

(19)



(11)

EP 4 151 923 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

19.03.2025 Bulletin 2025/12

(21) Application number: **22460043.7**

(22) Date of filing: **15.09.2022**

(51) International Patent Classification (IPC):

F24H 1/26 ^(2022.01) **F24H 1/28** ^(2022.01)
F24H 1/44 ^(2022.01) **F24H 8/00** ^(2022.01)
F24H 9/00 ^(2022.01) **F24H 9/02** ^(2006.01)
F24H 9/1836 ^(2022.01)

(52) Cooperative Patent Classification (CPC):

F24H 1/26; F24H 1/287; F24H 1/44; F24H 8/006;
F24H 9/0015; F24H 9/02; F24H 9/1836

(54) **BOILER**

KESSEL

CHAUDIÈRE

(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: **17.09.2021 PL 43897421**

(43) Date of publication of application:

22.03.2023 Bulletin 2023/12

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Description

[0001] The invention concerns a boiler designed for central heating and domestic hot water installations.

[0002] Known from patent document EP 0 926 439 A2 is a gas-fired boiler featuring a gas combustion chamber and a system of pipes to discharge the combustion gases. The combustion chamber and the pipes to discharge the combustion gases are placed in a tank filled with water. The combustion chamber is closed on top with a lid featuring an opening for the burner. The lid incorporates a thermo-insulating material.

Known from document PL 216 290 B1 is a heat exchanger having a fluid chamber encased in an outer jacket with fluid inlet and outlet, inside which there is a combustion chamber and a set of vertical pipes for the flow of the fumes. The combustion chamber is closed on top with a lid featuring an opening for the burner.

[0003] Known from US 2011/146594 A1 is a fire tube heater apparatus includes a shell, with a tube bundle received in the shell and a burner section communicated with the tube bundle. The tubes in the tube bundle have circular inlet and outlet end portions with a flattened, serpentine intermediate portion. The intermediate portion has a width greater than the inlet outside diameter and a tube thickness transverse to the width less than the inlet outside diameter.

[0004] US 9 097 436 B1 discloses a dual chamber burner assembly comprising a header, a first burner chamber adjacent the header, and a second burner chamber on an opposite side of the first burner chamber from the header. The second burner chamber is provided with a flame sensor portion extending back through the first burner chamber toward the header so that first and second flame sensors may be utilized to detect flame in the first and second chambers, respectively.

[0005] WO 2013/048269 A2 discloses a heat exchanger for the condensing boiler fitted with liquid, gas, and fume inlet and outlet stub pipes, having an outer jacket which encases the combustion chamber mounted in the top section thereof, under which a set of vertical pipe elements is fitted, both ends of which are fixed to the sieve walls, where the top sieve wall serves as the bottom of the combustion chamber and where partitions of any desired shape or number may be fitted crosswise in relation to the pipe elements, wherein the combustion chamber is given the shape of a truncated cone with the diameter decreasing towards the top, and the space between the side wall of the combustion chamber and the outer jacket, and the space under the combustion chamber where the pipe element set is mounted are mutually connected to form the fluid chamber.

[0006] US 2021/207849 A1 discloses a lid for a heat generating device in which the heat generating device has a body with a combustion chamber disposed therein. The lid includes an air moving device, an air intake housing, and a hinge. The air moving device is configured to generate a flow of air. The air intake housing is dis-

posed between the lid and the air moving device. The air intake housing extends out from the lid to cantilever the air moving device out from the lid. The hinge is disposed between the lid and the body and proximal to the air intake housing. The hinge is configured to provide a pivot for the lid. A weight of the air moving device counter balances at least a portion of a weight of the lid to ease pivoting of the lid into an open position.

[0007] In the known solutions the lid of the combustion chamber is a separate element which is thermally insulated and needs to be sufficiently sealed. In addition to the problems with achieving the required tightness and insulation of the lid, the known solutions are costly.

[0008] This invention solves the technical problem related to the required sealing and insulation of the combustion chamber lid, and the related high costs. Moreover, it solves the problem of losses of the heat accumulating in the layer insulating the combustion chamber.

[0009] The problems were solved by developing a new structure of the heat exchanger lid to replace the standard insulation and sealing of the lid, and by developing new circulation of the boiler water.

[0010] In accordance with this invention, a boiler incorporating a combustion chamber and a jacket with a package of vertical fume pipes mounted inside it, where on the one side the pipes are connected to the combustion chamber placed inside the said jacket, and where the combustion chamber is closed with a lid featuring an opening for the burner, and on the other side the pipes are connected to a condensate accumulation bowl, the boiler further featuring an inlet and outlet stub pipes for the boiler water and an outlet stub pipe for the fumes, and where the inside of the said jacket forms the main chamber for the boiler water wherein the lid incorporates two plates positioned one below the other, namely the outer plate and the inner plate which is connected to the combustion chamber, where the said plates are mounted at a distance to each other and are connected to each other via a side wall is characterized in that between the said plates on the inner side of the side wall of the lid, an additional chamber for the boiler water is formed, linked to the main chamber for the boiler water, wherein the inner plate of the lid extends outside beyond the side wall of the lid.

In one variant of the invention the outer plate of the lid is connected to the jacket, with a slit formed between the inner plate and the jacket for the flow of the boiler water, where there are openings in the side wall of the lid which link the main boiler water chamber to the additional boiler water chamber, and preferably there is an outlet boiler water stub pipe mounted on the jacket.

In another variant of the invention, the inner plate of the lid is connected to the jacket and features at least one opening which links the main boiler water chamber to the additional boiler water chamber, and preferably there is an outlet boiler water stub pipe in the outer plate of the lid.

Preferably, the lid is integrated with the jacket via a

welded connection.

[0011] The solution according to the invention ensures better use of the heat thanks to the forced circulation of the boiler water in the hot lid. Moreover, the integral connection of the lid and jacket by way of welded connections ensures absolute tightness.

[0012] The invention is shown in embodiments on the drawings, where:

Fig. 1 presents the boiler partially in axial section, in a 3D view, in the first embodiment;

Fig. 2 shows the lid partially in cross-section, in a 3D view, in the first embodiment;

Fig. 3 depicts the boiler partially in axial section, in a 3D view, in the second embodiment;

Fig. 4 presents the lid partially in cross-section, in a 3D view, in the second embodiment.

[0013] An exemplary boiler incorporates a jacket 1 with a package of vertical fume pipes 2 mounted inside it, where on the one side the pipes are connected to the combustion chamber 3, and on the other side to a condensate accumulation bowl 4. The fume pipes 2 are mounted in the sieve bottoms: upper 5 and lower 6. The combustion chamber 3 is placed inside the jacket 1, in its top part. The upper sieve bottom 5 forms the bottom of the combustion chamber 3. The inside of the jacket 1 forms the main chamber 7 for the boiler water in which the fume pipes 2 and the combustion chamber 3 are immersed. The combustion chamber 3 and the jacket 1 are closed with a lid 8. The lid 8 features two plates: the inner plate 8a which is connected to the combustion chamber 3, and the outer plate 8b which is situated above the inner plate 8a. The said plates 8a, 8b, are placed at a distance to each other and connected to each other via the side wall 8c, so that the inner plate 8a extends outside beyond the side wall 8c. Formed in between the said plates 8a, 8b, is an additional chamber 9 for the boiler water linked to the main chamber 7 for the boiler water.

[0014] In the first embodiment shown on Fig. 1 and Fig. 2, the outer plate 8b of the lid 8 is connected to the jacket 1, whereas between the outer plate 8a and the jacket 1 is a slit 18 for the flow of the boiler water, and the side wall 8c of the lid 8 features openings 19 which link the main chamber 7 for the boiler water to the additional chamber 9 for the boiler water. The outlet stub pipe 12 for the boiler water is mounted on the side wall of the jacket 1.

[0015] In the second embodiment shown on Fig. 3 and Fig. 4, the inner plate 8a of the lid 8 is connected to the jacket 1 and features one or more openings 10 which link the main chamber 7 for the boiler water to the additional chamber 9 for the boiler water. Mounted in the outer plate 8b of the lid 8 is an outlet stub pipe 12 for the boiler water.

[0016] In both embodiments, the inlet stub pipe 11 for the boiler water is placed in the bottom part of the jacket 1. Moreover, the lid 8 is fitted with an opening 13 for the burner, socket 15 for an ionisation probe to measure the current flowing through the flame and detect whether the

flame continues to burn in the burner, socket 16 for an ignition electrode which generates a sparkle to the ground and is responsible for igniting the gas on the boiler burner, and socket 17 for the viewing device which makes it possible to check visually through observation whether the flame on the burner continues to burn. Moreover, the jacket 1 is fitted with an outlet stub pipe 14 for the fumes.

The lid 8 is integrated with the jacket and combustion chamber via a welded connection.

[0017] The boiler water circulation in the solution according to the first embodiment of the invention is as follows. Boiler water supplied to the main chamber 7 via the inlet stub pipe 11 flows towards the lid 8 in the direction opposite to the direction of flow of the fumes in the fume pipes 2, and while flowing, the water washes around the hot fume pipes 2, whereupon it washes around the combustion chamber 3 and via the slit 18 it flows onto the extending part of the inner plate 8a, following which, through the openings 19 in the side wall 8c of the lid 8 it flows into the additional chamber 9 from where it is drawn through the outlet stub pipe 12 located in the top part of the jacket.

[0018] The boiler water circulation in the second embodiment differs from the circulation described in the first embodiment in that the boiler water flows into the additional chamber 9 through the opening(s) 10 in the inner plate 8a of the lid 8, from where it is drawn through the outlet pipe 12 located in the outer plate 8a of the lid 8.

List of numerical references

[0019]

- 1- jacket
- 2 - fume pipes
- 3 - combustion chamber
- 4 - condensate accumulation bowl
- 5 - upper sieve bottom
- 6 - lower sieve bottom
- 7 - main boiler water chamber
- 8 - lid
- 8a - inner plate of the lid
- 8b - outer plate of the lid
- 8c - side wall of the lid
- 9 - additional boiler water chamber
- 10 - opening in the inner plate of the lid
- 11 - inlet stub pipe for boiler water
- 12 - outlet stub pipe for boiler water
- 13 - opening in the lid for the burner
- 14 - outlet stub pipe for the fumes
- 15 - socket for the ionisation probe
- 16 - socket for the ignition electrode
- 17 - socket for the viewing device
- 18 - slit between the inner plate of the lid and the jacket
- 19 - openings in the side wall of the lid

Claims

1. A boiler incorporating a combustion chamber (3) and a jacket (1) with a package of vertical fume pipes (2) mounted inside it, where on the one side the pipes (2) are connected to the combustion chamber (3) placed inside the said jacket (1), and where the combustion chamber (3) is closed with a lid (8) featuring an opening (13) for the burner, and on the other side the pipes (2) are connected to a condensate accumulation bowl (4), the boiler further featuring an inlet and outlet stub pipes (11, 12) for the boiler water and an outlet stub pipe (14) for the fumes, and where the inside of the said jacket (1) forms the main chamber (7) for the boiler water, wherein the lid (8) incorporates two plates, namely outer plate (8b) and inner plate (8a) which is connected to the combustion chamber (3), where the said plates (8a, 8b) are mounted at a distance to each other and are connected to each other via a side wall (8c), **characterised in that** between the said plates (8a, 8b) on the inner side of the side wall (8c) of the lid (8), an additional chamber (9) for the boiler water is formed, linked to the main chamber (7) for the boiler water, wherein inner plate (8a) of the lid (8) extends outside beyond the side wall (8c) of the lid (8).
2. The boiler according to Claims 1, **characterised in that** the outer plate (8b) of the lid (8) is connected to the jacket (1), with a slit (18) formed between the inner plate (8a) and the jacket (1), and where there are openings (19) in the side wall (8c) of the lid (8) which link the main chamber (7) for the boiler water with the additional chamber (9) for the boiler water.
3. The boiler according to Claim 2, **characterised in that** there is an outlet stub pipe (12) for the boiler water mounter on the jacket (1).
4. The boiler according to Claims 1, **characterised in that** inner plate (8a) of the lid (8) is connected to the jacket (1) and features at least one opening (10) which links the main chamber (7) for the boiler water to the additional chamber (9) for the boiler water.
5. The boiler according to Claim 4, **characterised in that** there is an outlet boiler water sub pipe (12) in the outer plate (8b) of the lid (8).
6. The boiler according to Claims 2 or 4, **characterised in that** the lid (8) is integrated with the jacket (1) via a welded connection.

Patentansprüche

1. Kessel mit einer Verbrennungskammer (3) und einem Mantel (1), in dem ein Paket von vertikalen

Rauchrohren (2) angeordnet ist, wobei die Rohre (2) einerseits mit der Verbrennungskammer (3) verbunden sind, die sich innerhalb des Mantel (1) befindet, und wobei die Verbrennungskammer (3) durch einen Deckel (8) verschlossen ist, der mit einer Öffnung (13) für einen Brenner versehen ist, und andererseits Rohre (2) an einer Wanne (4) für Kondensat angeschlossen sind, wobei der Kessel außerdem mit einem Einlass- und einer Auslassstutzen (11, 12) fürs Kesselwasser und einem Auslassstutzen (14) für das Rauchgas versehen ist, und wobei der Hohlraum des Mantels (1) die Hauptkammer (7) für das Kesselwasser bildet, wobei der Deckel (8) aus zwei Platten besteht, nämlich aus einer äußeren Platte (8b) und einer inneren Platte (8a), die mit der Verbrennungskammer (3) verbunden ist, wobei die vorgenannten Platten (8a, 8b) in einem Abstand voneinander aufgebaut und durch eine Seitenwand (8c) miteinander verbunden sind, **dadurch gekennzeichnet, dass** zwischen den erwähnten Platten (8a, 8b) auf der Innenseite der Seitenwand (8c) des Deckels (8) eine zusätzliche Kammer (9) für das Kesselwasser herausgebildet ist, die mit der Hauptkammer (7) für das Kesselwasser verbunden ist, wobei die innere Platte (8a) des Deckels (8) gegenüber der Seitenwand (8c) des Deckels (8) nach außen hinausragt.

2. Kessel nach Anspruch 1, **dadurch gekennzeichnet, dass** die äußere Platte (8b) des Deckels (8) mit dem Mantel (1) verbunden ist, während zwischen der inneren Platte (8a) und dem Mantel (1) ein Spalt (18) herausgebildet ist und in der Seitenwand (8c) des Deckels (8) Aussparungen (19) vorhanden sind, die die Hauptkammer (7) für das Kesselwasser mit der zusätzliche Kammer (9) für das Kesselwasser verbinden.
3. Kessel nach Anspruch 2, **dadurch gekennzeichnet, dass** am Mantel (1) ein Auslassstutzen (12) für Kesselwasser vorhanden ist.
4. Kessel nach Anspruch 1, **dadurch gekennzeichnet, dass** die innere Platte (8a) des Deckels (8) mit dem Mantel (1) verbunden ist und mit mindestens einer Öffnung (10) versehen ist, die die Hauptkammer (7) für Kesselwasser mit der zusätzliche Kammer (9) für Kesselwasser verbindet.
5. Kessel nach Anspruch 4, **dadurch gekennzeichnet, dass** in der äußeren Platte (8b) des Deckels (8) ein Auslassstutzen (12) für Kesselwasser vorhanden ist.
6. Kessel nach Anspruch 2 oder 4, **dadurch gekennzeichnet, dass** der Deckel (8) durchs Schweißen mit dem Mantel (1) verbunden ist.

Revendications

l'enveloppe (1) par soudure.

1. Chaudière comprenant une chambre de combustion (3) et une enveloppe (1) à l'intérieur de laquelle est monté un ensemble de tuyaux de fumée verticaux (2), dans laquelle les tuyaux (2) sont reliés d'un côté à une chambre de combustion (3) située à l'intérieur de ladite enveloppe (1), et dans laquelle la chambre de combustion (3) est fermée par un couvercle (8) pourvu d'une ouverture (13) pour un brûleur, et, d'autre part, les tuyaux (2) sont reliés à un bac (4) pour l'évacuation des condensats, en outre, la chaudière est pourvue d'un manchon d'entrée et de sortie (11, 12) pour l'eau de chaudière et d'un manchon de sortie (14) pour les gaz de combustion, et où l'intérieur de ladite enveloppe (1) constitue la chambre principale (7) pour l'eau de chaudière, dans laquelle ledit couvercle (8) comprend deux plaques, à savoir une plaque extérieure (8b) et une plaque intérieure (8a) qui est reliée à la chambre de combustion (3), où lesdites plaques (8a, 8b) sont montées à une certaine distance l'une de l'autre et sont reliées l'une à l'autre par une paroi latérale (8c), **caractérisée en ce que** entre lesdites plaques (8a, 8b) sur la face intérieure de la paroi latérale (8c) du couvercle (8) est formée une chambre supplémentaire (9) pour l'eau de chaudière, reliée à la chambre principale (7) pour l'eau de chaudière, la plaque intérieure (8a) du couvercle (8) faisant saillie vers l'extérieur par rapport à la paroi latérale (8c) du couvercle (8).

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2. . Chaudière selon la revendication 1, **caractérisée en ce que** la plaque extérieure (8b) du couvercle (8) est reliée à l'enveloppe (1), tandis qu'il y a un espace (18) entre la plaque intérieure (8a) et l'enveloppe (1), et il y a des orifices (19) dans la paroi latérale (8c) du couvercle (8) qui relie la chambre principale (7) pour l'eau de chaudière à la chambre supplémentaire (9) pour l'eau de chaudière.

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3. . Chaudière selon la revendication 2, **caractérisée en ce que** sur l'enveloppe (1) se trouve un manchon de sortie (12) pour l'eau de la chaudière.
4. . Chaudière selon la revendication 1, **caractérisée en ce que** la plaque intérieure (8a) du couvercle (8) est reliée à l'enveloppe (1) et est pourvue d'au moins une ouverture (10) qui relie la chambre principale (7) pour l'eau de chaudière à une chambre supplémentaire (9) pour l'eau de chaudière.

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5. . Chaudière selon la revendication 4, **caractérisée en ce que** dans la plaque extérieure (8b) du couvercle (8) se trouve un manchon de sortie (12) pour l'eau de chaudière.

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6. . Chaudière selon la revendication 2 ou 4, **caractérisée en ce que** le couvercle (8) est assemblé à

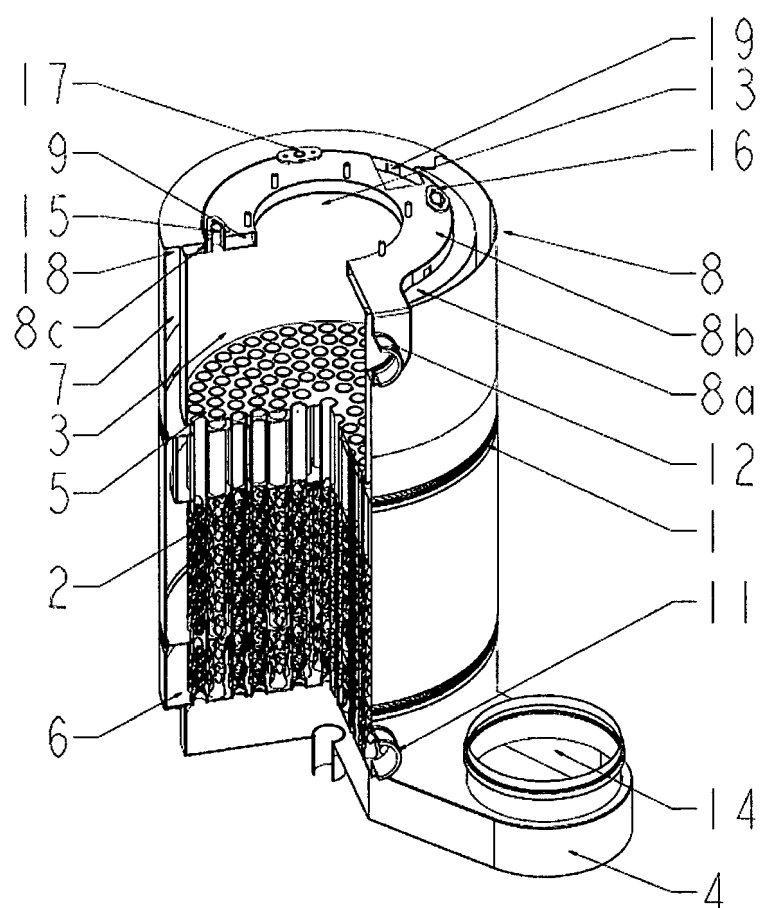


Fig. 1

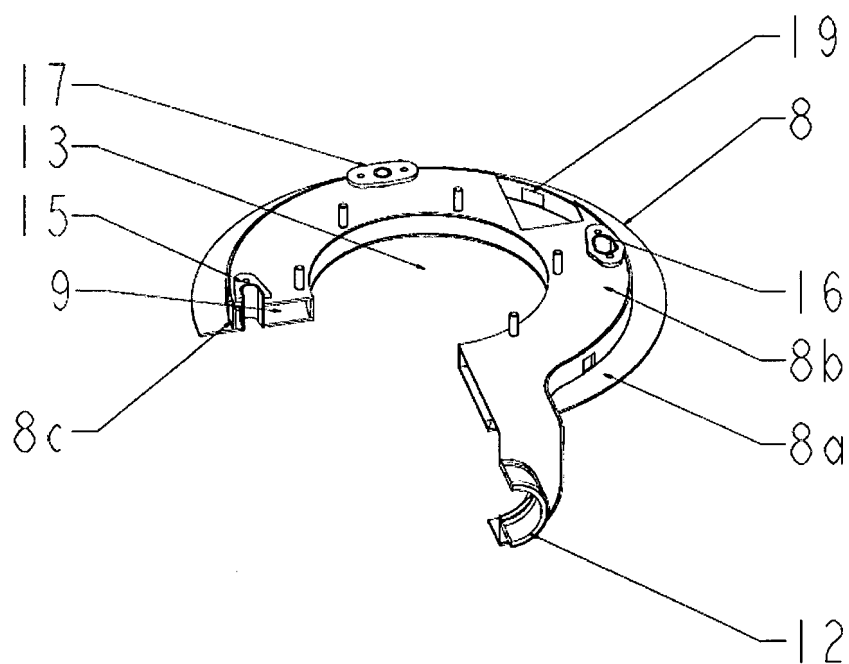


Fig. 2

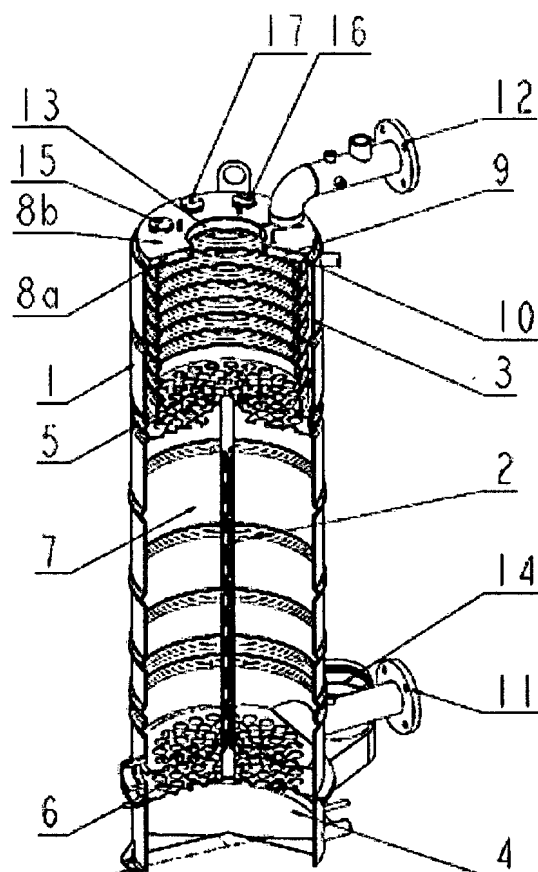


Fig. 3

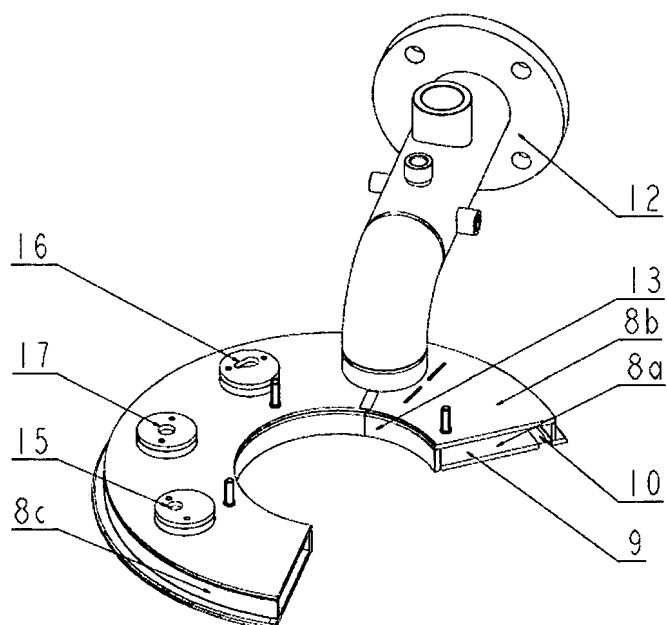


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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