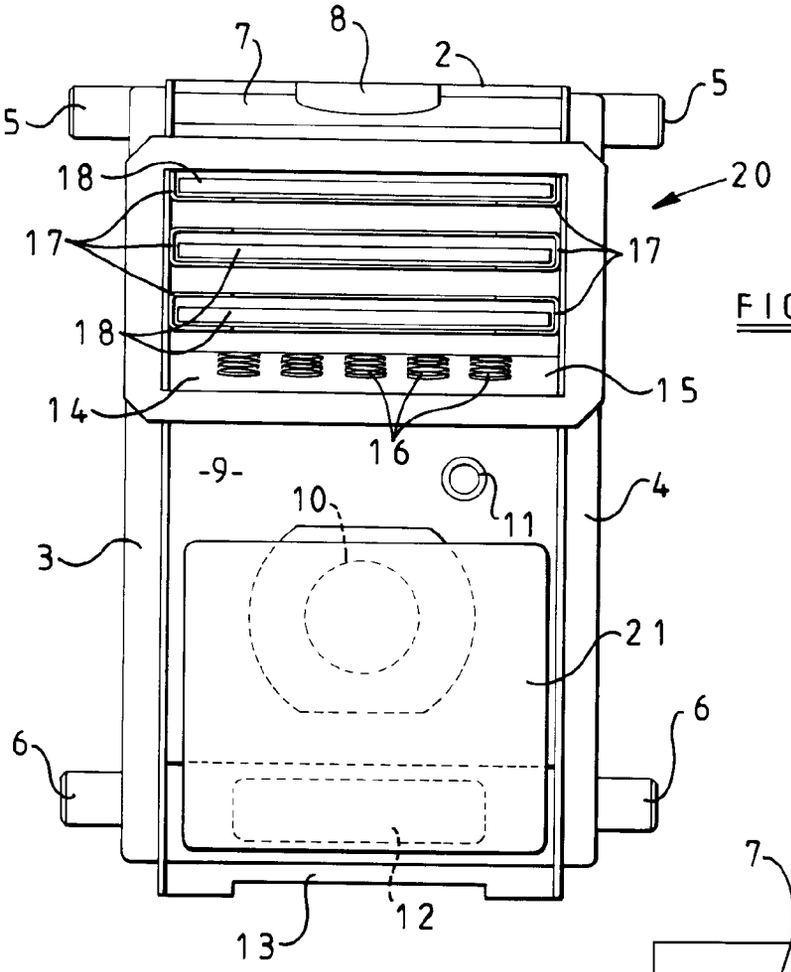
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FIG 2

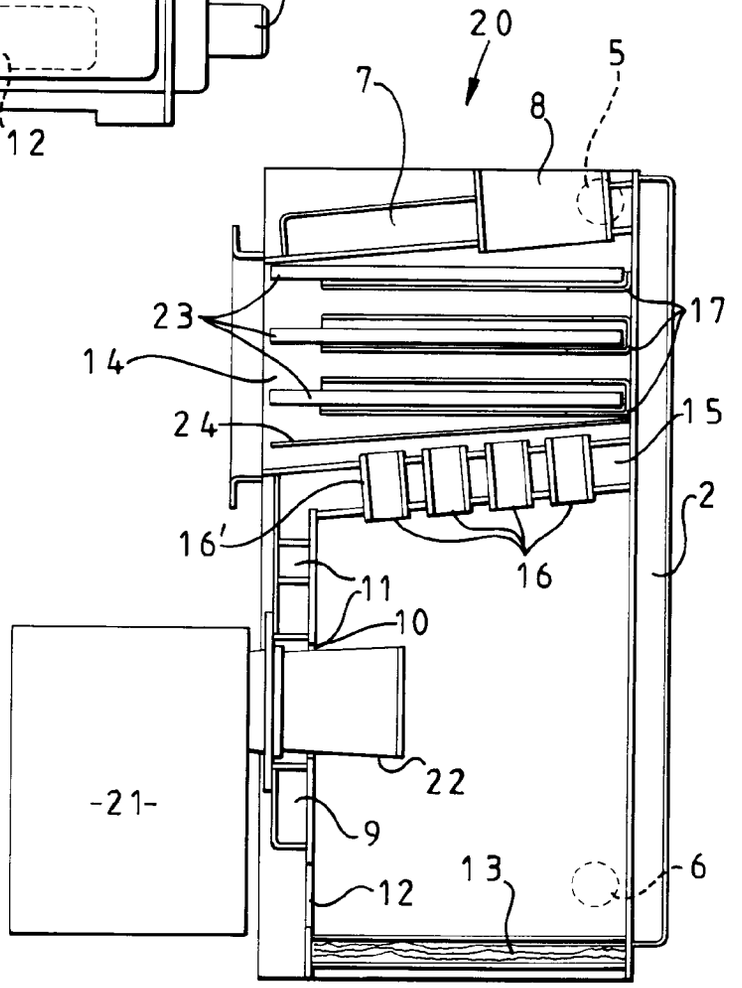
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FIG 3