(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 584 499 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
17.02.2021 Bulletin 2021/07

(21) Application number: **18900678.6**

(22) Date of filing: **13.06.2018**

(51) Int Cl.:
F23D 14/04 *(2006.01)* ***F23D 14/78*** *(2006.01)*

(86) International application number:
PCT/CN2018/091100

(87) International publication number:
WO 2019/140861 (25.07.2019 Gazette 2019/30)

(54) **FLAME SPREADER AS WELL AS BURNER AND WATER HEATER USING SAME**

FLAMMENVERTEILER SOWIE BRENNER UND WASSERERHITZER MIT VERWENDUNG DAVON

DIFFUSEUR DE FLAMME AINSI QUE BRÛLEUR ET CHAUFFE-EAU UTILISANT CELUI-CI

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **16.01.2018 CN 201810039045**
15.05.2018 CN 201810461364

(43) Date of publication of application:
25.12.2019 Bulletin 2019/52

(73) Proprietors:
- **Wuhu Midea Kitchen And Bath Appliances Mfg. Co, Ltd.**
  Wuhu, Anhui 241009 (CN)
- **Midea Group Co., Ltd.**
  Foshan, Guangdong 528311 (CN)

(72) Inventors:
- **CHEN, Wenfeng**
  Wuhu, Anhui 241009 (CN)
- **MENG, Xianchao**
  Wuhu, Anhui 241009 (CN)
- **LIANG, Guorong**
  Wuhu, Anhui 241009 (CN)

(74) Representative: **RGTH**
Patentanwälte PartGmbB
Neuer Wall 10
20354 Hamburg (DE)

(56) References cited:
EP-A1- 0 769 656
CN-A- 106 642 109
CN-U- 202 253 640
CN-U- 204 227 677
CN-U- 206 582 843
CN-U- 206 739 297
DE-A1- 19 542 649
DE-U1- 9 203 211
US-A1- 2012 225 393

EP 3 584 499 B1

Description

FIELD

[0001] The present disclosure relates to a technical field of water heater, particularly to a distributor and a burner and a water heater having the same.

BACKGROUND

[0002] The water heater or wall-hanging stove is a household appliance that uses fuel gas as the main energy source to provide domestic hot water or household heating. The burner is a joint name of devices for making fuel and air sprayed and mixed in a certain way, which is an important component of the gas water heater and wall-hanging stove. The burner is divided into industrial burners, combustion engines, civil burners and special burners according to the type and application field. The existing burner has insufficient combustion heat intensity, low combustion efficiency, and is prone to generate a large amount of nitrogen oxides.

[0003] EP 0 769 656 A1 discloses a distributor and a burner and a water heater having the same. The distributor includes at least three injection pipes, a gas mixing cavity, a splitter and a first through hole. Each injection pipe is provided with a flow guiding inclined surface, and the flow guiding inclined surface is formed by inclining an end surface of a gas outlet section of the injection pipe to two sides.

[0004] DE 195 42 649 A1 discloses a gas burner having at least one burner element, which has a distributor in a flat casing. The casing carries a ridge strip with burner apertures, forming the combustion zone. There is at least one cooling tube through which water flows. This tube is connected for heat conduction to the burner element, and extends sideways next to the distributor chamber, transversely to its casing.

[0005] DE 92 03 211 U1 discloses a gas burner with an upper part, which extends through an upper burner chamber and forms an elongated burner plate through which gas-air mixture outlet openings pass.

SUMMARY

[0006] Embodiments of the present disclosure provide a distributor and a burner and a water heater having same to solve or alleviate one or more technical problems in the prior art.

[0007] As a first aspect of the embodiments of the present disclosure, an embodiment of the present disclosure provides a distributor, comprising:

at least three injection pipes, wherein each injection pipe is provided with a flow guiding inclined surface, and the flow guiding inclined surface is formed by inclining an end surface of a gas outlet section of the injection pipe to two sides;
a gas mixing cavity respectively communicated with each injection pipe;
a splitter disposed at the gas outlet section of the injection pipe and recessed to an interior of the gas mixing cavity to split gas to two sides; and
a first through hole disposed beside the injection pipe, configured for a cooling water pipe to pass through, and in close contact with the cooling water pipe.

[0008] The distributor includes a top plate covering a top of each injection pipe, and the top plate is provided with a plurality of fire holes; and a vertical spacing between the top of the first through hole and the top plate is less than or equal to 20 mm.

[0009] In some embodiments, a top of the first through hole is higher than a bottom of the splitter.

[0010] In some embodiments, a ratio of the vertical spacing to a vertical height of the injection pipe is less than or equal to 20%.

[0011] In some embodiments, the fire hole has a plurality of protrusions, and the protrusions of two adjacent fire holes are staggered.

[0012] In some embodiments, a center point of the first through hole is higher than a bottom of the gas outlet section.

[0013] In some embodiments, the splitter is provided with a vertex angle part, the vertex angle part is used for splitting gas to two sides of the splitter, and an angle of the vertex angle part ranges from 45 degrees to 85 degrees.

[0014] In some embodiments, the distributor includes a second through hole, and the second through hole is positioned at an outer side of the injection pipes at two sides of the distributor, used for the cooling water pipe to pass through, and in close contact with the cooling water pipe.

[0015] In some embodiments, a top of the second through hole is lower than the bottom of the splitter.

[0016] As a second aspect of the embodiments of the present disclosure, an embodiment of the present disclosure

provides a burner, including a cooling water pipe and a plurality of distributors as described above, the plurality of distributors being distributed side by side; the cooling water pipe passing through the first through hole and penetrating through the plurality of the distributor.

[0017] In some embodiments, the cooling water pipe is a U-shaped pipe, and the distributor includes two first through holes, and two ends of the cooling water pipe pass through the corresponding first through holes and penetrate through the plurality of the distributors.

[0018] In some embodiments, a first width is define by a horizontal distance between the center points of the two first through holes, a second width is defined by a horizontal distance between center lines of two outside injection pipes, and the first width is half of the second width.

[0019] In some embodiments, the vertical spacing between the top of the first through hole and the top plate is less than or equal to 50% of the first width.

[0020] In some embodiments, at least four injection pipes are arranged, the first through hole is arranged between every two adjacent injection pipes; the cooling water pipe is a serpentine pipe, and the cooling water pipe passes through each first through hole in a circuitous way and penetrates through the plurality of distributor.

[0021] As a third aspect of the embodiments of the present disclosure, an embodiment of the present disclosure provides a cooling water pipe and a plurality of distributors as described above, and the plurality of distributors are distributed side by side; the cooling water pipe passes through the first through hole and the second through hole, and penetrates through the plurality of the distributor.

[0022] As a fourth aspect of the embodiments of the present disclosure, an embodiment of the present disclosure provides a burner, comprising a plurality of distributors as described above and a gas distributor arranged below each distributor, a plurality of gas channels is defined in the gas distributor, and the gas channels being communicated with the injection pipe.

[0023] Preferably, the gas distributor further includes gas distribution rods which are respectively perpendicular to each gas channel, wherein the gas distribution rods are provided with branch passage holes to communicate the gas distribution rods with each gas channel.

[0024] As a fifth aspect of the embodiments of the present disclosure, an embodiment of the present disclosure provides a water heater, including the burner of any of the above.

[0025] The technical solution of the embodiment of the present disclosure can increase the ejector coefficient, make the gas combustion more complete, and reduce the generation of nitrogen oxides.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Fig. 1 is a front view illustrating a burner according to the first embodiment.
Fig. 2 is a top view illustrating the burner according to the first embodiment.
Fig. 3 is a right side view illustrating a distributor of the burner according to the first embodiment.
Fig. 4 is a left side view illustrating the distributor and a gas distributor of the burner according to the first embodiment.
Fig. 5 is a top view illustrating the distributor of the burner according to the first embodiment.
Fig. 6 is a top view illustrating a burner according to the second embodiment.
Fig. 7 is a front view illustrating a distributor of the burner according to the second embodiment.
Fig. 8 is a left side view illustrating two distributors of the burner according to the second embodiment.
Fig. 9 is a front view illustrating a distributor of a burner according to the third embodiment.
Fig. 10 is a top view illustrating a burner according to the fourth embodiment.
Fig. 11 is a front view illustrating a distributor of the burner according to the fourth embodiment.

Description of reference numbers:

[0027]

50: burner;	20: cooling water pipe;	500: distributor;
510: injection pipe;		
510A: first injection pipe;	510B: second injection pipe;	510C: third injection pipe;
511: gas outlet end;	511A: flow guiding inclined surface;	D1: width of the gas outlet end;
512: gas inlet end;	D2: width of the gas inlet end;	14: through hole;

(continued)

141: turnup;	15A: first concave part;	15B: second concave part;
16: top plate;	161: fire hole;	161A: protrusion;
17A: first housing;	17B: second housing;	18: bracket;
12: gas mixing cavity;	600: gas distributor;	610: gas channel;
611: first gas channel;	612: second gas channel;	613: third gas channel;
621: first nozzle;	622: second nozzle;	623: third nozzle;
630: gas distribution rod;	631: branch passage hole;	
10: burner;	100: distributor;	
100A: first housing;	100B: second housing;	110: injection pipe;
111A: first flow guiding inclined surface;	111B: second flow guiding inclined surface;	112: splitter;
112A: first concave portion;	112B: second concave portion;	112C: vertex angle part;
110A: negative pressure section;	110B: premixing section;	110C: diffuser section;
110D: gas outlet section;	120: top plate;	121: fire hole;
131: first through hole of water inlet pipe;	132: first through hole of water outlet pipe;	140: turnup;
200: cooling water pipe;	210: water inlet pipe;	220: water outlet pipe;
300: distributor;	333: first through hole of intermediate pipe;	
40: burner;	400: distributor;	
231: second through hole of water inlet pipe;	232 : second through hole of water outlet pipe.	

DETAILED DESCRIPTION

The first embodiment

[0028] As illustrated in Figs. 1 and 2, as an aspect of embodiments of the present disclosure, the present embodiment provides a burner 50 including a plurality of distributors 500 arranged in a horizontal direction. Fig. 3 shows a right side view of one of the distributors 500. The distributor 500 of the present embodiment includes a gas mixing cavity 12 and a plurality of injection pipes 510. The number of the injection pipes 510 may be three or more. The plurality of injection pipes 510 are independent of each other, and each of the injection pipes 510 is in communication with the gas mixing cavity 12. The plurality of injection pipes 510 can inject a larger amount of gas and improve the ejecting ability, thereby greatly improving combustion heat intensity and heat load of the burner, making the gas combustion more complete, and reducing generation of nitrogen oxides.

[0029] The present embodiment is exemplified by three injection pipes 510, that is, the distributor 500 of the present embodiment includes a first injection pipe 510A, a second injection pipe 510B, and a third injection pipe 510C. Preferably, the first injection pipe 510A, the second injection pipe 510B, and the third injection pipe 510C are vertically arranged, so that the distributor is simple in structure, convenient to manufacture, and low in cost. The first injection pipe 510A, the second injection pipe 510B, and the third injection pipe 510C may be uniformly distributed at equal intervals, or may be randomly distributed at unequal intervals.

[0030] In the following, the injection pipe 510 of the embodiment of the present disclosure will be described in detail in the preferred manner with reference to the accompanying drawings. Since the first injection pipe 510A, the second injection pipe 510B and the third injection pipe 510C preferably have the same shape, the following description will only take the first ejector tube 510A as an example.

[0031] An end surface of a gas outlet end (gas outlet section) 511 of the first injection pipe 510A is inclined to two sides to form a flow guiding inclined surface 511A, so as to reduce an injection pressure of gas at the gas outlet end (gas outlet section) 511, guide the gas ejected from the gas outlet end (gas outlet section) 511 to flow to two sides, and help the gas to be uniformly mixed in the gas mixing cavity 12.

[0032] A width D1 of the gas outlet end (gas outlet section) 511 of the first injection pipe 510A is preferably greater than a width D2 of the gas inlet end 512, so that a size of the distributor 500 can be reduced as much as possible, and the gas can be uniformly mixed as much as possible after being ejected from the gas outlet end (gas outlet section) 511.

[0033] Fig. 4 illustrates a left side view of the distributor 500 of the present embodiment. Referring to Fig. 1, the burner 50 further includes a gas distributor 600 disposed below the first injection pipe 510A, the second injection pipe 510B, and the third injection pipe 510C of the distributor 500. A plurality of gas channels 610 is defined in the gas distributor 600, and the number and distribution of the gas channels 610 should correspond to the number and distribution of the

injection pipes 510. In the present embodiment, the gas distributor 600 includes a first gas channel 611, a second gas channel 612 and a third gas channel 613. The first gas channel 611 communicates with the first injection pipe 510A through a first nozzle 621; the second gas channel 612 is communicated with the second injection pipe 510B through a second nozzle 622; and the third gas channel 613 communicates with the third injection pipe 510C through a third nozzle 623.

[0034] The gas distributor 600 is fixedly connected with the first injection pipe 510A, the second injection pipe 510B and the third injection pipe 510C through a bracket 18. It should be noted that since the second gas channel 612 and the second nozzle 622 are blocked by the bracket 18 in Fig. 4, the second gas channel 612 and the second nozzle 622 are shown by dotted lines.

[0035] As shown in Figs. 1 and 4, the gas distributor 600 includes a gas distribution rod 630 disposed perpendicularly to each gas channel (the first gas channel 611, the second gas channel 612, and the third gas channel 613), a gas channel is defined inside the gas distribution rod 630, and the gas distribution rod 630 has a branch passage hole 631 to communicate the first gas channel 611, the second gas channel 612, and the third gas channel 613 with the gas distribution rod 630, respectively.

[0036] As shown in Fig. 1, Fig. 2 and Fig. 3, the burner of the present embodiment further includes a cooling water pipe 20, which passes through a through hole 14 provided in the distributor 500 and is in close contact with the distributor 500 to reduce cavity temperature of the distributor 500 and prolong service life of the burner. Preferably, the cooling water pipe 20 is a U-shaped pipe, and the distributor 500 is provided with two through holes 14 for the cooling water pipe 20 to pass through.

[0037] The distributor 500 of the present embodiment further includes a top plate 16 that covers a top of the gas mixing cavity 12, and Fig. 5 shows a top view of the top plate 16. The top plate 16 has a plurality of fire holes 161, and the plurality of fire holes 161 can be uniformly arranged in groups. Each fire hole 161 is strip-shaped with a plurality of protrusions 161A in a middle portion thereof to increase an area of the fire hole 161A to enhance the injection intensity, and the protrusions 161A of adjacent two fire holes 161 are staggered to increase the number and density of the fire holes 161.

[0038] As shown in Fig. 1, the distributor 500 of the present embodiment includes a first housing 17A and a second housing 17B which are symmetrically disposed forward and backward, that is, the injection pipe 510 is formed by the first housing 17A and the second housing 17B, a cavity of the injection pipe 510 is surrounded by the first housing 17A and the second housing 17B, and the gas mixing chamber 12 is surrounded by the first housing 17A and the second housing 17B. The first housing 17A and the second housing 17B are buckled to be connected, and the top plate 16 is welded to the first housing 17A and the second housing 17B respectively. Therefore, a punching process of the distributor 500 of the present embodiment is simple and reliable, which can reduce the production cost and reduce the noise when the burner operates.

[0039] Preferably, as shown in Figs. 3 and 4, the first housing 17A and the second housing 17B have turnup 141 in a circumferential direction of the through hole 14, so that the cooling water pipe 20 is in close contact with the distributor 500.

[0040] Preferably, the first housing 17A for enclosing the gas mixing chamber 12 has a first concave part 15A with a surface indentation, and the second housing 17B for enclosing the gas mixing cavity 12 has a second concave part 15B symmetrically disposed with respect to the first concave part 15A in a front and rear direction, and the first concave part 15A and the second concave part 15B are concave toward an inside of the gas mixing cavity 12. As shown in Figs. 3 and 4, three groups of the first concave part 15A and the second concave part 15B are provided, which are respectively located above the first injection pipe 510A, the second injection pipe 510B and the third injection pipe 510C, and are used for hold down the airflow and uniformly mixing the air.

[0041] As another aspect of the embodiments of the present disclosure, the present embodiment further provides a water heater including the burner according to the above embodiment. Other configurations of the water heater of the present embodiment can adopt various technical solutions those are known to those skilled in the art now and in the future, and will not be described in detail herein.

[0042] As another aspect of the embodiments of the present disclosure, the present embodiment further provides a wall-hanging stove including the burner according to the above embodiment. Other configurations of the wall-hanging stove of the present embodiment can adopt various technical solutions those are known to those skilled in the art now and in the future, and will not be described in detail herein.

[0043] The burner and the water heater or wall-hanging stove having the same of some embodiments of the present disclosure can greatly improve the ejecting ability and ejector coefficient of the gas, increase the combustion heat intensity and the heat load, make the combustion of the gas more completely, reduce the generation of nitrogen oxides, and reduce the cavity temperature of the distributor, prolong the service life of the burner, reduce the cost, and at the same time improve the performance and adaptability of the burner.

The second embodiment

[0044] Fig. 6 illustrates a top view of the burner 10 of the present embodiment. The burner 10 of the present embodiment includes a plurality of distributors 100 and cooling water pipes 200 penetrating through the plurality of distributors 100. The plurality of distributors 100 is distributed side by side along a width direction of the distributors 100. The cooling water pipe 200 is a U-shaped pipe including a water inlet pipe 210 and a water outlet pipe 220 to feed and drain water at a same side of the burner 10. Preferably, the cooling water pipe 200 is integrally formed.

[0045] Fig. 7 illustrates a front view of one of the distributors 100. The distributor 100 of the present embodiment includes three injection pipes 110 and two first through holes (the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe). The two ends of the cooling water pipe 200 respectively pass through the corresponding first through holes, that is, the first through hole 131 of the water inlet pipe is used for the water inlet pipe 210 to pass through and is in close contact with the water inlet pipe 210, and the first through hole 132 of the water outlet pipe is used for the water outlet pipe 220 to pass through and is in close contact with the water outlet pipe 220. The distributor 100 also includes a top plate 120 which covers above the three injection pipes 110 and is provided with a plurality of fire holes 121, which can be understood in combination with Fig. 6.

[0046] A vertical height H0 of the injection pipe 110 is preferably equal to or greater than 95 mm, which can be divided into an ejector section and a gas outlet section 110D according to a gas flow direction (i.e. from bottom to up in Fig. 7), the ejector section is sequentially a negative pressure section 110A, a premixing section 110B and a diffuser section 110C according to the gas flow direction. In the gas outlet section 110D, the gas injected by the three injection pipes 110 is mixed again and then discharged from the fire hole 121 and combusted to form a flame.

[0047] In order to prevent the flame from being excessively high due to the excessive jet force of the gas flow, firstly, an end surface of the gas outlet section 110D of the injection pipe 110 is inclined to two sides to form a flow guiding inclined surface (including a first flow guiding inclined surface 111A inclined to a left side and a second flow guiding inclined surface 111B inclined to a right side); secondly, a hole diameter of the injection pipe 110 in the diffuser section 110C gradually increases in the gas flow direction to reduce the pressure.

[0048] Referring to Figs. 7 and 8, the distributor 100 may be formed by a first housing 100A and a second housing 100B buckled together, i.e., a cavity of the three injection pipes 100 are surrounded by the first housing 100A and the second housing 100B. The first through hole 131 of the water inlet pipe and the first through hole 132 of water outlet pipe are formed by opening the first housing 100A and the second housing 100B at symmetrical positions.

[0049] The injection pipe 110 also has a splitter 112, which is disposed at the gas outlet section 110D, i.e., between the first flow guiding inclined surface 111A and the second flow guiding inclined surface 111B. The splitter 112 includes a first concave portion 112A formed by recessing the first housing 100A toward the cavity of the injection pipe 110 and a second concave portion 112B formed by recessing the second housing 100B toward the cavity of the injection pipe 110. A gas channel is defined between the first concave portion 112A and the second concave portion 112B for gas circulation.

[0050] The splitter 112 is used for splitting gas. That is, a part of the gas is affected by resistance of the splitter 112, split to two sides of the injection pipe 110, and ejected from the fire hole 121 corresponding to two sides of the injection pipe 110, and then combusted to form a flame; while another part of the gas rises vertically upward from the gas channel between the first concave portion 112A and the second concave portion 112B, and is ejected from the fire hole 121 corresponding to a center of the injection pipe 110, and then combusted to form a flame.

[0051] An angle α of a vertex angle part 112C of the splitter 112 is preferably 45 degrees (°) to 85°, that is, the angle at which the vertex angle part 112C divides the gas to two sides thereof is preferably 45° to 85°, so as to reduce the flow dividing resistance, reduce a transverse dimension of the splitter 112, and further provide conditions for moving up positions of the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe.

[0052] In the present embodiment, the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe are respectively located between two adjacent injection pipes 110 and have the same diameter. The diameters of the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe should be adapted to the cooling water pipe 200, preferably greater than or equal to 11mm, further preferably greater than or equal to 13mm. A greater diameter can increase a contact area with the cooling water pipe 200 and improve the cooling efficiency.

[0053] As shown in Fig. 7, in the present embodiment, a horizontal distance between center points of the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe forms a first width W1, a horizontal distance between center lines of two outside injection pipes 110 forms a second width W2, and the first width W1 is preferably half of the second width W2, so as to ensure that the entire area of the top plate 120 can be involved, thereby improving the cooling efficiency.

[0054] A top of the first through hole 131 of the water inlet pipe and a top of the first through hole 132 of the water outlet pipe are preferably arranged at the same horizontal plane. The top E1 of the first through hole 131 of the water inlet pipe should be higher than a bottom E2 of the splitter 112. Further, a center point E3 of the first through hole 131

of the water inlet pipe should be higher than a bottom E4 of the outlet section 110D, so that the position of the cooling water pipe 200 is adjacent to the top plate 120, thereby improving the cooling efficiency.

[0055] Preferably, a vertical distance H1 between the first through hole 131 of the water inlet pipe and the top plate 120 is less than or equal to 20 mm; a ratio of the vertical spacing H1 to the vertical height H0 of the injection pipe 110 is less than or equal to 20%; and the vertical distance HI is less than or equal to 50% of W1, so that the position of the cooling water pipe 200 is as adjacent to the top plate 120 as possible.

[0056] Nitric oxide accounts for 90% and nitrogen dioxide accounts for 5%~10% of the nitrogen oxides produced by the burner, of which nitrogen oxides produced by thermal oxidation reaction account for the majority (thermal oxidation reaction refers to the oxidation reaction of nitrogen and oxygen in air at high temperature to generate nitrogen oxides). Experiments show that the oxidation rate increases exponentially with the increase of reaction temperature.

[0057] Therefore, as the gas is continuously burned, the temperature of the fire hole 121, that is, the top plate 120, increases continuously and the risk of generating a large amount of nitrogen oxides also increases. In the present embodiment, the cooling water pipe 200 can cool the burner, especially reduce the temperature of the top plate 120. The positions of the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe are designed so that the position of the cooling water pipe 200 can be as adjacent to the top plate 120 as possible and the entire area of the top plate 120 can be involved. Therefore, the burner of the present embodiment can improve the cooling efficiency of the top plate 120 and further keep the top plate 120 at a lower temperature value to reduce thermal oxidation reaction and further reduce nitrogen oxide emission.

[0058] In addition, the burner 10 of the present embodiment can cool the top plate 120 and the fire hole 121, prolong the service life of the burner, and can also reduce the burning speed, thereby effectively controlling the occurrence of the tempering phenomenon and improving the safety factor.

[0059] Preferably, as shown in Fig. 7, the outer circumferences of the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe have turnups 140, so that the cooling water pipe 200 is in close contact with the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe.

[0060] As another aspect of the embodiments of the present disclosure, the present embodiment further provides a gas water heater including the burner according to the above embodiment. Other configurations of the gas water heater of the present embodiment can adopt various technical solutions those are known to those skilled in the art now and in the future, and will not be described in detail herein.

[0061] As another aspect of the embodiment of the present disclosure, the present embodiment further provides a wall-hanging stove including the burner according to the above embodiment. Other configurations of the wall-hanging stove of the present embodiment can adopt various technical solutions those are known to those skilled in the art now and in the future, and will not be described in detail herein.

The third embodiment

[0062] The present embodiment provides a burner, a water heater and a wall-hanging stove having the same. The difference from the second embodiment is that, as shown in Fig. 9, a distributor 300 of the present embodiment has four injection pipes 110, and a first through hole is provided between every two adjacent injection pipes 110, i.e., the distributor 300 includes three first through holes (a first through hole 131 of the water inlet pipe, a first through hole 132 of the water outlet pipe, and a first through hole 333 of an intermediate pipe).

[0063] In the present embodiment, the cooling water pipe is a serpentine pipe and passes through each first through hole in a circuitous way, that is, the water inlet pipe passes through the first through hole 131 of the water inlet pipe, the water outlet pipe passes through the first through hole 132 of the water outlet pipe, and the pipe connecting the water inlet pipe and the water outlet pipe passes through the first through hole 333 of the intermediate pipe, so as to respectively feed and drain water on two sides of the burner.

[0064] In the present embodiment, the size and position of the first through hole 333 of the intermediate pipe are designed to be the same as those of the first through hole 131 of the water inlet pipe. Therefore, the position of the cooling water pipe can be as adjacent to the top plate 120 as possible and the entire area of the top plate 120 can be involved. Therefore, the burner of the present embodiment can improve the cooling efficiency of the top plate 120 and further keep the top plate 120 at a lower temperature value to reduce the emission of nitrogen oxides.

[0065] The above embodiments provide a variety of burners, as well as gas water heaters and wall-hanging stove based on the above burners. The cooling water pipe is further made adjacent to the top plate and the fire hole by arranging the first through hole for the cooling water pipe to pass through between adj acent injection pipes and making the position of the first through hole adjacent to the top plate, so as to improve the cooling efficiency of the top plate and reduce the emission of nitrogen oxides. In addition, the design of multiple injection pipes can increase the ejector coefficient and the amount of ejected air, thus improving the combustion efficiency.

[0066] It should be noted that the embodiment of the present disclosure does not limit the number of injection pipes and the number of first through holes. For example, when the number of injection pipes is odd, a first through hole may

be provided between every two adjacent injection pipes, i.e., an even number of first through holes may be provided, at the same time the cooling water pipes feed and drain water at the same side of the burner. Alternatively, when the number of injection pipes is even, a first through hole may be provided between every two adjacent injection pipes, i.e., an odd number of first through holes may be provided, at the same time the cooling water pipes feed and drain water on two sides of the burner respectively.

The fourth embodiment

[0067] The present embodiment provides a burner 40, a water heater and a wall-hanging stove having the same. The difference from the second embodiment is that, a distributor 400 further includes two second through holes (the first through hole 231 of the water inlet pipe and the first through hole 232 of the water outlet pipe). The two ends of the cooling water pipe 200 respectively pass through the corresponding second through holes, i.e., the second through hole 231 of the water inlet pipe is used for the water inlet pipe 210 to pass through and is in close contact with the water inlet pipe 210, and the second through hole 232 of the water outlet pipe is used for the water outlet pipe 220 to pass through and is in close contact with the water outlet pipe 220, which can be understood in combination with Figs. 10 and 11.

[0068] The tops of the second through hole 231 of the water inlet pipe and the second through hole 232 of the water outlet pipe are preferably disposed at the same horizontal plane, and the top portion E11 of the second through hole 231 of the water inlet pipe and the second through hole 232 of the water outlet pipe may be lower than the bottom portion E2 of the splitter 112. Therefore, the second through hole match with the first through hole (131/132) so that the position of the cooling water pipe 200 can be adjacent to the top plate 120 or slightly lower than the splitter 112, thereby improving the cooling efficiency. Certainly, the second through hole 231 of the water inlet pipe and the second through hole 232 of the water outlet pipe may also be in the same height plane as the first through hole 131 of the water inlet pipe and the first through hole 132 of the water outlet pipe.

[0069] Certainly, the cooling water pipe in the present embodiment can be a serpentine pipe, which penetrates through the second through hole on one side, the plurality of distributors, the first through hole, and finally the second through hole on the other side in a circuitous way. The cooling water pipe can also be a plurality of U-shaped pipes which respectively penetrate through the first through hole, the plurality of distributors, and then the second through hole; or respectively penetrate in and out through the first through hole and penetrate in and out through the second through hole. In addition, the inlet end and the outlet end for the cooling water pipe may be located at one side of the burner or at two sides of the burner, and there is no specific limitation here.

Claims

1. A distributor (100), wherein the distributor (100) comprises

at least three injection pipes (110), wherein each injection pipe (110) is provided with a flow guiding inclined surface, and the flow guiding inclined surface is formed by inclining an end surface of a gas outlet section (110C) of the injection pipe (110) to two sides;
a gas mixing cavity (12) respectively communicated with each injection pipe (110);
a splitter (112) disposed at the gas outlet section (110C) of the injection pipe (110) and recessed to an interior of the gas mixing cavity (12) to split gas to flow along two sides; and
a first through hole (132) disposed beside the injection pipe (110), configured for a cooling water pipe (200) to pass through, and in close contact with the cooling water pipe (200), wherein the distributor (100) comprises a top plate (120) covering a top of each injection pipe (110), the top plate (120) being provided with a plurality of fire holes (121); and a vertical spacing between a top of the first through hole (132) and the top plate (120) is less than or equal to 20 mm.

2. The distributor (100) according to claim 1, wherein a top of the first through hole (132) is higher than a bottom of the splitter (112).

3. The distributor (100) according to claim 1, wherein a ratio of the vertical spacing to a vertical height of the injection pipe (110) is less than or equal to 20%, or
the fire hole (121) has a plurality of protrusions (161A), and the protrusions (161A) of two adjacent fire holes (121) are staggered.

4. The distributor (100) according to claim 1, wherein a center point (E3) of the first through hole (132) is higher than a bottom of the gas outlet section (110C).

5. The distributor (100) according to claim 1, wherein the splitter (112) is provided with a vertex angle part (112C), the vertex angle part (112C) is used for splitting gas to flow along two sides of the splitter (112), and an angle of the vertex angle part (112C) ranges from 45 degrees to 85 degrees.

6. The distributor (100) according to any one of claims 1-5, wherein the distributor (100) comprises a second through hole (231), the second through hole (231) is located outside the injection pipes (110) on two sides, configured for the cooling water pipe (200) to pass through, and in close contact with the cooling water pipe (200), wherein a top of the second through hole (231) is preferably lower than a bottom of the splitter (112).

7. A burner, comprising a cooling water pipe (200) and a plurality of distributors (100) according to any one of claims 1 to 6, the plurality of distributors (100) being distributed side by side; the cooling water pipe (200) passing through the first through hole (132) and penetrating through the plurality of the distributors (100).

8. The burner according to claim 7, wherein the cooling water pipe (200) is a U-shaped pipe, and the distributor (100) comprises two first through holes (132), two ends of the cooling water pipe (200) respectively pass through the corresponding first through holes (132) and penetrate through the plurality of the distributors (100).

9. The burner according to claim 8, wherein a first width (W1) is defined by a horizontal distance between center points (E3) of the two first through holes (132), a second width (W2) is defined by a horizontal distance between center lines of two outside injection pipes (110), and the first width (W1) is half of the second width (W2),
wherein a vertical spacing (H1) between a top of the first through hole (132) and the top plate (120) is preferably less than or equal to 50% of the first width (W1).

10. The burner according to any one of claims 7 to 9, wherein at least four injection pipes (110) are provided, the first through hole (132) is arranged between every two adjacent injection pipes (110); the cooling water pipe (200) is a serpentine pipe, passing through each first through hole (132) in a circuitous way, and penetrating through the plurality of distributor (100).

11. A burner, comprising a cooling water pipe (200) and a plurality of distributors (100) according to claim 6, the plurality of distributors (100) being distributed side by side; the cooling water pipe (200) passing through the first through hole (132) and the second through hole (231), and penetrating through the plurality of the distributors (100).

12. A burner, comprising a plurality of distributors (100) according to any one of claims 1 to 6, and a gas distributor (600) arranged below each distributor (100), a plurality of gas channels being defined in the gas distributor (600), and the gas channels (610) being communicated with the injection pipe (110).

13. The burner according to claim 12, wherein the gas distributor further comprises a gas distribution rod (630) perpendicular to each gas channel (610), the gas distribution rod (630) is provided with a branch passage hole (631) so as to communicate the gas distribution rod (630) with each gas channel (610).

14. A water heater, wherein the water heater comprises a burner according to any one of claims 7 to 13.

Patentansprüche

1. Ein Verteiler (100), wobei der Verteiler (100) Folgendes umfasst:

mindestens drei Einspritzrohre (110), wobei jedes Einspritzrohr (110) mit einer strömungsführenden Schrägfläche versehen ist, und die strömungsführende Schrägfläche durch Neigung einer Endfläche eines Gasauslassabschnitts (110C) des Einspritzrohrs (110) zu zwei Seiten gebildet ist;
einen Gasmischhohlraum (12), der jeweils mit jedem Einspritzrohr (110) in Verbindung steht;
einen Teiler (112), der am Gasauslassabschnitt (110C) des Einspritzrohrs (110) angeordnet ist und in ein Inneres des Gasmischhohlraums (12) eingelassen ist, um das Gas so zu teilen, dass es entlang zweier Seiten strömt; und
ein erstes Durchgangsloch (132), das neben dem Einspritzrohr (110) angeordnet ist und so konfiguriert ist, dass ein Kühlwasserrohr (200) hindurchgeht, und in engem Kontakt mit dem Kühlwasserrohr (200) steht, wobei der Verteiler (100) eine Kopfplatte (120) umfasst, die eine Oberseite jedes Einspritzrohrs (110) abdeckt, wobei die Kopfplatte (120) mit einer Vielzahl von Feuerlöchern (121) versehen ist; und ein vertikaler Abstand zwischen

einer Oberseite des ersten Durchgangslochs (132) und der Kopfplatte (120) kleiner oder gleich 20 mm ist.

2. Verteiler (100) gemäß Anspruch 1, wobei eine Oberseite des ersten Durchgangslochs (132) höher ist als eine Unterseite des Teilers (112).

3. Verteiler (100) gemäß Anspruch 1, wobei ein Verhältnis des vertikalen Abstands zu einer vertikalen Höhe des Einspritzrohrs (110) kleiner oder gleich 20% ist, oder
das Feuerloch (121) eine Vielzahl von Vorsprüngen (161A) aufweist und die Vorsprünge (161A) zweier benachbarter Feuerlöcher (121) versetzt angeordnet sind.

4. Verteiler (100) gemäß Anspruch 1, wobei ein Mittelpunkt (E3) des ersten Durchgangslochs (132) höher ist als ein Boden des Gasauslassabschnitts (110C).

5. Verteiler (100) gemäß Anspruch 1, wobei der Teiler (112) mit einem Scheitelwinkelteil (112C) versehen ist, der Scheitelwinkelteil (112C) zum Teilen von Gas verwendet wird, so dass es entlang zweier Seiten des Teilers (112) strömt, und ein Winkel des Scheitelwinkelteils (112C) im Bereich von 45 Grad bis 85 Grad liegt.

6. Verteiler (100) gemäß einem der Ansprüche 1-5, wobei der Verteiler (100) ein zweites Durchgangsloch (231) umfasst, sich das zweite Durchgangsloch (231) außerhalb der Einspritzrohre (110) auf zwei Seiten befindet, und so konfiguriert ist, dass das Kühlwasserrohr (200) hindurchgeht, und in engem Kontakt mit dem Kühlwasserrohr (200) steht,
wobei eine Oberseite des zweiten Durchgangslochs (231) vorzugsweise niedriger ist als eine Unterseite des Teilers (112).

7. Brenner, umfassend ein Kühlwasserrohr (200) und eine Vielzahl von Verteilern (100) gemäß einem der Ansprüche 1 bis 6, wobei die Vielzahl von Verteilern (100) nebeneinander verteilt ist; wobei das Kühlwasserrohr (200) durch das erste Durchgangsloch (132) geht und durch die Vielzahl der Verteiler (100) dringt.

8. Brenner gemäß Anspruch 7, wobei das Kühlwasserrohr (200) ein U-förmiges Rohr ist und der Verteiler (100) zwei erste Durchgangslöcher (132) umfasst, wobei zwei Enden des Kühlwasserrohrs (200) jeweils durch die entsprechenden ersten Durchgangslöcher (132) gehen und durch die Vielzahl der Verteiler (100) dringen.

9. Brenner gemäß Anspruch 8, wobei eine erste Breite (W1) durch einen horizontalen Abstand zwischen Mittelpunkten (E3) der beiden ersten Durchgangslöcher (132) definiert ist, eine zweite Breite (W2) durch einen horizontalen Abstand zwischen Mittellinien zweier äußerer Einspritzrohre (110) definiert ist, und die erste Breite (W1) die Hälfte der zweiten Breite (W2) beträgt, wobei ein vertikaler Abstand (H1) zwischen einer Oberseite des ersten Durchgangslochs (132) und der Kopfplatte (120) bevorzugt kleiner oder gleich 50% der ersten Breite (W1) ist.

10. Brenner gemäß einem der Ansprüche 7 bis 9, wobei mindestens vier Einspritzrohre (110) vorgesehen sind, das erste Durchgangsloch (132) zwischen jeweils zwei benachbarten Einspritzrohren (110) angeordnet ist; das Kühlwasserrohr (200) ein Serpentinenrohr ist, das durch jedes erste Durchgangsloch (132) in einem Schlängelpfad verläuft und durch die Vielzahl von Verteilern (100) dringt.

11. Brenner, umfassend ein Kühlwasserrohr (200) und eine Vielzahl von Verteilern (100) gemäß Anspruch 6, wobei die Vielzahl von Verteilern (100) nebeneinander verteilt ist; das Kühlwasserrohr (200) durch das erste Durchgangsloch (132) und das zweite Durchgangsloch (231) hindurchgeht und durch die Vielzahl der Verteiler (100) dringt.

12. Brenner, umfassend eine Vielzahl von Verteilern (100) gemäß einem der Ansprüche 1 bis 6 und einen Gasverteiler (600), der unter jedem Verteiler (100) angeordnet ist, wobei in dem Gasverteiler (600) eine Vielzahl von Gaskanälen definiert ist und die Gaskanäle (610) mit dem Einspritzrohr (110) in Verbindung stehen.

13. Brenner gemäß Anspruch 12, wobei der Gasverteiler ferner einen Gasverteilungsstab (630) senkrecht zu jedem Gaskanal (610) aufweist, wobei der Gasverteilungsstab (630) mit einem Zweigdurchgangsloch (631) versehen ist, um den Gasverteilungsstab (630) mit jedem Gaskanal (610) zu verbinden.

14. Wassererhitzer, wobei der Wassererhitzer einen Brenner nach einem der Ansprüche 7 bis 13 umfasst.

Revendications

1. Distributeur (100), dans lequel le distributeur (100) comprend :

   - au moins trois tuyaux d'injection (110), chaque tuyau d'injection (110) étant doté d'une surface inclinée de guidage de flux, et la surface inclinée de guidage de flux étant formée par inclinaison d'une surface d'extrémité d'une section de sortie de gaz (110C) du tuyau d'injection (110) vers deux côtés ;
   - une cavité de mélange de gaz (12) communiquant respectivement avec chaque tuyau d'injection (110) ;
   - un diviseur (112) disposé au niveau de la section de sortie de gaz (110C) du tuyau d'injection (110) et en retrait dans un intérieur de la cavité de mélange de gaz (12) pour diviser le gaz de manière à ce que celui-ci s'écoule le long de deux côtés ; et
   - un premier trou de passage (132) disposé à côté du tuyau d'injection (110), configuré pour le passage d'un tuyau d'eau de refroidissement (200), et en contact étroit avec le tuyau d'eau de refroidissement (200), dans lequel le distributeur (100) comprend une plaque supérieure (120) recouvrant une partie supérieure de chaque tuyau d'injection (110), la plaque supérieure (120) étant dotée d'une pluralité d'orifices de chauffe (121) ; et un espacement vertical entre une partie supérieure du premier trou de passage (132) et la plaque supérieure (120) est inférieur ou égal à 20 mm.

2. Distributeur (100) selon la revendication 1, dans lequel une partie supérieure du premier trou de passage (132) est plus élevée qu'une partie inférieure du diviseur (112).

3. Distributeur (100) selon la revendication 1, dans lequel un rapport de l'espacement vertical à une hauteur verticale du tuyau d'injection (110) est inférieur ou égal à 20 %, ou

   - l'orifice de chauffe (121) comporte une pluralité de saillies (161A), et les saillies (161A) de deux orifices de chauffe (121) adjacents sont étagées.

4. Distributeur (100) selon la revendication 1, dans lequel un point central (E3) du premier trou de passage (132) est plus élevé qu'une partie inférieure de la section de sortie de gaz (110C).

5. Distributeur (100) selon la revendication 1, dans lequel le diviseur (112) est doté d'une partie d'angle de sommet (112C), la partie d'angle de sommet (112C) étant utilisée pour diviser le gaz de manière à ce que celui-ci s'écoule le long de deux côtés du diviseur (112), et un angle de la partie d'angle de sommet (112C) est compris entre 45 degrés et 85 degrés.

6. Distributeur (100) selon l'une quelconque des revendications 1 à 5, dans lequel le distributeur (100) comprend un deuxième trou de passage (231), le deuxième trou de passage (231) étant situé à l'extérieur des tuyaux d'injection (110) sur deux côtés, configuré pour le passage du tuyau d'eau de refroidissement (200), et en contact étroit avec le tuyau d'eau de refroidissement (200),
   dans lequel une partie supérieure du deuxième trou de passage (231) est de préférence plus basse qu'une partie inférieure du diviseur (112).

7. Brûleur comprenant un tuyau d'eau de refroidissement (200) et une pluralité de distributeurs (100) selon l'une quelconque des revendications 1 à 6, la pluralité de distributeurs (100) étant répartis côte à côte ; le tuyau d'eau de refroidissement (200) traversant le premier trou de passage (132) et pénétrant à travers la pluralité de distributeurs (100).

8. Brûleur selon la revendication 7, dans lequel le tuyau d'eau de refroidissement (200) est un tuyau en forme de U, et le distributeur (100) comprend deux premiers trous de passage (132), deux extrémités du tuyau d'eau de refroidissement (200) traversent respectivement les premiers trous de passage (132) correspondants et pénètrent à travers la pluralité de distributeurs (100).

9. Brûleur selon la revendication 8, dans lequel une première largeur (W1) est définie par une distance horizontale entre des points centraux (E3) des deux premiers trous de passage (132), une deuxième largeur (W2) est définie par une distance horizontale entre des lignes centrales de deux tuyaux d'injection extérieurs (110), et la première largeur (W1) est égale à la moitié de la deuxième largeur (W2),
   dans lequel un espacement vertical (H1) entre une partie supérieure du premier trou de passage (132) et la plaque supérieure (120) est de préférence inférieur ou égal à 50 % de la première largeur (W1).

10. Brûleur selon l'une quelconque des revendications 7 à 9, dans lequel il est prévu au moins quatre tuyaux d'injection (110), le premier trou de passage (132) est disposé respectivement entre deux tuyaux d'injection (110) adjacents ; le tuyau d'eau de refroidissement (200) est un tuyau en serpentin traversant chaque premier trou de passage (132) de manière détournée, et pénétrant à travers la pluralité de distributeurs (100).

11. Brûleur comprenant un tuyau d'eau de refroidissement (200) et une pluralité de distributeurs (100) selon la revendication 6, la pluralité de distributeurs (100) étant répartis côte à côte ; le tuyau d'eau de refroidissement (200) traversant le premier trou de passage (132) et le deuxième trou de passage (231), et pénétrant à travers la pluralité de distributeurs (100).

12. Brûleur comprenant une pluralité de distributeurs (100) selon l'une quelconque des revendications 1 à 6, et un distributeur de gaz (600) disposé sous chaque distributeur (100), une pluralité de canaux de gaz étant définis dans le distributeur de gaz (600), et les canaux de gaz (610) communiquant avec le tuyau d'injection (110).

13. Brûleur selon la revendication 12, dans lequel le distributeur de gaz comprend en outre une tige de distribution de gaz (630) perpendiculaire à chaque canal de gaz (610), la tige de distribution de gaz (630) étant dotée d'un trou de passage d'embranchement (631) de manière à ce que la tige de distribution de gaz (630) communique avec chaque canal de gaz (610).

14. Chaudière, dans laquelle la chaudière comprend un brûleur selon l'une quelconque des revendications 7 à 13.

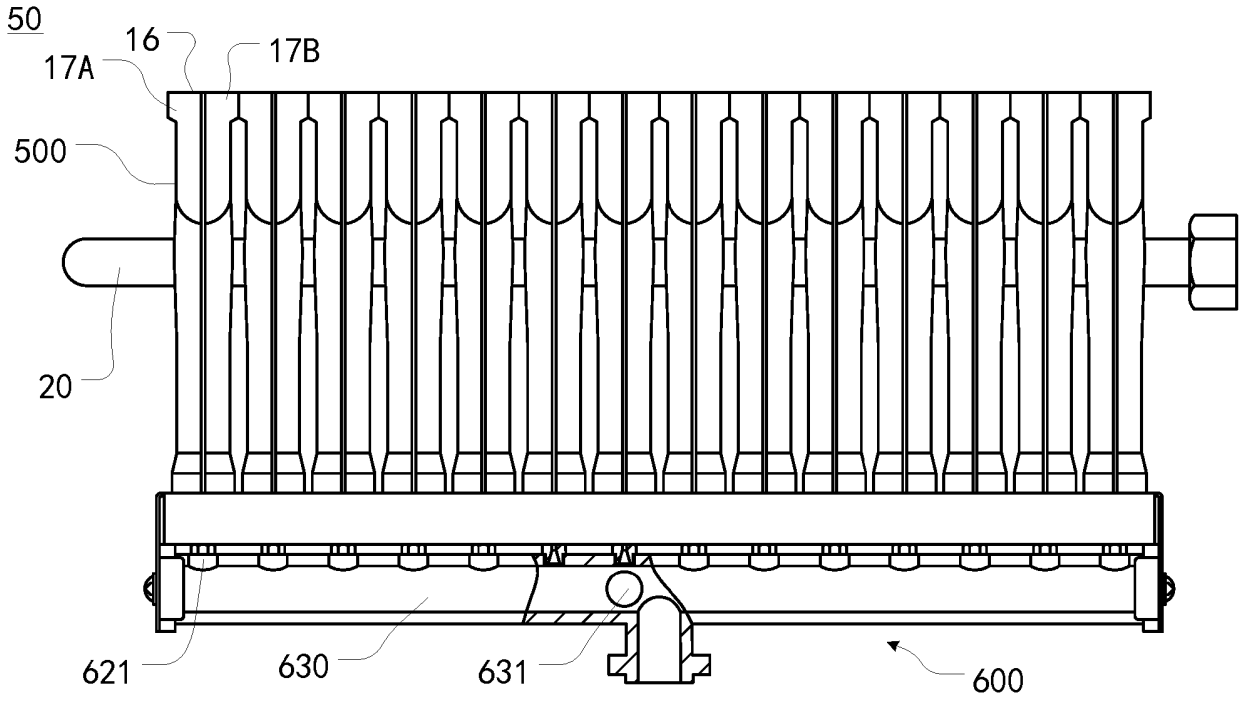

Fig. 1

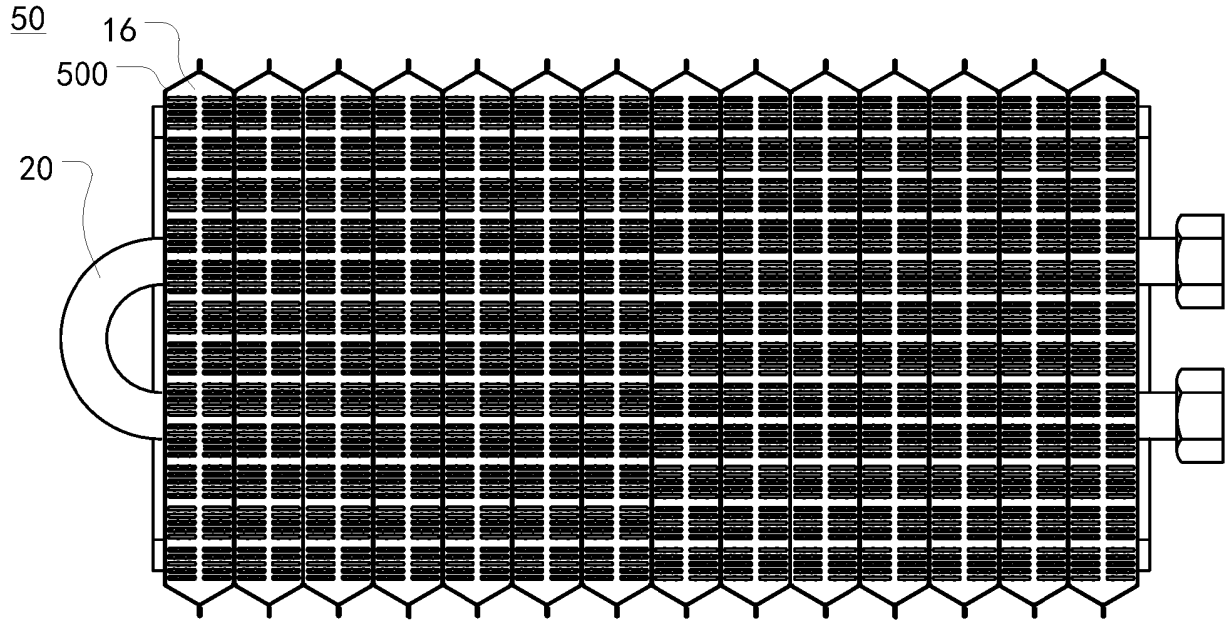

Fig. 2

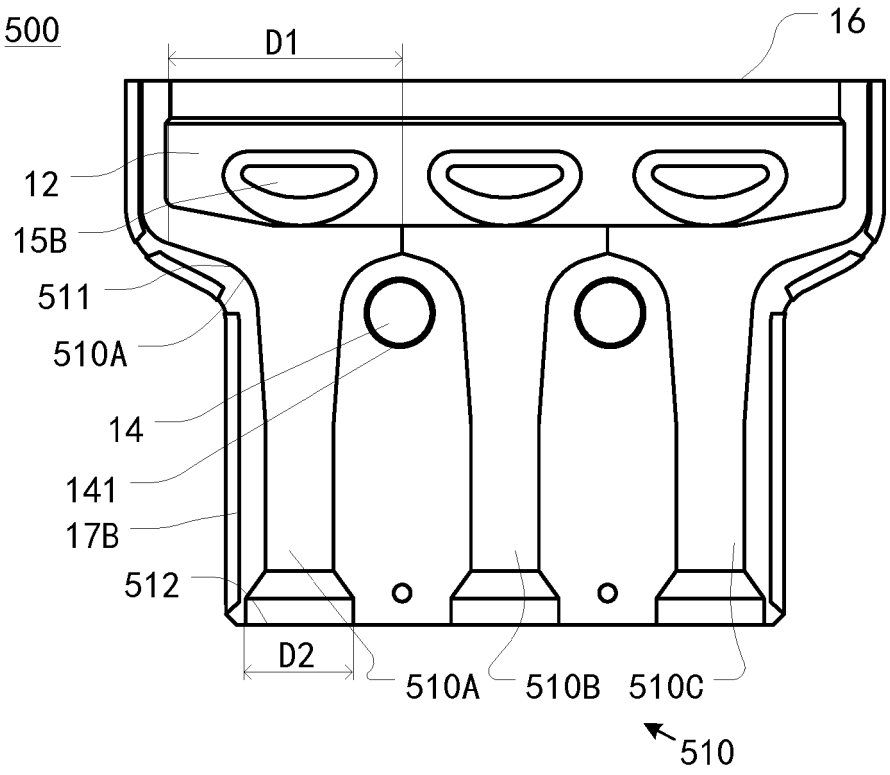

Fig. 3

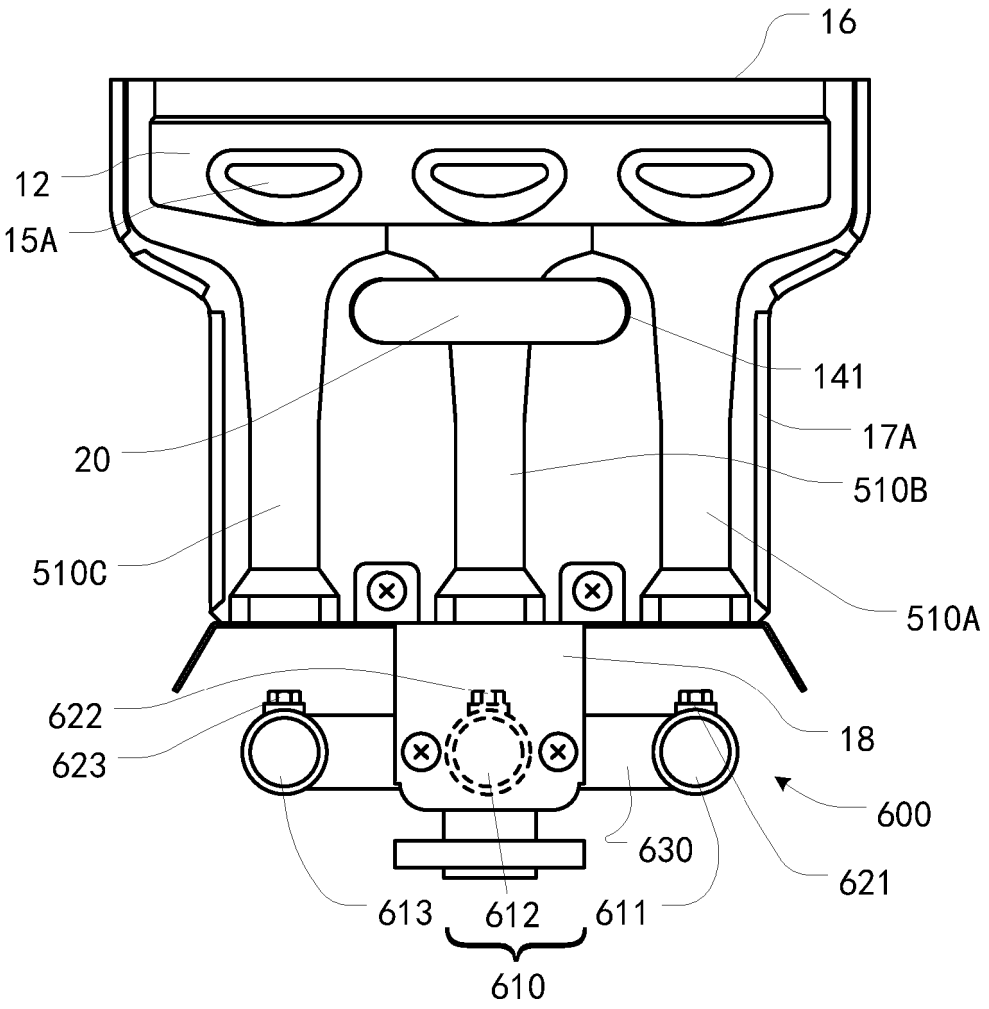
16
12
15A
141
17A
20
510B
510C
510A
622
18
623
600
630
621
613
612
611
610

Fig. 4

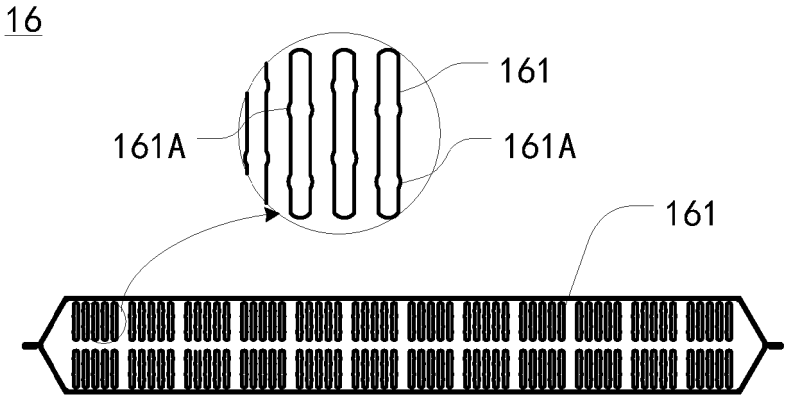
16
161
161A
161A
161

Fig. 5

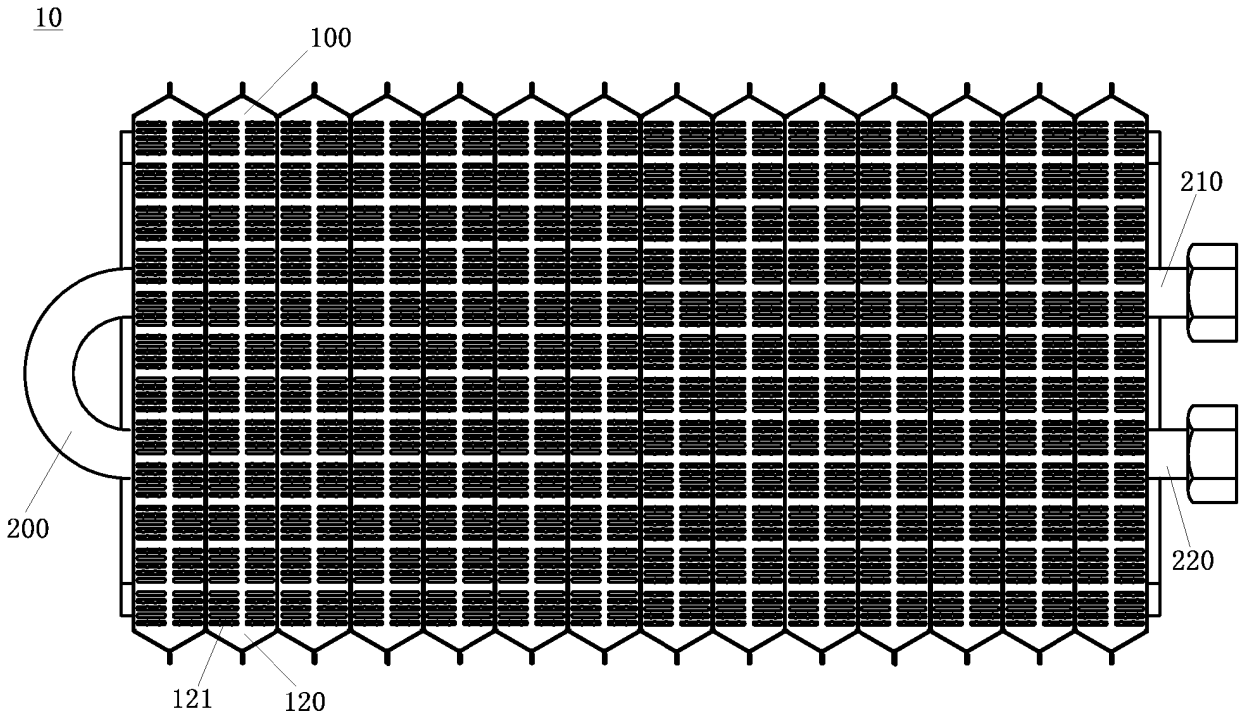

Fig. 6

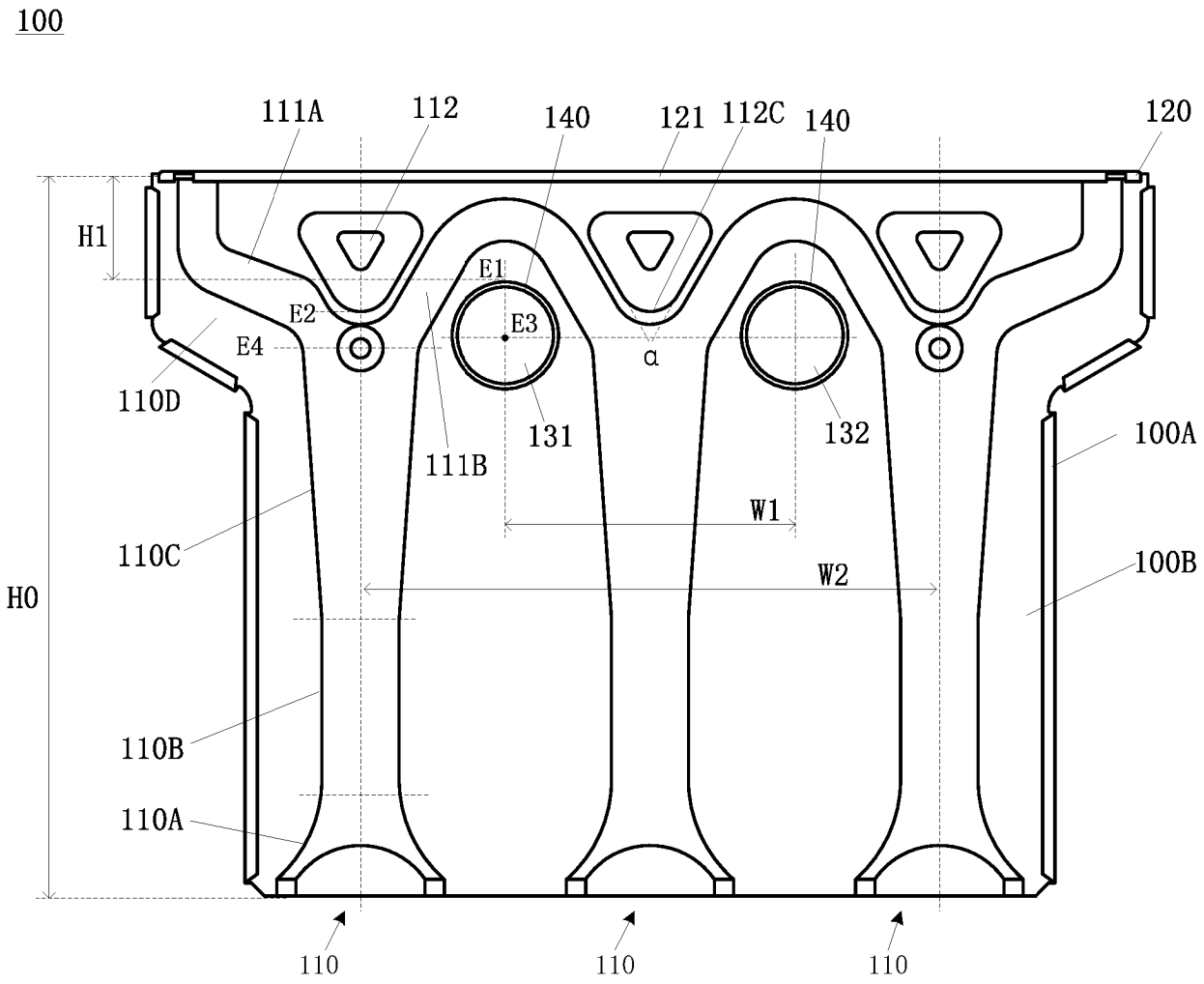
100
111A
112
140
121
112C
140
120
H1
E1
E2
E3
E4
a
110D
131
132
111B
100A
W1
110C
W2
100B
H0
110B
110A
110
110
110

Fig. 7

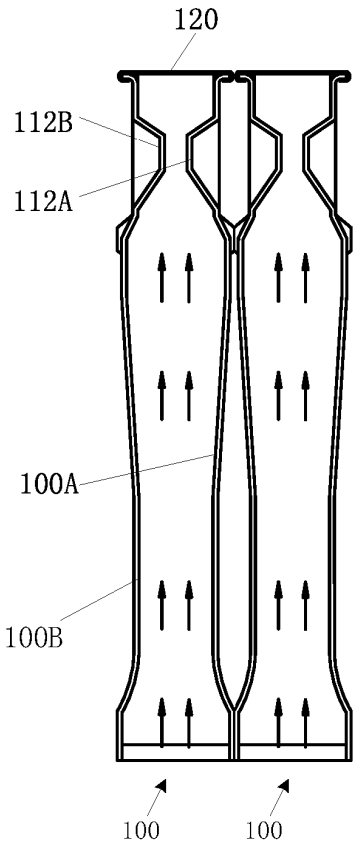
120
112B
112A
100A
100B
100
100

Fig. 8

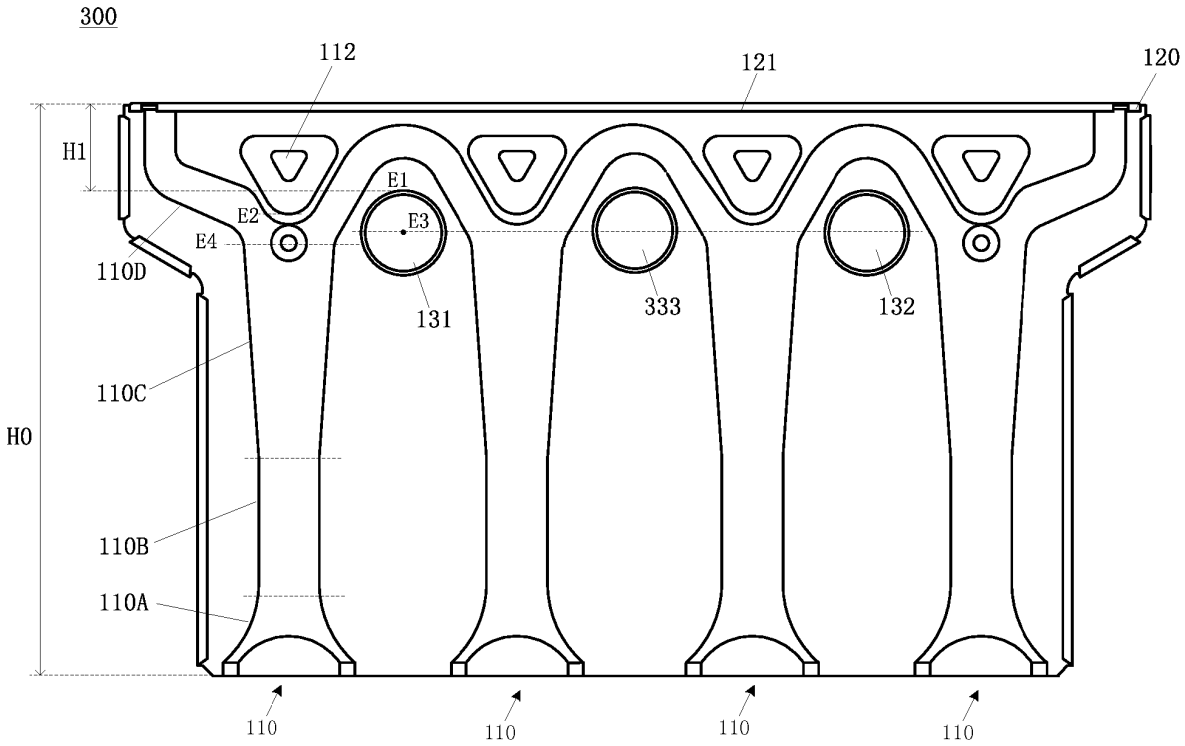
300
112
121
120
H1
E1
E2
E3
E4
110D
131
333
132
110C
H0
110B
110A
110
110
110
110

Fig. 9

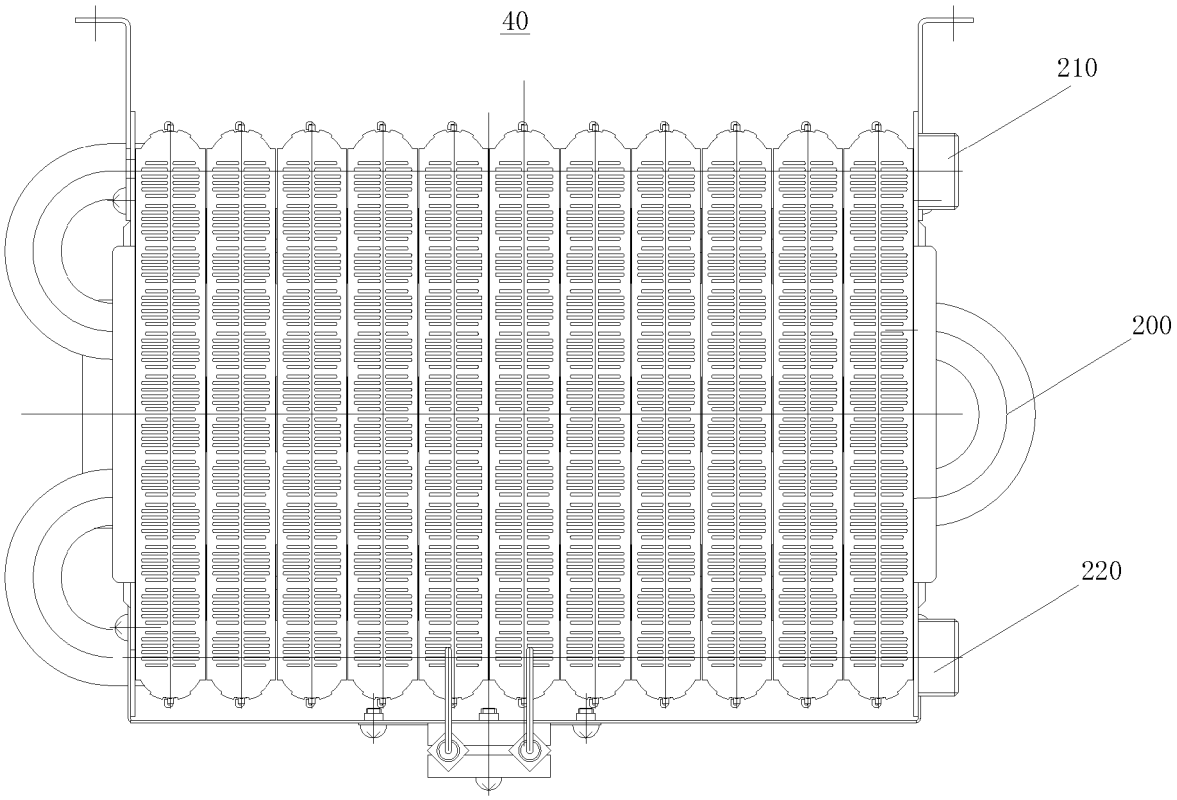

Fig. 10

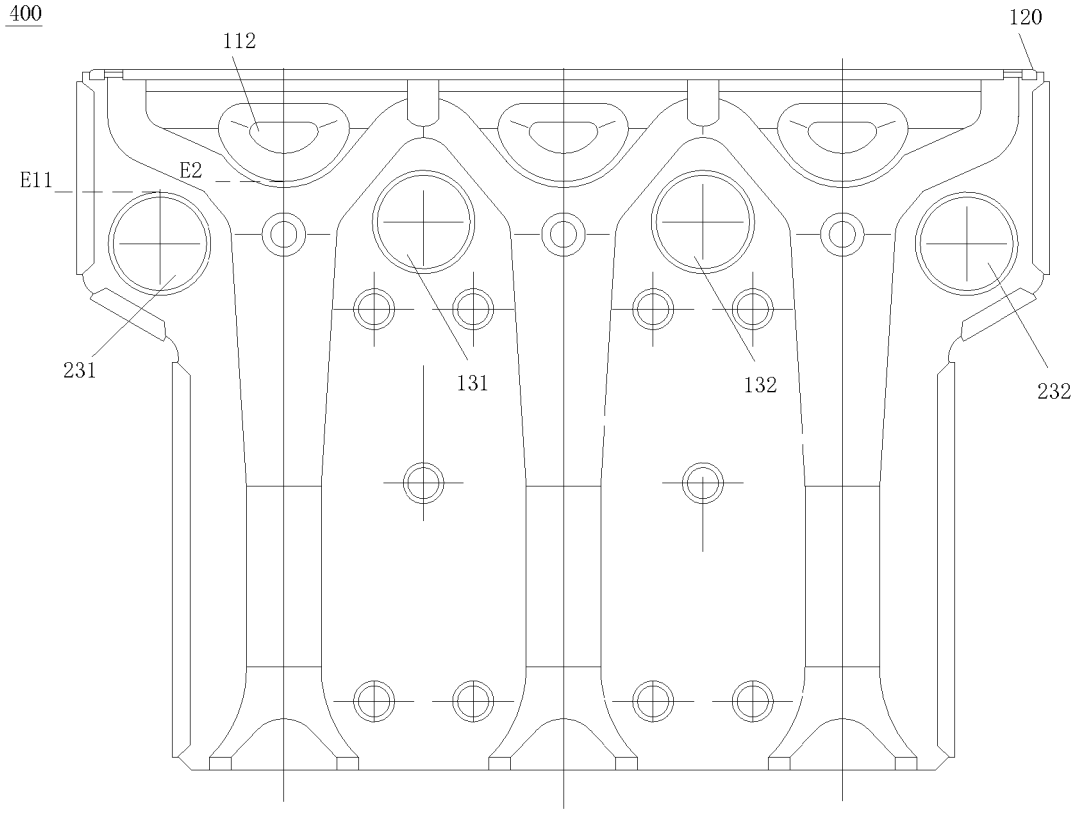

Fig. 11

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0769656 A1 **[0003]**
- DE 19542649 A1 **[0004]**
- DE 9203211 U1 **[0005]**