



(11)

EP 4 530 553 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
02.04.2025 Bulletin 2025/14

(51) International Patent Classification (IPC):
F24H 9/00 ^(2022.01) **F24H 9/02** ^(2006.01)

(21) Application number: **22944652.1**

(52) Cooperative Patent Classification (CPC):
F24H 9/00; F24H 9/02

(22) Date of filing: **05.12.2022**

(86) International application number:
PCT/CN2022/136565

(87) International publication number:
WO 2023/231351 (07.12.2023 Gazette 2023/49)

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **02.06.2022 CN 202210624531**
02.06.2022 CN 202221387758 U

(71) Applicants:
• **Qingdao Economic and Technological Development District Haier Water Heater Co., Ltd. Qingdao, Shandong 266510 (CN)**
• **Haier Smart Home Co., Ltd. Qingdao, Shandong 266101 (CN)**

(72) Inventors:
• **MA, Teng Qingdao, Shandong 266510 (CN)**
• **ZENG, Xianmang Qingdao, Shandong 266510 (CN)**
• **ZHAO, Xiaoyong Qingdao, Shandong 266510 (CN)**
• **DU, Fanglin Qingdao, Shandong 266510 (CN)**
• **LI, Yong Qingdao, Shandong 266510 (CN)**
• **ZHAO, Long Qingdao, Shandong 266510 (CN)**
• **YU, Yongfei Qingdao, Shandong 266510 (CN)**

(74) Representative: **HGF HGF Limited 1 City Walk Leeds LS11 9DX (GB)**

(54) **NON-METAL LINER AND ELECTRIC WATER HEATER HAVING SAME**

(57) The present application relates to the technical field of electric water heaters. Provided are a non-metal liner and an electric water heater having the same. The non-metal liner includes a liner body, a reinforcement layer, and a liner flange; one end of the liner body forms a liner opening, and a limiting annular portion surrounding the liner opening is disposed on an outer side of the liner opening; the reinforcement layer covers an outer periphery of the liner body; an inner end of the liner flange is limited and fixed by the limiting annular portion, and an outer end of the liner flange is fixed between the liner body and the reinforcement layer.

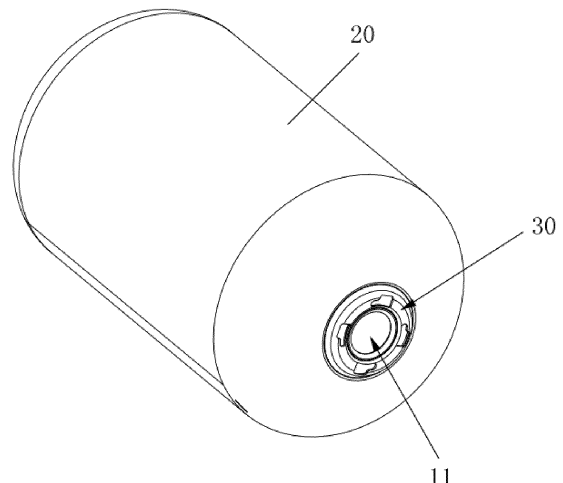


FIG. 1

EP 4 530 553 A1

Description

[0001] This application claims priority to Chinese Patent Application No. 202210624531.2 filed with the China National Intellectual Property Administration (CNIPA) on Jun. 02, 2022 and claims priority to Chinese Patent Application No. 202221387758.1 filed with the CNIPA on Jun. 02, 2022, the disclosure of which is incorporated herein by reference in their entireties.

TECHNICAL FIELD

[0002] The present application relates to the technical field of electric water heaters, for example, a non-metal liner and an electric water heater having the same.

BACKGROUND

[0003] The liner of an electric water heater, serving as a water storage component, is mostly made of metal. To heat the water in the metal liner, a heating pipe also needs to be installed in the liner. During the installation of the heating pipe, a liner flange is usually welded at the liner opening of the metal liner, and then the heating pipe is installed on the heating pipe flange. The liner flange and the heating pipe flange are fixedly connected to achieve the installation of the heating pipe in the metal liner.

[0004] However, most liners are made of stainless steel or enamel. Although these types of liners can meet pressure requirements, they have several drawbacks, including low insulation coefficients, poor corrosion resistance, and high processing costs. Therefore, the market has begun using non-metal liners (such as plastic liners) to replace liners of stainless steel or enamel. However, this substitution introduces the following problems: To achieve a fixed connection with the heating pipe flange, it is still necessary to provide a liner flange at the liner opening of a non-metal liner.

[0005] In related art, the liner flange is typically embedded at the liner opening of the non-metal liner through a welding process and then fixedly connected to a heating pipe flange. With this structure, when the non-metal liner is subjected to high pressure, cracks may develop at the welded position between the liner opening of the non-metal liner and the liner flange due to excessive pressure, leading to water leakage.

[0006] To avoid welding between the liner flange and the non-metal liner, the related art often adopts the following solution: A fixing member with internal threads is molded in the liner opening of the non-metal liner, and the liner flange, which has external threads, is threadedly connected to the fixing member. The heating pipe flange, which holds the heating pipe, is then connected to the liner flange. The disadvantages of this solution lie in the presence of multiple interfaces, such as between the fixing member and the liner flange and between the liner flange and the heating pipe flange. Moreover, the high number of interfaces increases the likelihood of installa-

tion defects and raises the probability of water leakage, thereby affecting the performance of the electric water heater and in severe cases, even posing safety risks.

SUMMARY

[0007] The present application provides a non-metal liner and an electric water heater having the same.

[0008] A non-metal liner includes a liner body, a reinforcement layer, and a liner flange.

[0009] One end of the liner body forms a liner opening, and a limiting annular portion surrounding the liner opening is disposed on an outer side of the liner opening.

[0010] The reinforcement layer covers an outer periphery of the liner body.

[0011] An inner end of the liner flange is limited and fixed by the limiting annular portion, and an outer end of the liner flange is fixed between the liner body and the reinforcement layer.

[0012] An electric water heater includes the non-metal liner as described above.

BRIEF DESCRIPTION OF DRAWINGS

[0013]

FIG. 1 is a view illustrating the structure of a non-metal liner according to an embodiment of the present application.

FIG. 2 is a view illustrating the structure of a non-metal liner after removing the reinforcement layer according to an embodiment of the present application.

FIG. 3 is a view illustrating the structure of a liner flange according to an embodiment of the present application.

FIG. 4 is a sectional view of a liner flange according to an embodiment of the present application.

FIG. 5 is a front view of a non-metal liner according to the present application.

FIG. 6 is a sectional view taken along an A-A direction of FIG. 5.

FIG. 7 is an enlarged view of point B in FIG. 6.

Reference list

[0014]

- 10 liner body
- 11 liner opening
- 12 limiting annular portion
- 13 thickened portion

20 reinforcement layer
 30 liner flange
 31 inner end annular portion
 32 protruded connecting portion
 33 outer end annular portion

DETAILED DESCRIPTION

[0015] The technical solutions of the present application are described hereinafter in conjunction with drawings and embodiments. Specific embodiments described herein are only intended to explain the present application. For ease of description, only the parts related to the present application are illustrated in the drawings.

[0016] In the description of the present application, unless otherwise specified and limited, the term "connected to each other", "connected" or "secured" is to be construed in a broad sense, for example, as securely connected, detachably connected, or integrated; mechanically connected or electrically connected; directly connected to each other or indirectly connected to each other via an intermediary; or internally connected between two elements or interaction relations between two elements. For those of ordinary skill in the art, meanings of the preceding terms can be understood according to situations in the present application.

[0017] In the present application, unless otherwise specified and limited, when a first feature is described as "on" or "below" a second feature, the first feature and the second feature may be in direct contact or be in contact via another feature between the two features instead of being in direct contact. Moreover, when the first feature is "on", "above", or "over" the second feature, the first feature is right on, above, or over the second feature, or the first feature is obliquely on, above, or over the second feature, or the first feature is simply at a higher level than the second feature. When the first feature is "under", "below", or "underneath" the second feature, the first feature is right under, below, or underneath the second feature, or the first feature is obliquely under, below, or underneath the second feature, or the first feature is simply at a lower level than the second feature.

[0018] In the description of the present application, it should be noted that orientations or position relations indicated by terms such as "above", "below", "left", and "right" are based on orientations or position relations shown in the drawings. These orientations or position relations are intended only to facilitate and simplify the operation and not to indicate or imply that a device or element referred to must have such specific orientations or must be configured or operated in such specific orientations. Thus, these orientations or position relations are not to be construed as limiting the present application. In addition, terms "first" and "second" are used only to distinguish between descriptions and have no special meaning.

[0019] The present application provides a non-metal liner. The non-metal liner is applied to the field of water

heaters, such as electric water heaters and is configured to store water. In the embodiments, the non-metal liner may be a plastic liner or a liner made of other non-metallic materials.

5

Embodiment one

[0020] As shown in FIGS. 1 to 7, the non-metal liner of the embodiments of the present application includes a liner body 10, a reinforcement layer 20, and a liner flange 30; one end of the liner body 10 forms a liner opening 11, and a limiting annular portion 12 surrounding the liner opening 11 is disposed on an outer side of the liner opening 11; the reinforcement layer 20 covers an outer periphery of the liner body 10; an inner end of the liner flange 30 is limited and fixed by the limiting annular portion 12, and an outer end of the liner flange 30 is fixed between the liner body 10 and the reinforcement layer 20. A limiting annular portion 12 surrounding the liner opening 11 is disposed on the outer side of the liner opening 11, the inner end of the liner flange 30 is limited and fixed by the limiting annular portion 12, and the outer end is fixed between the liner body 10 and the reinforcement layer 20. In this manner, the liner flange 30 and the liner body 10 can be tightly combined, and no welding point exists, which avoids the leakage at the welded position when the non-metal liner is under high pressure. In addition, the liner flange 30 is directly connected to the liner body 10, eliminating the fixing members for fixing the liner flange 30 and reducing the connection interfaces between the fixing members and the liner flange 30, thereby reducing the probability of leakage.

[0021] The limiting annular portion 12 may be formed integrally with the liner body 10 in the direction from the end of the liner opening 11 away from the center of the liner opening 11. Alternatively, the limiting annular portion 12 may be an independent component set on the outer side of the liner opening 11. The limiting annular portion 12 may be arranged as needed.

[0022] With reference to FIGS. 3 to 7, the liner flange 30 includes an inner end annular portion 31, an outer end annular portion 33, and a protruded connecting portion 32 connected between the inner end annular portion 31 and the outer end annular portion 33, the inner end annular portion 31 is limited and fixed by the limiting annular portion 12, the outer end annular portion 33 is fixed between the liner body 10 and the reinforcement layer 20, and the protruded connecting portion 32 is configured to be connected to a heating pipe flange. The liner flange 30 is configured to include three parts, namely, the inner end annular portion 31, the protruded connecting portion 32, and the outer end annular portion 33 so that the connection between the liner flange 30 and the liner body 10 and between the liner flange 30 and the heating pipe flange is simpler, and the structure of the liner flange 30 is more reasonable.

[0023] The inner end annular portion 31 and the limiting annular portion 12 may both be flat, and the inner end

annular portion 31 can be limited and fixed by pressing the inner end annular portion 31 against the lower end of the limiting annular portion 12, see FIG. 7. Alternatively, the cross section of the limiting annular portion 12 may be U-shaped, and correspondingly, the cross section of the inner end annular portion 31 may be L-shaped. The horizontal portion of the inner end annular portion 31 is connected to the protruded connecting portion 32, and the vertical portion of the inner end annular portion 31 is inserted into a limiting groove of the limiting annular portion 12. Thus, the limiting annular portion 12 limits the inner end annular portion 31.

[0024] In an embodiment, the outer end annular portion 33 of the liner flange 30 is arc-shaped and can fit the outer surface of the liner body 10. The outer end annular portion 33 of the liner flange 30 is configured to be arc-shaped and fit the outer surface of the liner body 10 so that the stability of the outer end annular portion 33 fixed between the liner body 10 and the reinforcement layer 20 can be improved, and the flatness of the reinforcement layer 20 can be enhanced. Thus, the strength of the reinforcement layer 20 is ensured.

[0025] In an embodiment, an arc transition is formed between the protruded connecting portion 32 and the inner end annular portion 31, and an arc transition is formed between the protruded connecting portion 32 and the outer end annular portion 33. The arc transition is formed between the protruded connecting portion 32 and the inner end annular portion 31, and the arc transition is formed between the protruded connecting portion 32 and the outer end annular portion 33 so that the stress concentration at the connection between the protruded connecting portion 32 and the inner annular portion 31 and between the protruded connecting portion 32 and the outer end annular portion 33 can be reduced, and the strength of the liner flange 30 can be improved.

[0026] An annular accommodation groove is opened on an outer surface of the liner body 10, and the outer end annular portion 33 of the liner flange 30 is disposed in the accommodation groove. An annular accommodation groove is opened on the outer surface of the liner body 10 and the outer end annular portion 33 of the liner flange 30 is disposed in the accommodation groove so that the outer surface of the outer end annular portion 33 of the liner flange 30 can be flush with the outer surface of the liner body 10, thereby ensuring the flatness of the reinforcement layer 20, avoiding increasing the thickness of the reinforcement layer 20, and ensuring the costs.

[0027] In an embodiment, an annular thickened portion 13 is disposed on an inner surface of the liner body 10 opposite to the accommodation groove. An annular thickened portion 13 is disposed on the inner surface of the liner body 10 opposite to the accommodation groove so that the strength weakened by opening the accommodation groove on the outer surface of the liner body 10 can be reinforced, thereby ensuring the overall strength of the liner body 10. In an embodiment, the thickness of the thickened portion 13 is greater than or equal to the depth

of the accommodation groove. The thickness of the thickened portion 13 is configured to be greater than or equal to the depth of the accommodation groove so that the reinforced strength can be greater than the weakened strength, thereby ensuring that the overall strength of the liner body 10 is not reduced.

[0028] In this embodiment, the reinforcement layer 20 is formed by fiber winding. The reinforcement layer 20 is made of a composite material of fiber-reinforced resin. The filament fiber impregnated with resin is wound on the liner body 10. The fiber may be glass fiber, carbon fiber, and Kevlar fiber. After winding, high-temperature curing is performed. The cured fiber winding layer is the pressure-bearing structural layer of the liner body 10.

Embodiment two

[0029] As shown in FIGS. 1 to 7, the non-metal liner of the embodiments of the present application includes a liner body 10, a reinforcement layer 20, and a liner flange 30; one end of the liner body 10 forms a liner opening 11, and a limiting annular portion 12 surrounding the liner opening 11 is disposed on an outer side of the liner opening 11; the reinforcement layer 20 covers an outer periphery of the liner body 10, and the reinforcement layer 20 is formed by fiber winding; an inner end of the liner flange 30 is limited and fixed by the limiting annular portion 12, and an outer end of the liner flange 30 is fixed between the liner body 10 and the reinforcement layer 20. The liner flange 30 includes an inner end annular portion 31, an outer end annular portion 33, and a protruded connecting portion 32 connected between the inner end annular portion 31 and the outer end annular portion 33, the inner end annular portion 31 is limited and fixed by the limiting annular portion 12, the outer end annular portion 33 is fixed between the liner body 10 and the reinforcement layer 20, and the protruded connecting portion 32 is configured to be connected to a heating pipe flange. The outer end annular portion 33 of the liner flange 30 is arc-shaped and can fit the outer surface of the liner body 10. An arc transition is formed between the protruded connecting portion 32 and the inner end annular portion 31, and an arc transition is formed between the protruded connecting portion 32 and the outer end annular portion 33. An annular accommodation groove is opened on an outer surface of the liner body 10, and the outer end annular portion 33 of the liner flange 30 is disposed in the accommodation groove. An annular thickened portion 13 is disposed on an inner surface of the liner body 10 opposite to the accommodation groove. The thickness of the thickened portion 13 is greater than or equal to the depth of the accommodation groove.

Embodiment three

[0030] An embodiment of the present application provides an electric water heater. The electric water heater includes the non-metal liner as described in embodiment

one or embodiment two, a heating pipe flange, and a heating pipe mounted on the heating pipe flange. The heating pipe flange is fixedly mounted on the liner flange 30 of the non-metal liner, and the heating pipe is disposed in the non-metal liner so as to heat the water stored in the non-metal liner.

[0031] The non-metal liner includes a liner body 10, a reinforcement layer 20, and a liner flange 30; one end of the liner body 10 forms a liner opening 11, and a limiting annular portion 12 surrounding the liner opening 11 is disposed on an outer side of the liner opening 11; the reinforcement layer 20 covers an outer periphery of the liner body 10; an inner end of the liner flange 30 is limited and fixed by the limiting annular portion 12, and an outer end of the liner flange 30 is fixed between the liner body 10 and the reinforcement layer 20.

[0032] The liner flange 30 includes an inner end annular portion 31, an outer end annular portion 33, and a protruded connecting portion 32 connected between the inner end annular portion 31 and the outer end annular portion 33, the inner end annular portion 31 is limited and fixed by the limiting annular portion 12, the outer end annular portion 33 is fixed between the liner body 10 and the reinforcement layer 20, and the protruded connecting portion 32 is configured to be connected to a heating pipe flange.

[0033] In an embodiment, the outer end annular portion 33 of the liner flange 30 is arc-shaped and can fit the outer surface of the liner body 10.

[0034] In an embodiment, an arc transition is formed between the protruded connecting portion 32 and the inner end annular portion 31, and an arc transition is formed between the protruded connecting portion 32 and the outer end annular portion 33.

[0035] An annular accommodation groove is opened on an outer surface of the liner body 10, and the outer end annular portion 33 of the liner flange 30 is disposed in the accommodation groove.

[0036] In an embodiment, an annular thickened portion 13 is disposed on an inner surface of the liner body 10 opposite to the accommodation groove. In an embodiment, the thickness of the thickened portion 13 is greater than or equal to the depth of the accommodation groove.

[0037] The reinforcement layer 20 is formed by fiber winding.

[0038] Alternatively, the non-metal liner includes a liner body 10, a reinforcement layer 20, and a liner flange 30; one end of the liner body 10 forms a liner opening 11, and a limiting annular portion 12 surrounding the liner opening 11 is disposed on an outer side of the liner opening 11; the reinforcement layer 20 covers an outer periphery of the liner body 10, and the reinforcement layer 20 is formed by fiber winding; an inner end of the liner flange 30 is limited and fixed by the limiting annular portion 12, and an outer end of the liner flange 30 is fixed between the liner body 10 and the reinforcement layer 20. The liner flange 30 includes an inner end annular portion 31, an outer end annular portion 33, and a protruded connecting

portion 32 connected between the inner end annular portion 31 and the outer end annular portion 33, the inner end annular portion 31 is limited and fixed by the limiting annular portion 12, the outer end annular portion 33 is fixed between the liner body 10 and the reinforcement layer 20, and the protruded connecting portion 32 is configured to be connected to a heating pipe flange. The outer end annular portion 33 of the liner flange 30 is arc-shaped and can fit the outer surface of the liner body 10. An arc transition is formed between the protruded connecting portion 32 and the inner end annular portion 31, and an arc transition is formed between the protruded connecting portion 32 and the outer end annular portion 33. An annular accommodation groove is opened on an outer surface of the liner body 10, and the outer end annular portion 33 of the liner flange 30 is disposed in the accommodation groove. An annular thickened portion 13 is disposed on an inner surface of the liner body 10 opposite to the accommodation groove. The thickness of the thickened portion 13 is greater than or equal to the depth of the accommodation groove.

[0039] In an embodiment, one or two non-metal liners of this embodiment may be set. When two non-metal liners are set, the two non-metal liners are arranged side by side.

[0040] The electric water heater of the present application can effectively reduce the water leakage rate and ensure the performance by setting the preceding non-metal liner.

Claims

1. A non-metal liner, comprising:

a liner body (10), wherein one end of the liner body (10) forms a liner opening (11), and a limiting annular portion (12) surrounding the liner opening (11) is disposed on an outer side of the liner opening (11);
a reinforcement layer (20) covering an outer periphery of the liner body (10); and
a liner flange (30), wherein an inner end of the liner flange (30) is limited and fixed by the limiting annular portion (12), and an outer end of the liner flange (30) is fixed between the liner body (10) and the reinforcement layer (20).

2. The non-metal liner according to claim 1, wherein an annular accommodation groove is opened on an outer surface of the liner body (10), and the outer end of the liner flange (30) is disposed in the accommodation groove.

3. The non-metal liner according to claim 2, wherein an annular thickened portion (13) is disposed on an inner surface of the liner body (10) opposite to the accommodation groove.

4. The non-metal liner according to claim 3, wherein a thickness of the thickened portion (13) is greater than or equal to a depth of the accommodation groove.

5. The non-metal liner according to claim 1, wherein the liner flange (30) comprises an inner end annular portion (31), an outer end annular portion (33), and a protruded connecting portion (32) connected between the inner end annular portion (31) and the outer end annular portion (33), the inner end annular portion (31) is limited and fixed by the limiting annular portion (12), the outer end annular portion (33) is fixed between the liner body (10) and the reinforcement layer (20), and the protruded connecting portion (32) is configured to be connected to a heating pipe flange.

6. The non-metal liner according to claim 5, wherein the outer end annular portion (33) is arc-shaped and fits an outer surface of the liner body (10).

7. The non-metal liner according to claim 5, wherein an arc transition is formed between the protruded connecting portion (32) and the inner end annular portion (31), and an arc transition is formed between the protruded connecting portion (32) and the outer end annular portion (33).

8. The non-metal liner according to claim 1, wherein the reinforcement layer (20) is formed by fiber winding.

9. An electric water heater, comprising the non-metal liner according to any one of claims 1 to 8.

10. The electric water heater according to claim 9, further comprising a heating pipe flange and a heating pipe mounted on the heating pipe flange, wherein the heating pipe flange is fixedly mounted on the liner flange (30) of the non-metal liner, and the heating pipe is disposed in the non-metal liner.

45

50

55

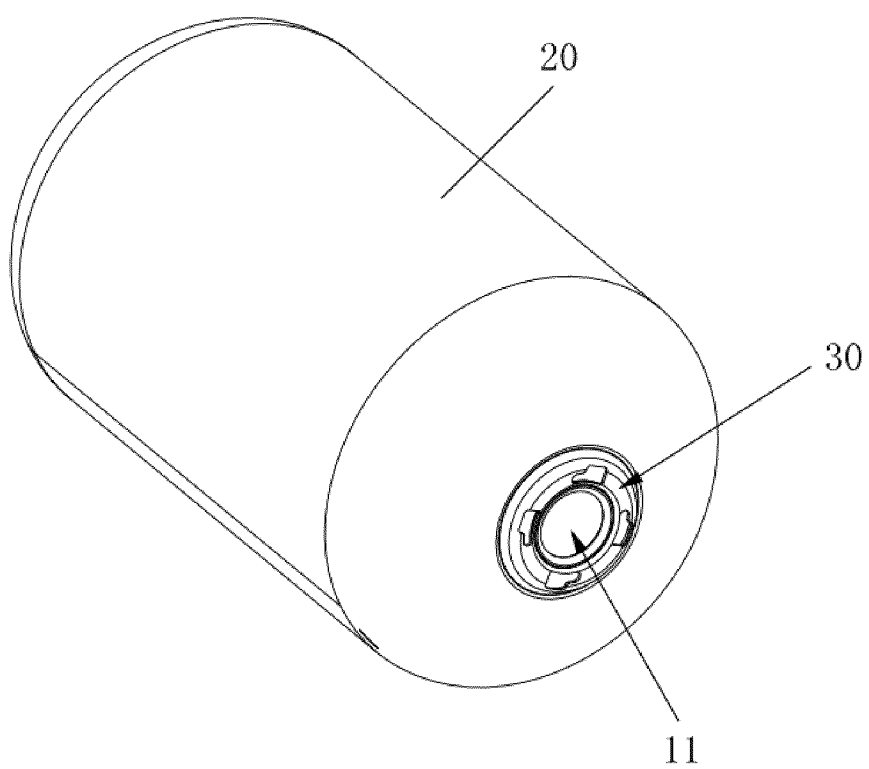


FIG. 1

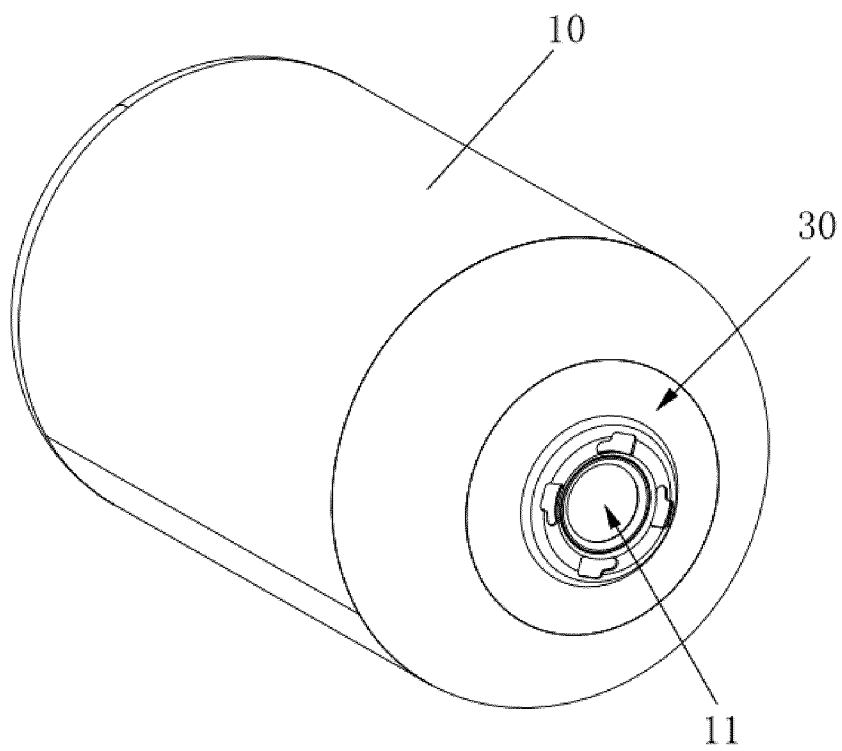


FIG. 2

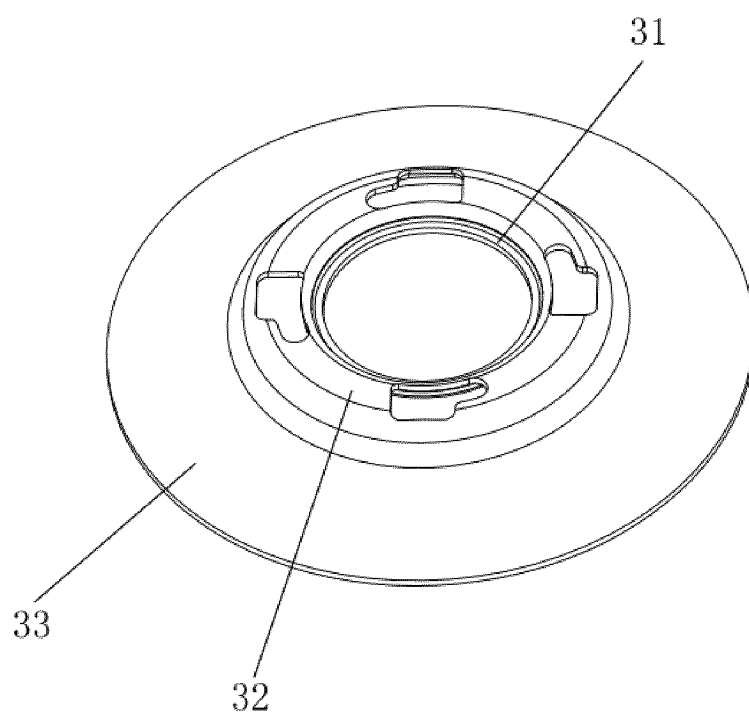


FIG. 3

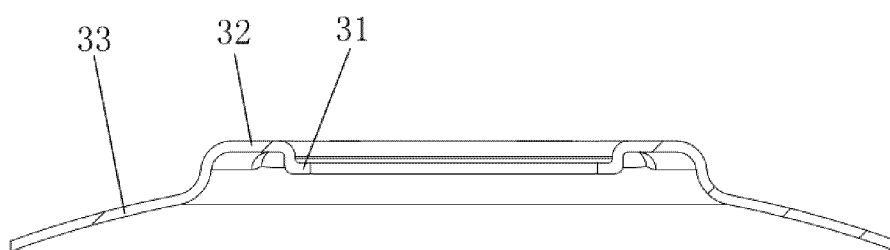


FIG. 4

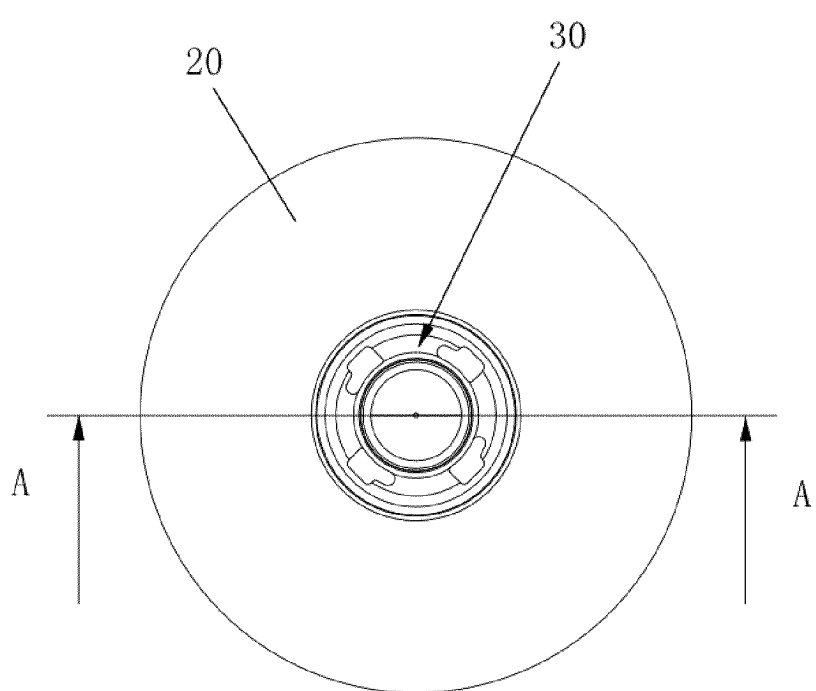


FIG. 5

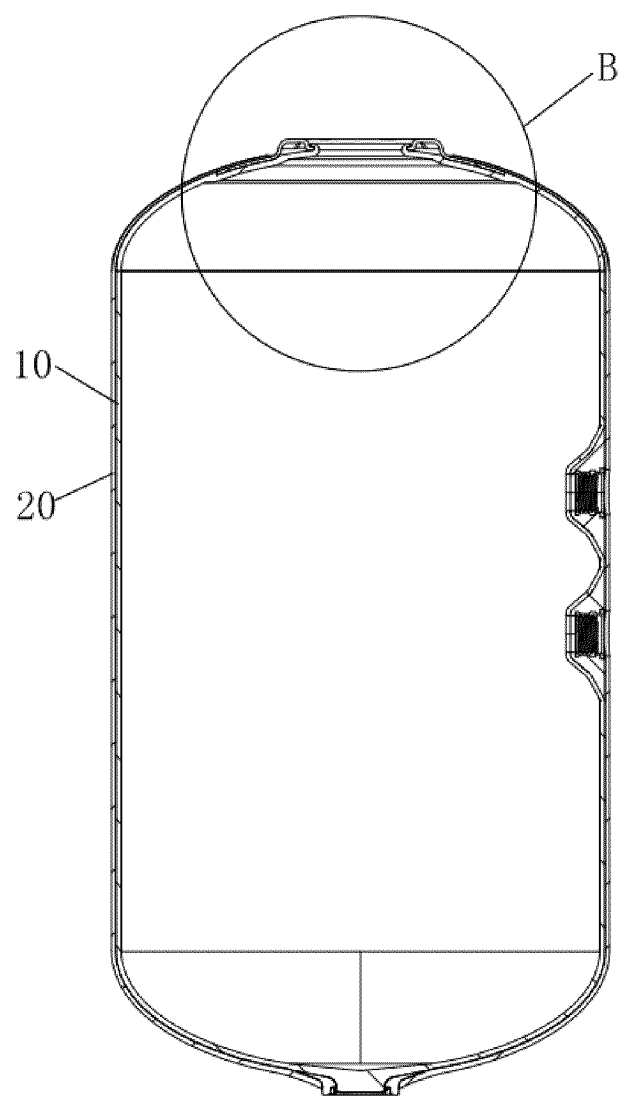


FIG. 6

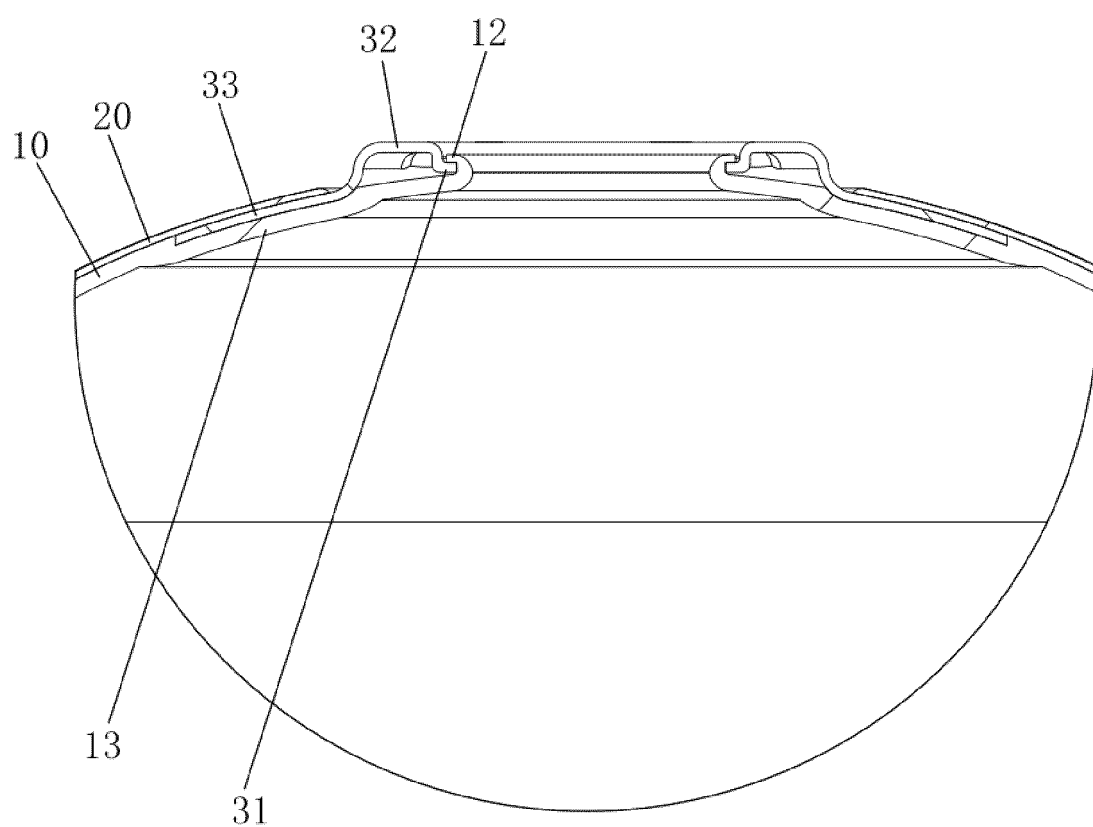


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/136565

A. CLASSIFICATION OF SUBJECT MATTER F24H9/00(2022.01)i;F24H9/02(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC															
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC:F24H Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched															
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNABS, CNTXT, ENTXT, ENTXTC, OETXT, VEN, DWPI, CNKI, 万方, WANFANG, 超星读秀, DUXIU: 海尔, 马腾, 曾宪芒, 赵小勇, 杜方林, 李勇, 赵龙, 于永飞, 电热水器, 法兰, 非金属, 漏水, 密封, 内胆, flange, liner, water heater, leak+, seal+															
C. DOCUMENTS CONSIDERED TO BE RELEVANT															
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 114992860 A (QINGDAO ECONOMIC & TECHNOLOGY DEVELOPMENT ZONE HAIER WATER HEATER CO., LTD.; HAIER SMART HOME CO., LTD.) 02 September 2022 (2022-09-02) claims 1-10</td> <td>1-10</td> </tr> <tr> <td>X</td> <td>CN 104108179 A (WUHU MIDEA KITCHEN & BATH APPLIANCES MFG CO., LTD.) 22 October 2014 (2014-10-22) description, paragraphs 0072-0074 and 0092-0094, and figures 1-2</td> <td>1-4, 8-10</td> </tr> <tr> <td>A</td> <td>CN 113405255 A (QINGDAO ECONOMIC & TECHNOLOGY DEVELOPMENT ZONE HAIER WATER HEATER CO., LTD.; HAIER SMART HOME CO., LTD.) 17 September 2021 (2021-09-17) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 205717870 U (GUANGDONG MACRO GAS APPLIANCE CO., LTD.) 23 November 2016 (2016-11-23) entire document</td> <td>1-10</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 114992860 A (QINGDAO ECONOMIC & TECHNOLOGY DEVELOPMENT ZONE HAIER WATER HEATER CO., LTD.; HAIER SMART HOME CO., LTD.) 02 September 2022 (2022-09-02) claims 1-10	1-10	X	CN 104108179 A (WUHU MIDEA KITCHEN & BATH APPLIANCES MFG CO., LTD.) 22 October 2014 (2014-10-22) description, paragraphs 0072-0074 and 0092-0094, and figures 1-2	1-4, 8-10	A	CN 113405255 A (QINGDAO ECONOMIC & TECHNOLOGY DEVELOPMENT ZONE HAIER WATER HEATER CO., LTD.; HAIER SMART HOME CO., LTD.) 17 September 2021 (2021-09-17) entire document	1-10	A	CN 205717870 U (GUANGDONG MACRO GAS APPLIANCE CO., LTD.) 23 November 2016 (2016-11-23) entire document	1-10
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.													
PX	CN 114992860 A (QINGDAO ECONOMIC & TECHNOLOGY DEVELOPMENT ZONE HAIER WATER HEATER CO., LTD.; HAIER SMART HOME CO., LTD.) 02 September 2022 (2022-09-02) claims 1-10	1-10													
X	CN 104108179 A (WUHU MIDEA KITCHEN & BATH APPLIANCES MFG CO., LTD.) 22 October 2014 (2014-10-22) description, paragraphs 0072-0074 and 0092-0094, and figures 1-2	1-4, 8-10													
A	CN 113405255 A (QINGDAO ECONOMIC & TECHNOLOGY DEVELOPMENT ZONE HAIER WATER HEATER CO., LTD.; HAIER SMART HOME CO., LTD.) 17 September 2021 (2021-09-17) entire document	1-10													
A	CN 205717870 U (GUANGDONG MACRO GAS APPLIANCE CO., LTD.) 23 November 2016 (2016-11-23) entire document	1-10													
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.															
<table border="0"> <tr> <td style="vertical-align: top;"> * Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “D” document cited by the applicant in the international application “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed </td> <td style="vertical-align: top;"> “T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family </td> </tr> </table>	* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “D” document cited by the applicant in the international application “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family													
* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “D” document cited by the applicant in the international application “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family														
Date of the actual completion of the international search 31 January 2023	Date of mailing of the international search report 15 February 2023														
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 Facsimile No. (86-10)62019451	Authorized officer Telephone No.														

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/136565

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 214501747 U (GUANGDONG SMALES ELECTRIC APPLIANCE CO., LTD.) 26 October 2021 (2021-10-26) entire document	1-10
A	CN 215983216 U (SHANDONG SHENG DING ENERGY TECHNOLOGY CO., LTD.) 08 March 2022 (2022-03-08) entire document	1-10
A	JP S59170687 A (HITACHI LTD.) 26 September 1984 (1984-09-26) entire document	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2022/136565

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	114992860	A	02 September 2022	CN	218033738	U	13 December 2022
CN	104108179	A	22 October 2014	CN	104108179	B	02 January 2018
CN	113405255	A	17 September 2021	CN	215909430	U	25 February 2022
CN	205717870	U	23 November 2016	None			
CN	214501747	U	26 October 2021	None			
CN	215983216	U	08 March 2022	None			
JP	S59170687	A	26 September 1984	None			

Form PCT/ISA/210 (patent family annex) (July 2022)

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

- CN 202210624531 [0001]
- CN 202221387758 [0001]