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(71) Applicant : **GOLDSTAR CO. Ltd.**
20, Yoido-Dong, Youngdungpo-Gu
Seoul (KR)

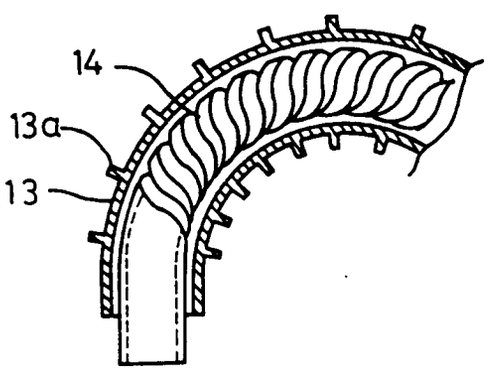
(72) Inventor : **Han, Seok Hwan, c/o Goldstar Co., Ltd.**
20 Yoido-dong, Youngdungpo-gu
Seoul (KR)

(74) Representative : **Lawson, David Glynne**
MARKS & CLERK 57-60 Lincoln's Inn Fields
London WC2A 3LS (GB)

(54) Heat exchanger for a gas boiler.

(57) A heat exchanger for a gas boiler, having a simple structure and increased heat-exchanging efficiency, has a heating tube 13 wound into a spiral and having a plurality of heat-exchanging fins 13a formed thereon by rolling. At least one hot water tube 14 may be installed inside the heating tube, to perform both space heating and water heating in a compact structure. The outer peripheral surface of the hot water tube may be carved in a spiral form so that space heating water has a turbulent flow.

FIG. 3



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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a heat exchanger, and more particularly to a heat exchanger for a gas boiler which can reduce manufacturing processes and improve the heat-exchanging efficiency thereof by simplifying its structure.

2. Description of the Prior Art

A gas boiler is a heating system for domestic use, e.g., for space heating and/or for water heating purposes and is normally provided with a burner and a heat exchanger as the main parts that determine the characteristics and design of the gas boiler. Accordingly, there has been a great effort in developing such main parts in order to provide a compact, efficient, easily produced and inexpensive gas boiler.

A conventional heat exchanger for a gas boiler, as shown in Figs. 1A and 1B, comprises a plurality of heating tubes 3 arranged around the periphery of a cylindrical gas burner 2 which is vertically mounted on the inner central part of a body 1 of the heat exchanger and has a plurality of flame nozzles 2a, and a plurality of heat-exchanging fins 4 vertically welding-fixed on the outside of the heating tubes 3 at regular intervals so as to increase the heat-exchanging area.

The gas boiler is also provided with a bottom 5 for supporting the heating tubes 3 and connecting heating water passages, being installed at the lower part of the body 1, a header 6 for providing passages of the heating water flowing from the lower part of the body 1, being installed at the upper part thereof, and a baffle 7 for partitioning the inner space of the header 6 to enable the heating water to flow smoothly, being installed inside the header 6.

Further, two pipes 8 and 9 installed at the lower part of the bottom 5 and coupled to external pipes (not illustrated) to provide water inlet and outlet channels, a ceramic heater 10 for igniting mixed gas, which is installed adjacent to the cylindrical gas burner 2, and a fan 11 for supplying mixed gas to be in combustion into the gas burner 2, installed at the lower part of the gas burner 2, are also provided.

Operation of the conventional heat exchanger constructed as above will now be explained as follows.

When the mixed gas composed of fuel gas and air supplied by fan 11 is drawn into gas burner 2, and ceramic heater 10 is supplied with electric power source to be heated to an ignition point, the supplied mixed gas becomes in combustion. At this time, water supplied through inlet pipe 8 is gathered in bottom 5, divided through a plurality of heating tubes 3, and then gathered at the inner space of header 6, thereby exchanging heat with high temperature combustion gas burned at gas burner 2. That is, the high temperature combustion gas burned at gas burner 2 transmits heat to a plurality of heating tubes 3, a plurality of heat-exchanging fins 4 and the water which flows through heating tubes 3, thereby heating the water.

The water gathered in the inner space of header 6 in this way passes through heating tubes 3 again, along the passage formed by baffle 7, exchanging heat once more, and is then exhausted to the external pipe through outlet pipe 9.

However, the conventional heat exchanger as described above has a problem in that a plurality of heat-exchanging fins 4 for increasing the heat transmission area must be welding-fixed in order to adhere closely about the periphery of heating tubes 3 installed around cylindrical gas burner 2. Also, bottom 5 and header 6 for forming water passages must be respectively welding-fixed at the lower and upper part of heating water tubes 3 in order not to leak water, so that the overall structure is complicated and manufacturing processes and costs are increased. Moreover, when a plurality of heat-exchanging fins 4 are welding-fixed to a plurality of heating water tubes 3, perfect adhesion cannot be practically obtained. Accordingly, it is difficult to perform fixing-work of a regular interval (usually 3-4mm interval) and thus it is impossible to examine the array accuracy of heat-exchanging fins 4. Therefore, heat-exchanging efficiency is degraded.

SUMARY OF THE INVENTION

The present invention has been made to overcome the problems involved in the prior art. It is an object of the present invention to provide a heat exchanger for a gas boiler which can reduce the manfacturing processes and costs and improve the heat-exchanging efficiency by simplifying the structure of the heat exchanger.

According to the present invention, there is provided a heat exchanger for a gas boiler having a gas burner, comprising:

a tube for heating space-heating water, the tube being wound into a spiral, centering around the gas burner with a predetermined distance therefrom, and having a plurality of heat-exchanging fins formed on the outer peripheral surface of the tube.

BRIEF DESCRIPTION OF THE DRAWINGS

The above object and other advantages of the present invention will become more apparent by describing the preferred embodiment thereof with reference to the accompanying drawings, in which:

Fig. 1A is a partially-sectioned perspective view of the conventional heat exchanger for a gas boiler.

Fig. 1B is a cross-sectional view taken along the line A-A in Fig. 1A.

Fig. 2A is a longitudinal cross-sectional view showing an embodiment of a heat exchanger for a gas boiler according to the present invention.

Fig. 2B is a cross-sectional view taken along the line B-B in Fig. 2A.

Fig. 3 is a detailed cross-sectional view of C part in Fig. 2B, showing the structures of a heating tube and a hot-water tube according to the embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to Figs. 2A, 2B and 3, cylindrical gas burner 12 having a plurality of flame nozzles 12a is vertically mounted on the inner central part of body 11, and heating tube 13 having a plurality of heat-exchanging fins 13a formed thereon is wound into a spiral, centering about the periphery of gas burner 12 with a predetermined distance from gas burner 12.

In the embodiment of the present invention, hot water tube 14 for exchanging heat with hot water is installed inside heating tube 13 for hot water supply, while heating tube 13 is for space heating.

Cylindrical gas burner 2 is fixed on burner-fixing plate 11a of body 11 by a plurality of screws 15. Heating tube 13 is arranged around the periphery of gas burner 12 in a spiral form, being fixed on burner-fixing plate 11a.

In particular, a plurality of heat-exchanging fins 13a are formed on the outer peripheral surface of heating tube 13, while the height of each fin 13a and the interval between each fin 13a are made to be constant by a rolling (screw thread rolling) process.

Moreover, it is desirable that the outer peripheral surface of hot water tube 14 installed inside heating tube 13 is carved in a spiral form so that the heating water has a turbulent flow and thus flows smoothly, thereby increasing the heat transmission area and improving heat-exchanging efficiency.

Furthermore, at the ends of coupling pipes 16 and 17, which are respectively folded downwardly at an angle of 90 degrees from the upper and lower parts of heating tube 13, inlet nipple 18 which is composed of heating water inlet 18a and hot water inlet 18b, and outlet nipple 19 which is composed of heating water outlet 19a and hot water outlet 19b are formed, respectively.

At the upper side of body 11, adiabatic vessel 20 is installed to prevent the combustion gas from being directly expelled through exhaust port 23 which is connected to heating tube 13 and installed at the top of body 11, by coupling tubes 21 and 22 so that a portion of the heating water flows through adiabatic vessel 20.

Ignition plug 24 is installed to be adjacent to cylindrical gas burner 12, and fan 25 for supplying the mixed gas into gas burner 12 is installed at the lower side of burner 12.

The operation of the heat exchanger according to the present invention constructed as above will be described in detail.

When the mixed gas is supplied into gas burner 12 by fan 25 coupled to burner 12 and ignition plug 10 is supplied with the electric power source, the supplied mixed gas is immediately ignited and burned. The combustion gas passes through spaces between each of heat-exchanging fins 13a formed on heating tube 13 which surrounds burner 12, transmitting heat thereto, and then is exhausted through exhaust port 23.

At this time, the heating water and hot water supplied from inlet nipple 18 flow to the upper part of body 11 through heating tube 13 and hot water tube 14, respectively, exchanging heat with the combustion gas. The heating water and hot water then flow down to the lower part of body 11 through coupling pipe 17 and are respectively exhausted to the external pipes through output nipple 19.

In the embodiment, since the outer peripheral surface of hot water tube 14 installed inside heating tube 13 is carved in a spiral form, turbulent flow occurs in the heating water, thereby improving the heat transmission effect. The length of the heating tube 13 is determined according to the input amount of heat, which can be obtained by the following expression:

$$Q = U \cdot A \cdot \Delta Tm$$

where, Q: input amount of heat (Kcal/h),

U: heat transmission coefficient (Kcal/h·m^2·°C),

A: heat transmission area (m^2), and

Δ Tm: algebraic average temperature difference (°C).

If any input amount of heat (Q) is determined, the heat transmission area (A) suitable for the determined amount of heat is obtained by the above expression. Thereafter, the length of heating tube 13 can be obtained by converting the heat tramsmission area (A).

In particular, since heat-exchanging fins 13a are formed on the periphery of heating tube 13 by a rolling process, it is possible to reduce the height of heat-exchanging fin 13a from 3-4 millimeters to 2 millimeters or less, while the number thereof can be increased. Accordingly, it is possible to increase the heat transmission area, whereas the length of heating tube 13 can be shorter. Further, it is possible to solve the corrosion problem due to the high heat-exchanging fin 13a of the conventional apparatus and to make the pitch of the heat-exchanging fin 13a shorter.

From the foregoing, it will be apparent that the heat exchanger for a gas boiler according to the present invention has a simpler structure and reduced manufacturing processes, in comparison with the conventional heat exchanger, by reason of the heat-

ing tube having heat-exchanging fins formed thereon and wound into a spiral. Practically, the present heat exchanger achieves a reduction of manufacturing cost of over 30 percent compared with the conventional heat exchanger as well as achieving an improvement in working efficiency. Moreover, the present heat exchanger can perform both space heating and water heating even in a compact-structured heat exchanger by installing the heating hot water tube inside the heating tube. Furthermore, the outer peripheral surface of the hot water tube is carved in a spiral form to make the heating water flow turbulently and thus the heat-exchanging efficiency is much improved.

Claims

1. A heat exchanger for a gas boiler having a gas burner, comprising:
   a tube (13) for heating space-heating water, said heating tube being would into a spiral, centering around said gas burner (12) with a predetermined distance therefrom, and having a plurality of heat-exchanging fins (13a) formed on the outer peripheral surface of said heating tube.

2. A heat exchanger as claimed in claim 1, wherein said plurality of heat-exchanging fins are formed on the outer peripheral surface of said heating tube by a rolling process.

3. A heat exchanger as claimed in claim 1 or 2, further comprising at least one hot water tube (14) installed inside said heating tube.

4. A heat exchanger as claimed in claim 3, wherein the outer peripheral surface of said hot water tube is carved in a spiral form, whereby said space-heating water has a turbulent flow and flows smoothly.

5. A heat exchanger as claimed in claim 4, wherein the outer peripheral surface of said hot water tube is carved in a spiral form by a rolling process.

FIG. 1A

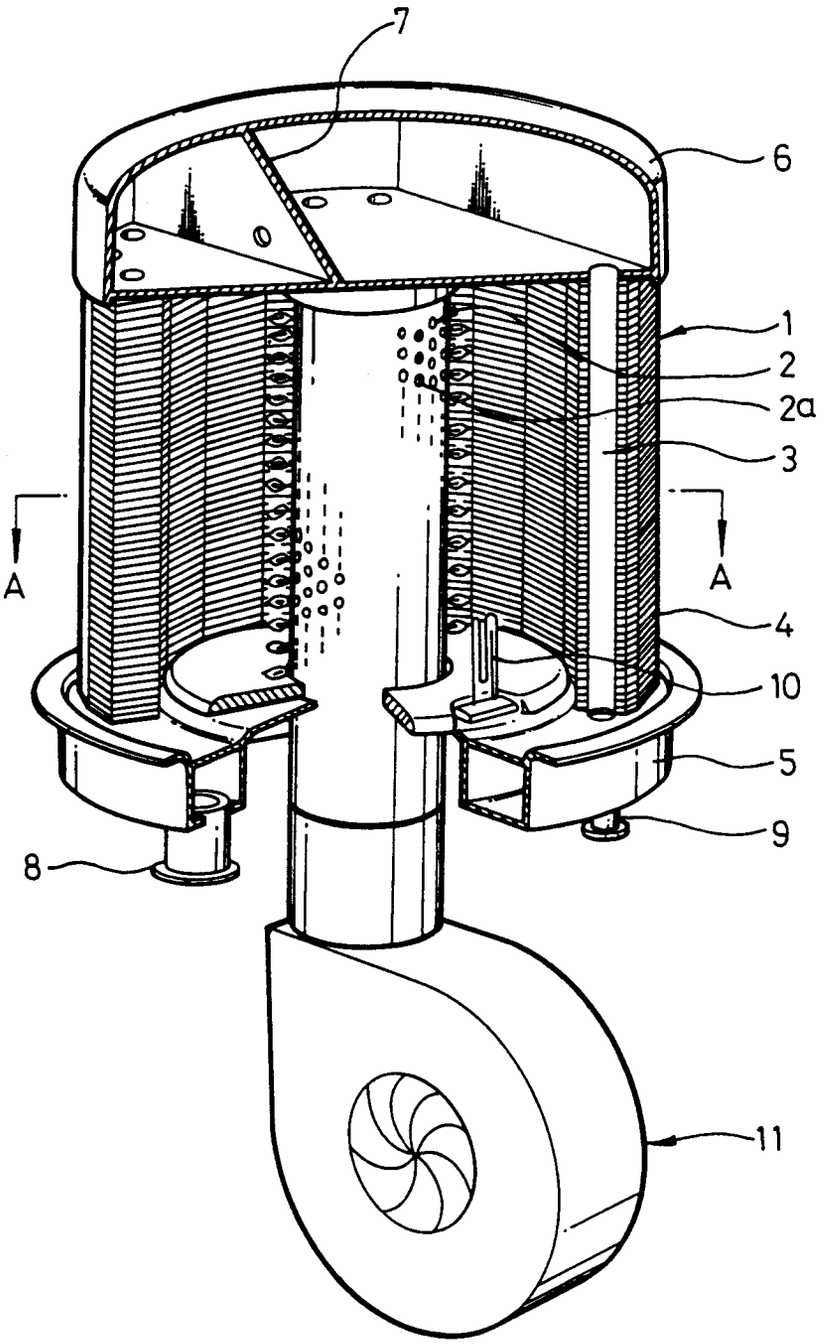

FIG. 1B

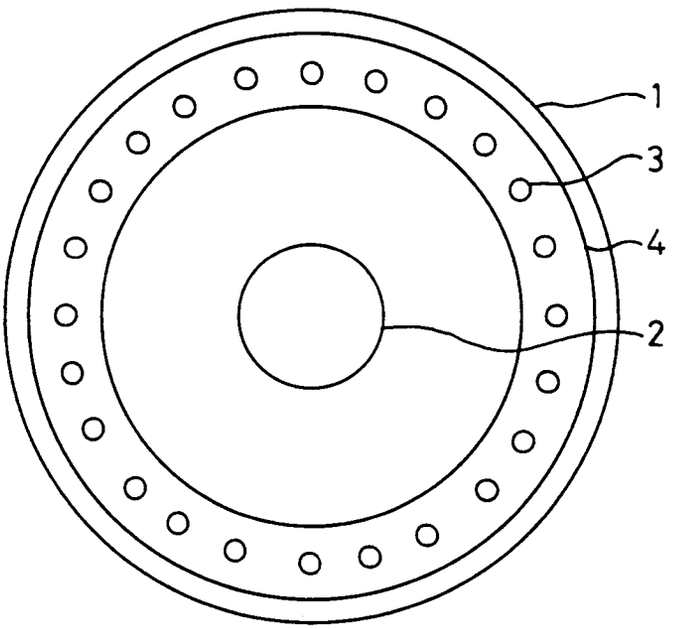

FIG. 2A

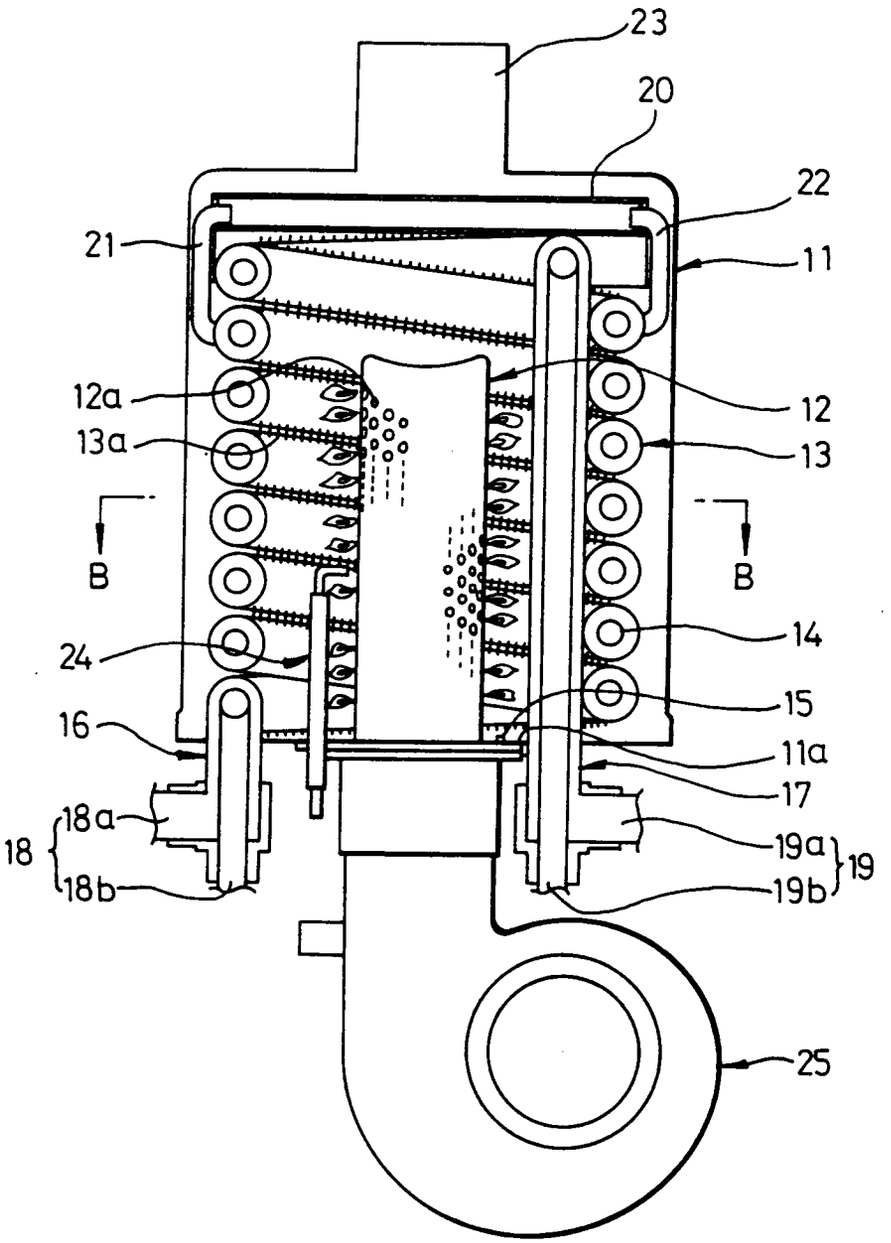
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FIG.2B

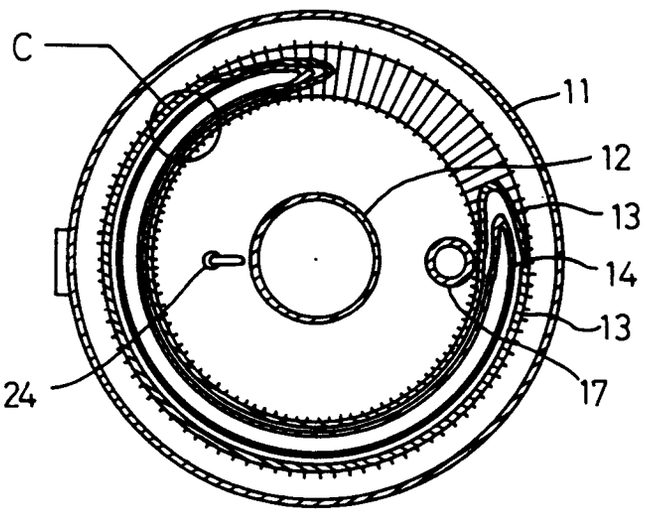
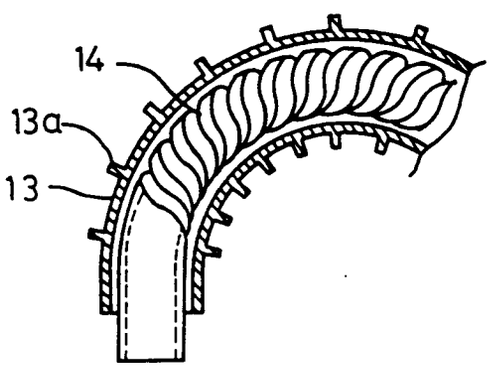


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 93 30 3652

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X Y	EP-A-0 385 700 (NUNNERLY) * figures 7,8 *	1,3 2,4,5	F24H1/43 F24H1/52
Y	PATENT ABSTRACTS OF JAPAN vol. 12, no. 315 (M-735)26 August 1988 & JP-A-63 087 597 (SAKUSHIYON GAS KIKAN SEISAKUSHO:KK) 18 April 1988 * abstract *	2	
Y	PATENT ABSTRACTS OF JAPAN vol. 9, no. 307 (M-435)4 December 1985 & JP-A-60 144 595 (MITSUBISHI JUKOGYO KK) 30 July 1985 * abstract *	4,5	
X	DE-A-2 253 493 (STEAM ENGINE SYSTEMS CORP.) * claims; figures *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F24H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 AUGUST 1993	VAN GESTEL H.M.

CATEGORY OF CITED DOCUMENTS

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