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# (54) HEAT EXCHANGE ASSEMBLY AND AIR CONDITIONING SYSTEM HAVING SAME

(57) Disclosed in the present invention are a heat exchange assembly and an air conditioning system having same. The heat exchange assembly comprises a heat exchanger and a water guide device. The heat exchanger comprises a first heat exchanger core and a second heat exchanger core. The first heat exchanger core comprises a plurality of first heat exchange tubes, the second heat exchanger core is located on one side of the first heat exchanger core in a thickness direction of the first heat exchanger core and comprises a plurality of second heat exchange tubes, and a lower edge of the second heat exchanger core is higher than a lower edge of the first heat exchanger core. The water guide device comprises a first water guide device, wherein at least part of the first water guide device is arranged below the second heat exchanger core and used for receiving and guiding condensed water from the second heat exchanger core. The heat exchange assembly and the air conditioning system according to the present invention reduce the risk of the condensed water being blown out of the heat exchanger core with a higher lower edge.

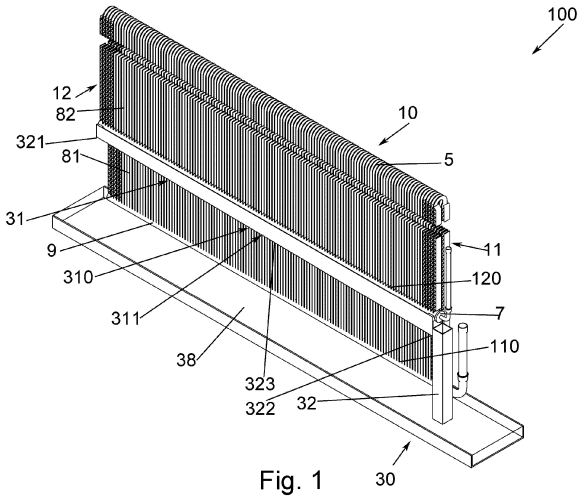


Fig. 1

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## Description

### Technical Field

**[0001]** Embodiments of the present invention relate to a heat exchange assembly and an air conditioning system having same.

### Background

**[0002]** In heat exchangers such as microchannel heat exchangers, if the lower edges of a plurality of heat exchanger cores are inconsistent, condensed water dripping toward the water receiving tray is likely blown out of the heat exchanger core with a higher lower edge due to the distance between it and the water receiving tray. Consequently, peripheral components rust away or condensed water is blown onto an end user, which provides a poor user experience.

### Summary of the Invention

**[0003]** An objective of embodiments of the present invention is to provide a heat exchange assembly and an air conditioning system having same, thereby reducing the risk of condensed water being blown out of the heat exchanger core with a higher lower edge, for example.

**[0004]** Embodiments of the present invention provide a heat exchange assembly, which comprises: a heat exchanger comprising a first heat exchanger core, wherein the first heat exchanger core comprises a plurality of first heat exchange tubes; and a second heat exchanger core located on one side of the first heat exchanger core in a thickness direction of the first heat exchanger core, wherein the second heat exchanger core comprises a plurality of second heat exchange tubes, and a lower edge of the second heat exchanger core is higher than a lower edge of the first heat exchanger core; and a water guide device comprising a first water guide device, wherein at least part of the first water guide device is arranged below the second heat exchanger core and used for receiving and guiding condensed water from the second heat exchanger core.

**[0005]** According to an embodiment of the present invention, the first water guide device comprises a first water guide channel.

**[0006]** According to an embodiment of the present invention, the bottom of the first water guide channel is inclined relative to the horizontal plane, so that a first end of the bottom of the first water guide channel is higher than a second end thereof.

**[0007]** According to an embodiment of the present invention, the bottom of the first water guide channel is inclined relative to the horizontal plane, so that the middle of the bottom of the first water guide channel located between the first and second ends is higher than the first and second ends.

**[0008]** According to an embodiment of the present invention, the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core, wherein the manifold also functions as the first water guide device, and the manifold is inclined relative to the horizontal plane, so that a first end of the manifold is higher than a second end thereof.

**[0009]** According to an embodiment of the present invention, the heat exchanger is inclined so that the manifold is inclined relative to the horizontal plane; alternatively, the plurality of first heat exchange tubes of the first heat exchanger core are vertically arranged, and the plurality of second heat exchange tubes of the second heat exchanger core are inclined so that the manifold is inclined relative to the horizontal plane.

**[0010]** According to an embodiment of the present invention, the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core, wherein the manifold also functions as the first water guide device, and at least part of the outer surface of the manifold has a coating, the coating having at least one of different degrees of hydrophilicity in an axial direction of the manifold and different degrees of hydrophobicity in an axial direction of the manifold, so that the condensed water received from the second heat exchanger core flows along the manifold to at least one of a first end and a second end of the manifold.

**[0011]** According to an embodiment of the present invention, the water guide device further comprises a second water guide device located near an end portion of the first water guide device in a lateral direction perpendicular to a thickness direction and a vertical direction of the first heat exchanger core, and used for receiving and guiding condensed water received and guided by the first water guide device from the end portion of the first water guide device.

**[0012]** According to an embodiment of the present invention, the second water guide device comprises a second water guide channel or water guide tube.

**[0013]** According to an embodiment of the present invention, the second water guide device comprises a water guide tube vertically or obliquely arranged.

**[0014]** According to an embodiment of the present invention, the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core, and the first water guide channel is integrated with the manifold.

**[0015]** According to an embodiment of the present invention, the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core, wherein the manifold also functions as the first water guide device, and the plane where the first heat exchanger core is lo-

cated is inclined relative to the horizontal plane.

**[0016]** According to an embodiment of the present invention, the plane where the second heat exchanger core is located is inclined relative to the horizontal plane.

**[0017]** According to an embodiment of the present invention, an angle between the plane where the first heat exchanger core is located and the horizontal plane is equal to an angle between the plane where the second heat exchanger core is located and the horizontal plane.

**[0018]** According to an embodiment of the present invention, the first water guide device comprises a water guide plate, the water guide plate comprising a first side away from the first heat exchanger core in a thickness direction of the first heat exchanger core and a second side close to the first heat exchanger core in a thickness direction of the first heat exchanger core, the water guide plate being inclined relative to the horizontal plane, so that the first side of the water guide plate is higher than the second side, the water guide plate being configured to guide condensed water received from the second heat exchanger core to the first heat exchanger core.

**[0019]** According to an embodiment of the present invention, the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core, wherein the manifold also functions as the first water guide device, and part of the plurality of second heat exchange tubes near the manifold is bent toward the first heat exchanger core, so that the manifold comes into contact with the first heat exchanger core.

**[0020]** According to an embodiment of the present invention, the heat exchanger further comprises a connecting portion, wherein the plurality of first heat exchange tubes of the first heat exchanger core are connected to the plurality of second heat exchange tubes of the second heat exchanger core through the connecting portion.

**[0021]** According to an embodiment of the present invention, the water guide device further comprises a water receiving tray, wherein the second water guide device guides received condensed water into the water receiving tray.

**[0022]** According to an embodiment of the present invention, the size of the first heat exchanger core in a vertical direction is larger than the size of the second heat exchanger core in a vertical direction.

**[0023]** An embodiment of the present invention further provides an air conditioning system comprising: a heat exchange assembly as described above.

**[0024]** Using a heat exchange assembly and an air conditioning system having same according to embodiments of the present invention, the risk of condensed water being blown out of the heat exchanger core having a higher lower edge may be reduced, for example.

## Brief Description of the Drawings

**[0025]**

Fig. 1 is a schematic perspective view of a heat exchange assembly according to a first embodiment of the present invention;

Fig. 2 is a schematic main view of the heat exchange assembly shown in Fig. 1;

Fig. 3 is a schematic side view of the heat exchange assembly shown in Fig. 1;

Fig. 4 is a schematic perspective view of a heat exchange assembly according to a variant example of the first embodiment of the present invention;

Fig. 5 is a schematic main view of the heat exchange assembly shown in Fig. 4;

Fig. 6 is a schematic side view of part of the heat exchange assembly shown in Fig. 4;

Fig. 7 is a schematic perspective view of a heat exchange assembly according to another variant example of the first embodiment of the present invention;

Fig. 8 is a schematic main view of the heat exchange assembly shown in Fig. 7;

Fig. 9 is a schematic side view of the heat exchange assembly shown in Fig. 7;

Fig. 10 is a schematic perspective view of a heat exchange assembly according to another variant example of the first embodiment of the present invention;

Fig. 11 is a schematic main view of the heat exchange assembly shown in Fig. 10;

Fig. 12 is a schematic side view of the heat exchange assembly shown in Fig. 10;

Fig. 13 is a schematic perspective view of a heat exchanger according to a second embodiment of the present invention;

Fig. 14 is a schematic main view of the heat exchange assembly shown in Fig. 13;

Fig. 15 is a schematic side view of the heat exchange assembly shown in Fig. 13;

Fig. 16 is a schematic perspective view of a heat exchange assembly according to a variant example of the second embodiment of the present invention;

Fig. 17 is a schematic main view of the heat exchange assembly shown in Fig. 16;

Fig. 18 is a schematic side view of the heat exchange assembly shown in Fig. 16;

Fig. 19 is a schematic perspective view of a heat exchange assembly according to another variant example of the second embodiment of the present invention;

Fig. 20 is a schematic main view of the heat exchange assembly shown in Fig. 19; and

Fig. 21 is a schematic side view of the heat exchange assembly shown in Fig. 19.

## Detailed Description of the Invention

**[0026]** The present invention will be described in greater detail below in conjunction with the drawings and specific embodiments.

**[0027]** An air conditioning system according to embodiments of the present invention comprises a heat exchanger. Specifically, the air conditioning system according to embodiments of the present invention comprises a compressor, a heat exchanger serving as an evaporator, a heat exchanger serving as a condenser, and an expansion valve, etc.

**[0028]** Referring to Fig. 1 to Fig. 21, a heat exchange assembly 100 according to an embodiment of the present invention comprises a heat exchanger 10 and a water guide device 30. The heat exchanger 10 comprises a first heat exchanger core 11 comprising a plurality of first heat exchange tubes 81; and a second heat exchanger core 12 located on one side of the first heat exchanger core 11 in a thickness direction (the left-right direction in Figs. 3, 6, 9, 12, 15, 18 and 21) of the first heat exchanger core 11, wherein the second heat exchanger core 12 comprises a plurality of second heat exchange tubes 82, and a lower edge 120 of the second heat exchanger core 12 is higher than a lower edge 110 of the first heat exchanger core 11. The water guide device 30 comprises a first water guide device 31, wherein at least part of the first water guide device 31 is arranged below the second heat exchanger core 12, and used for receiving and guiding condensed water from the second heat exchanger core 12. For example, the first water guide device 31 extends in a lateral direction perpendicular to a thickness direction and a vertical direction of the first heat exchanger core (the left-right direction in Figs. 2, 5, 8, 11, 14, 17 and 20). A longitudinal direction of the first water guide device 31 may be a lateral direction.

**[0029]** Referring to Fig. 1 to Fig. 3 and Fig. 10 to Fig. 12, in an embodiment of the present invention, the first water guide device 31 comprises a first water guide channel 310. The bottom 311 of the first water guide channel 310 is inclined relative to the horizontal plane, so that a first end 321 of the bottom 311 of the first water guide channel 310 is higher than a second end 322 thereof. Thus, by means of gravity, condensed water from the second heat exchanger core 12 flows along the first water guide channel 310 to the second end 322 of the first water guide channel 310. Alternatively, the bottom 311 of the first water guide channel 310 is inclined relative to the horizontal plane, so that the middle 323 of the bottom 311 of the first water guide channel 310 located between the first end 321 and the second end 322 is higher than the first end 321 and the second end 322. Thus, by means of gravity, condensed water from the second heat exchanger core 12 flows along the first water guide channel 310 to the first end 321 and the second end 322 of the first water guide channel 310. In addition, even if the bottom 311 of the first water guide channel 310 is not inclined relative to the horizontal plane, when the water level in the first water guide channel 310 reaches a certain height, water will still flow out from the first end 321 and the second end 322 of the first water guide channel 310; and, if one of the first end 321 and the second end 322 of the first water guide channel 310 has an end wall, when the water level in the first water guide channel 310 reaches a certain height, water will still flow out from the other one of the first end 321 and the second end 322 of the first water guide channel 310.

**[0030]** Referring to Fig. 1 to Fig. 21, in an embodiment of the present invention, the heat exchanger 10 further comprises a manifold 7, the manifold 7 being connected to the plurality of second heat exchange tubes 82 of the second heat exchanger core 12 below the second heat exchanger core 12. In addition, the heat exchanger 10 further comprises a manifold 9, the manifold 9 being connected to the plurality of first heat exchange tubes 81 of the first heat exchanger core 11 below the first heat exchanger core 11.

**[0031]** Referring to Fig. 4 to Fig. 9, in an embodiment of the present invention, the manifold 7 also functions as the first water guide device 31, and the manifold 7 is inclined relative to the horizontal plane, so that a first end 71 of the manifold 7 is higher than a second end 72 thereof. Thus, by means of gravity, condensed water from the second heat exchanger core 12 flows along the manifold 7 to the second end 72 of the manifold 7. For example, as shown in Fig. 4 to Fig. 6, the heat exchanger 10 is inclined so that the manifold 7 is inclined relative to the horizontal plane; alternatively, as shown in Fig. 7 to Fig. 9, the plurality of first heat exchange tubes 81 of the first heat exchanger core 11 are vertically arranged, while the plurality of second heat exchange tubes 82 of the second heat exchanger core 12 are inclined so that the manifold 7 is inclined relative to the horizontal plane. Alternatively, the first heat exchanger core 11 is horizontally arranged, while only the second heat exchanger core 12 is inclined so that the manifold 7 is inclined relative to the horizontal plane.

**[0032]** In an embodiment of the present invention, the manifold 7 also functions as the first water guide device 31, and at least part of the outer surface 73 of the manifold 7 has a coating, the coating having at least one of different degrees of hydrophilicity in an axial direction of the manifold 7 and different degrees of hydrophobicity in an axial direction of the manifold 7, so that condensed water received from the second heat exchanger core 12 flows along the manifold 7 to at least one of the first end 71 and the second end 72 of the manifold 7.

**[0033]** Referring to Fig. 1 to Fig. 12, in an embodiment of the present invention, the water guide device 30 further comprises a second water guide device 32 located near end portions 331, 332 of the first water guide device 31 in a lateral direction perpendicular to a thickness direction and a vertical direction of the first heat exchanger core 11, and used for receiving and guiding condensed water received and guided by the first water guide device 31 from the end portions 331, 332 of the first water guide device 31. The second water guide device 32 may be one second water guide device 32 arranged on one side of the heat exchanger, or may be two second water guide devices 32 respectively arranged on two sides of the heat exchanger. The second water guide device 32 may com-

prise a second water guide channel or a water guide tube 320. For example, the second water guide device 32 comprises a water guide tube 320, the water guide tube 320 being vertically or obliquely arranged. The water guide device 30 may further comprise a water receiving tray 38, and the second water guide device 32 guides received condensed water into the water receiving tray 38.

**[0034]** Referring to Fig. 12, in an embodiment of the present invention, the first water guide channel 310 is integrated with the manifold 7.

**[0035]** Referring to Fig. 13 to Fig. 15, in an embodiment of the present invention, the manifold 7 also functions as the first water guide device 31, and the plane where the first heat exchanger core 11 is located is inclined relative to the horizontal plane. As a result, condensed water from the second heat exchanger core 12 drips from the manifold 7 onto the first heat exchanger core 11, and flows along the first heat exchanger core 11 into the water receiving tray 38. In addition, the plane where the second heat exchanger core 12 is located may also be inclined relative to the horizontal plane. For example, an angle between the plane where the first heat exchanger core 11 is located and the horizontal plane is equal to an angle between the plane where the second heat exchanger core 12 is located and the horizontal plane. In other words, the plane where the heat exchanger 10 is located is inclined relative to the horizontal plane.

**[0036]** Referring to Fig. 19 to Fig. 21, in an embodiment of the present invention, the first water guide device 31 comprises a water guide plate 315, the water guide plate 315 comprising a first side 3151 away from the first heat exchanger core 11 in a thickness direction of the first heat exchanger core 11 and a second side 3152 close to the first heat exchanger core 11 in a thickness direction of the first heat exchanger core 11, the water guide plate 315 being inclined relative to the horizontal plane, so that the first side 3151 of the water guide plate 315 is higher than the second side 3152, the water guide plate 315 being configured to guide condensed water received from the second heat exchanger core 12 to the first heat exchanger core 11. Thus, the condensed water flows along the first heat exchanger core 11 into the water receiving tray 38.

**[0037]** Referring to Fig. 16 to Fig. 18, in an embodiment of the present invention, the manifold 7 also functions as the first water guide device 31, and part of the plurality of second heat exchange tubes 82 near the manifold 7 is bent toward the first heat exchanger core 11, so that the manifold 7 comes into contact with the first heat exchanger core 11. Thus, condensed water from the second heat exchanger core 12 is guided to the first heat exchanger core 11. As a result, the condensed water flows along the first heat exchanger core 11 into the water receiving tray 38.

**[0038]** Referring to Fig. 1 to Fig. 21, in an embodiment of the present invention, the heat exchanger 10 further comprises a connecting portion 5, wherein the plurality of first heat exchange tubes 81 of the first heat exchanger core 11 are connected to the plurality of second heat exchange tubes 82 of the second heat exchanger core 12 through the connecting portion 5. In an embodiment of the present invention, the connecting portion 5 may comprise a plurality of connecting tubes, wherein the plurality of first heat exchange tubes 81 of the first heat exchanger core 11 are connected to the plurality of second heat exchange tubes 82 of the second heat exchanger core 12 respectively through the plurality of connecting tubes. The plurality of connecting tubes may be integrated with the plurality of first heat exchange tubes 81 of the first heat exchanger core 11 and the plurality of second heat exchange tubes 82 of the second heat exchanger core 12, wherein, for example, the heat exchanger 10 may be formed by bending a flat plate heat exchanger. The first heat exchanger core 11 further comprises fins arranged alternately with the plurality of first heat exchange tubes 81. The second heat exchanger core 12 further comprises fins arranged alternately with the plurality of second heat exchange tubes 82. In addition, the size of the first heat exchanger core 11 in a vertical direction may be larger than the size of the second heat exchanger core 12 in a vertical direction.

**[0039]** Although the first water guide device 31 and the second water guide device 32 have been described with reference to the drawings, a water guide device may have any suitable shape and structure, rather than being limited to the water guide devices shown in the drawings.

**[0040]** The use of a water guide device, heat exchange assembly, and air conditioning system according to embodiments of the present invention can reduce the risk of condensed water being blown out of the heat exchanger core with a higher lower edge, thereby ensuring that the condensed water is completely collected into a water receiving tray.

**[0041]** Although the above embodiments have been described, certain features in the above embodiments can be combined to form new embodiments.

## Claims

**1.** A heat exchange assembly, which comprises:

a heat exchanger comprising a first heat exchanger core, wherein the first heat exchanger core comprises a plurality of first heat exchange tubes; and a second heat exchanger core located on one side of the first heat exchanger core in a thickness direction of the first heat exchanger core, wherein the second heat exchanger core comprises a plurality of second heat exchange tubes, and a lower edge of the second heat exchanger core is higher than a lower edge of the first heat exchanger core; and

a water guide device comprising a first water guide device, wherein at least part of the first

water guide device is arranged below the second heat exchanger core and used for receiving and guiding condensed water from the second heat exchanger core.

2. The heat exchange assembly as claimed in claim 1, **characterized in that**:
the first water guide device comprises a first water guide channel.

3. The heat exchange assembly as claimed in claim 2, **characterized in that**:
the bottom of the first water guide channel is inclined relative to the horizontal plane, so that a first end of the bottom of the first water guide channel is higher than a second end thereof.

4. The heat exchange assembly as claimed in claim 2, **characterized in that**:
the bottom of the first water guide channel is inclined relative to the horizontal plane, so that the middle of the bottom of the first water guide channel located between the first and second ends is higher than the first and second ends.

5. The heat exchange assembly as claimed in claim 1, **characterized in that**:

the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core,
wherein the manifold also functions as the first water guide device, and
the manifold is inclined relative to the horizontal plane, so that a first end of the manifold is higher than a second end thereof.

6. The heat exchange assembly as claimed in claim 5, **characterized in that**:

the heat exchanger is inclined so that the manifold is inclined relative to the horizontal plane; alternatively,
the plurality of first heat exchange tubes of the first heat exchanger core are vertically arranged, and the plurality of second heat exchange tubes of the second heat exchanger core are inclined so that the manifold is inclined relative to the horizontal plane.

7. The heat exchange assembly as claimed in claim 1, **characterized in that**:

the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core,
wherein the manifold also functions as the first water guide device, and
at least part of the outer surface of the manifold has a coating, the coating having at least one of different degrees of hydrophilicity in an axial direction of the manifold and different degrees of hydrophobicity in an axial direction of the manifold, so that the condensed water received from the second heat exchanger core flows along the manifold to at least one of a first end and a second end of the manifold.

8. The heat exchange assembly as claimed in any one of claims 2 to 7, **characterized in that**:
the water guide device further comprises a second water guide device located near an end portion of the first water guide device in a lateral direction perpendicular to a thickness direction and a vertical direction of the first heat exchanger core, and used for receiving and guiding condensed water received and guided by the first water guide device from the end portion of the first water guide device.

9. The heat exchange assembly as claimed in claim 8, **characterized in that**:
the second water guide device comprises a second water guide channel or water guide tube.

10. The heat exchange assembly as claimed in claim 8, **characterized in that**:
the second water guide device comprises a water guide tube vertically or obliquely arranged.

11. The heat exchange assembly as claimed in claim 2, **characterized in that**:

the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core, and
the first water guide channel is integrated with the manifold.

12. The heat exchange assembly as claimed in claim 1, **characterized in that**:

the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core,
wherein the manifold also functions as the first water guide device, and
the plane where the first heat exchanger core is located is inclined relative to the horizontal

plane.

**13.** The heat exchange assembly as claimed in claim 12, **characterized in that**:
the plane where the second heat exchanger core is located is inclined relative to the horizontal plane.

**14.** The heat exchange assembly as claimed in claim 13, **characterized in that**: an angle between the plane where the first heat exchanger core is located and the horizontal plane is equal to an angle between the plane where the second heat exchanger core is located and the horizontal plane.

**15.** The heat exchange assembly as claimed in claim 1, **characterized in that**:
the first water guide device comprises a water guide plate, the water guide plate comprising a first side away from the first heat exchanger core in a thickness direction of the first heat exchanger core and a second side close to the first heat exchanger core in a thickness direction of the first heat exchanger core, the water guide plate being inclined relative to the horizontal plane, so that the first side of the water guide plate is higher than the second side, the water guide plate being configured to guide condensed water received from the second heat exchanger core to the first heat exchanger core.

**16.** The heat exchange assembly as claimed in claim 1, **characterized in that**:

the heat exchanger further comprises a manifold, the manifold being connected to the plurality of second heat exchange tubes of the second heat exchanger core below the second heat exchanger core,
wherein the manifold also functions as the first water guide device, and
part of the plurality of second heat exchange tubes near the manifold is bent toward the first heat exchanger core, so that the manifold comes into contact with the first heat exchanger core.

**17.** The heat exchange assembly as claimed in claim 1, **characterized in that**:
the heat exchanger further comprises a connecting portion, wherein the plurality of first heat exchange tubes of the first heat exchanger core are connected to the plurality of second heat exchange tubes of the second heat exchanger core through the connecting portion.

**18.** The heat exchange assembly as claimed in claim 8, **characterized in that**:
the water guide device further comprises a water receiving tray, wherein the second water guide device guides received condensed water into the water receiving tray.

**19.** The heat exchange assembly as claimed in claim 1, **characterized in that**:
the size of the first heat exchanger core in a vertical direction is larger than the size of the second heat exchanger core in a vertical direction.

**20.** An air conditioning system, comprising:
the heat exchange assembly as claimed in any one of claims 1 to 18.

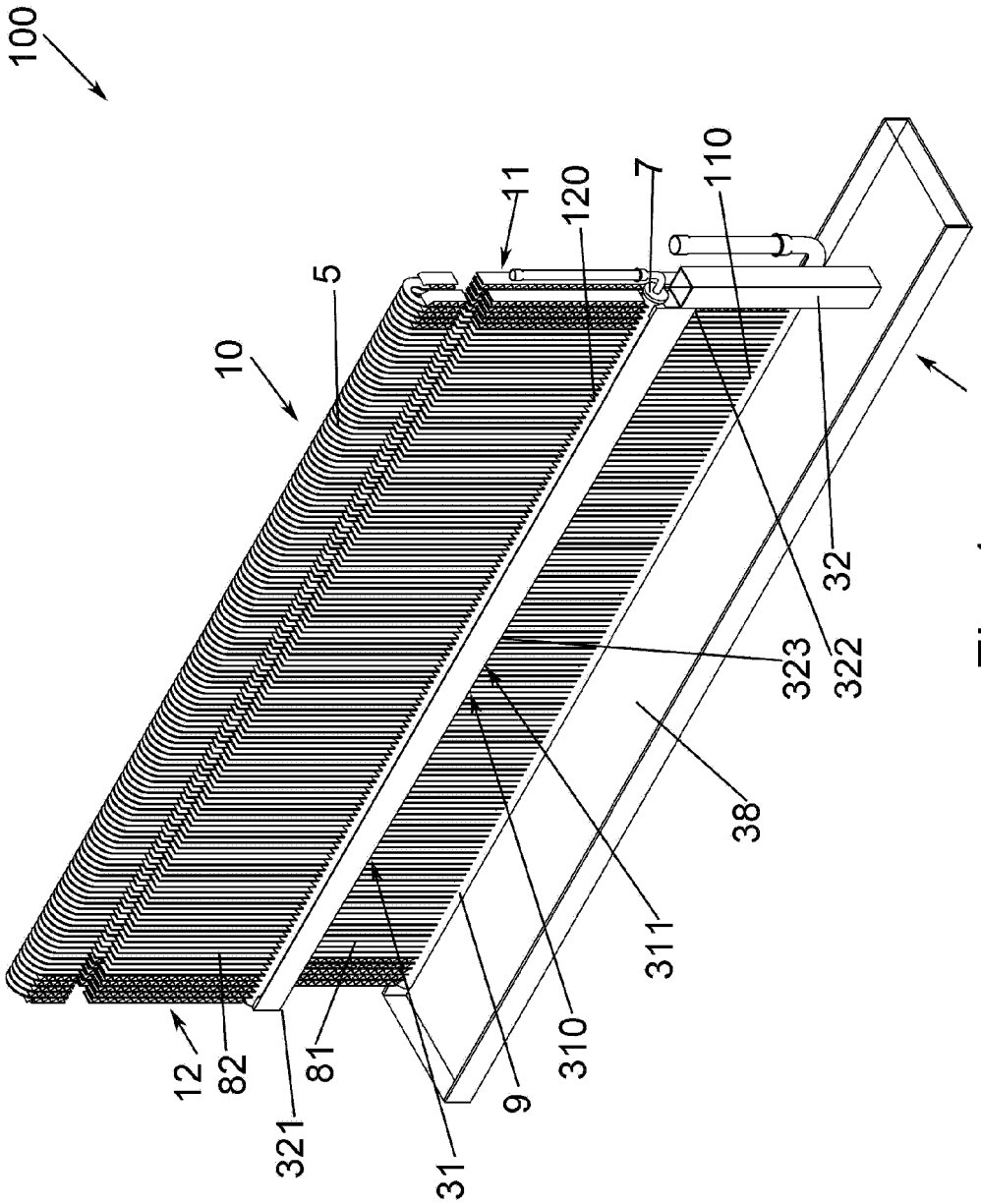


Fig. 1

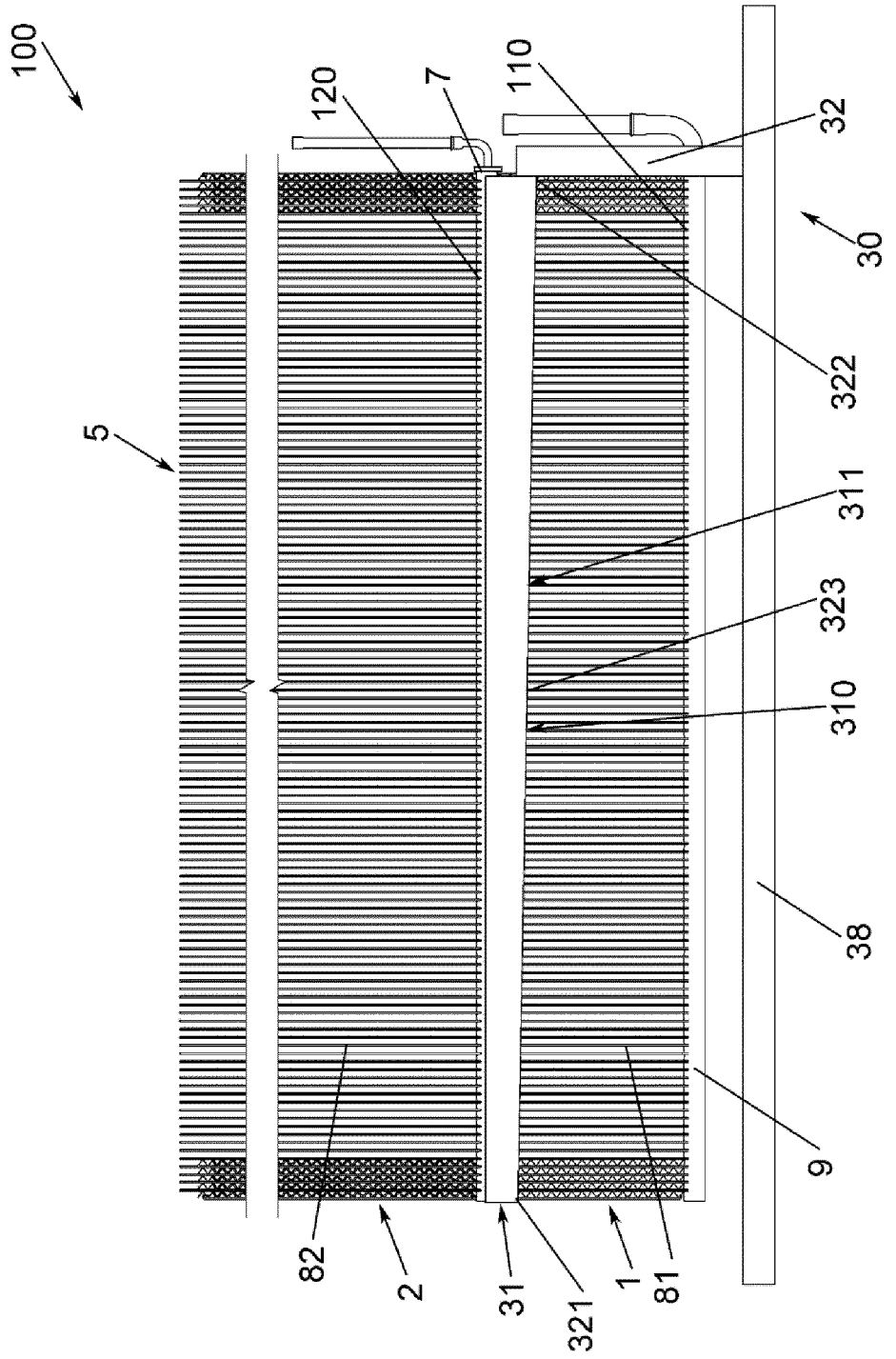


Fig. 2

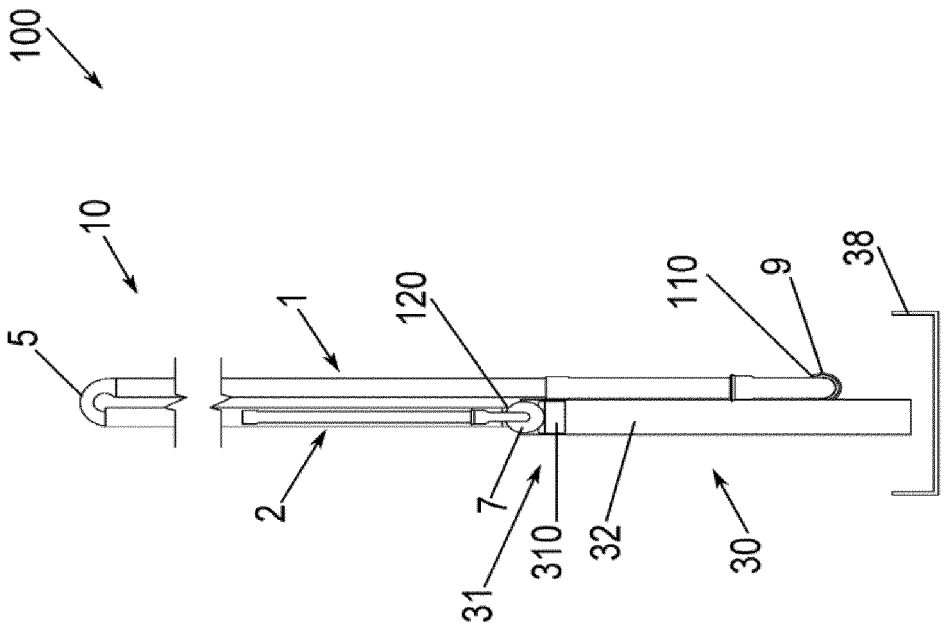


Fig.3

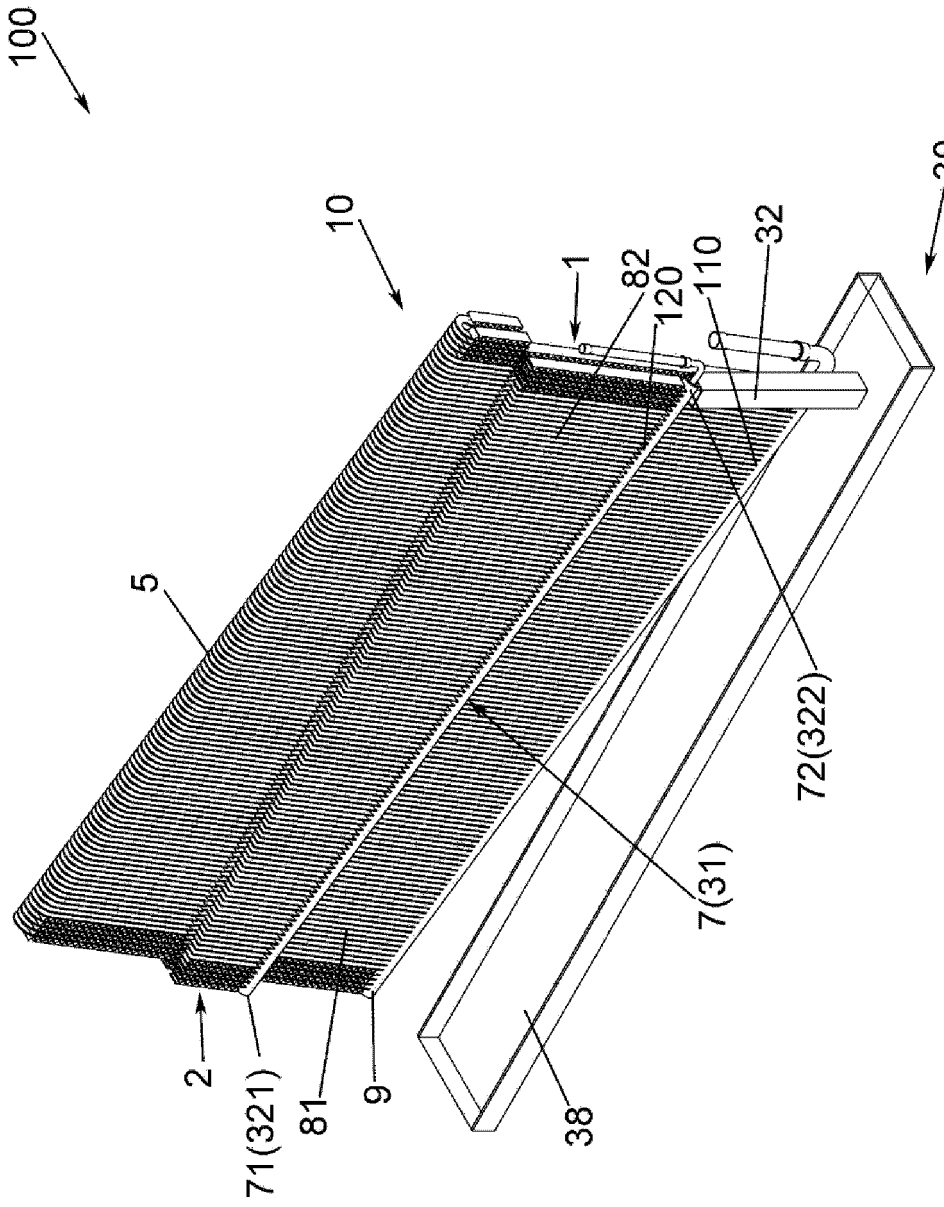


Fig. 4

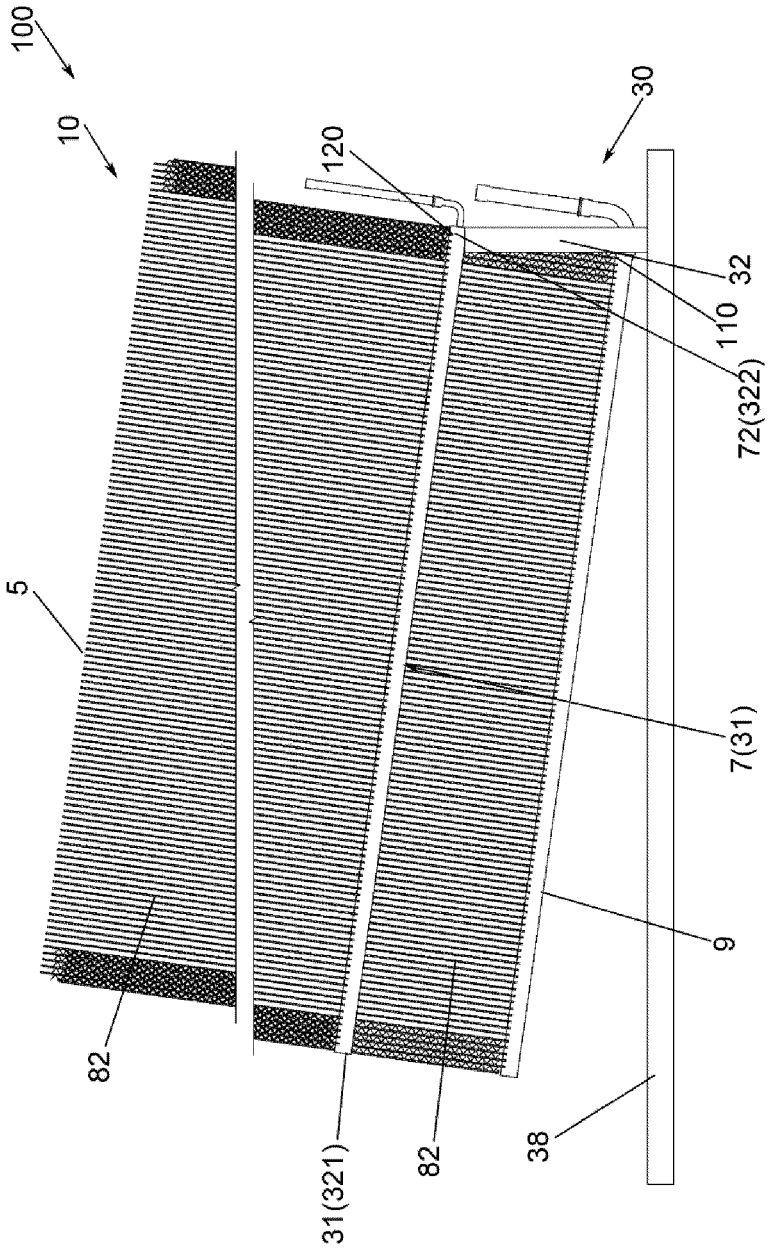


Fig.5

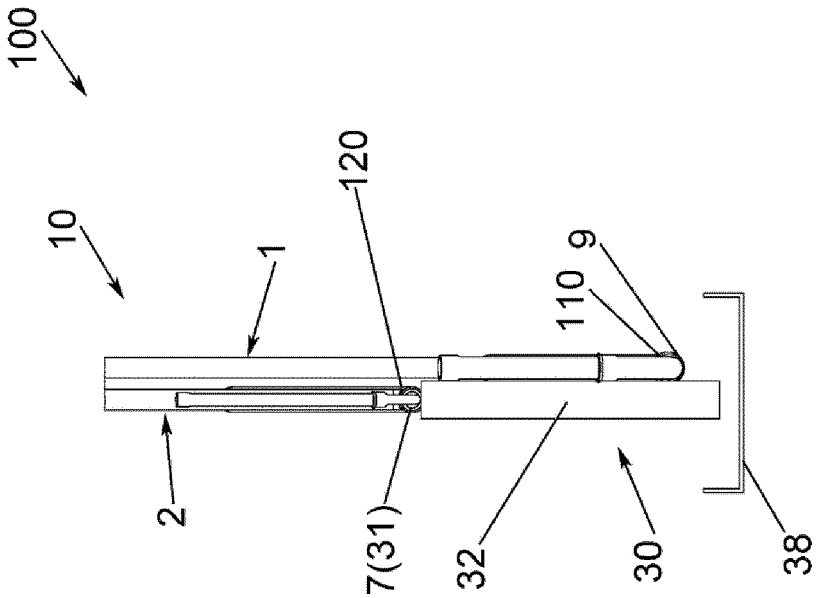


Fig. 6

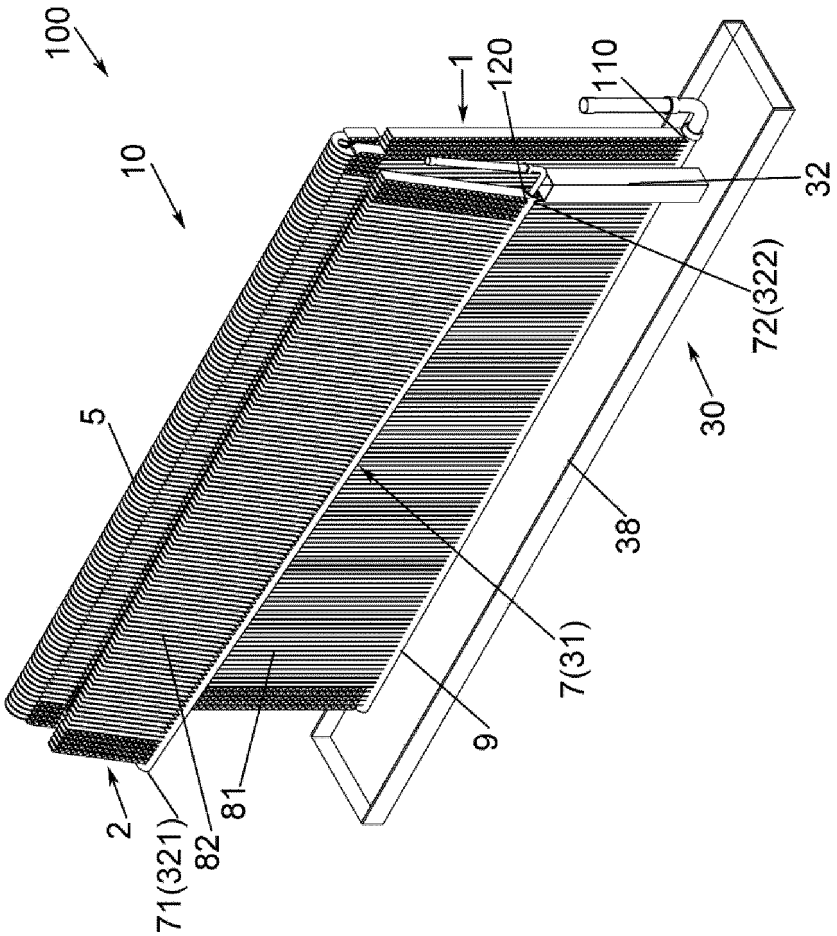


Fig. 7

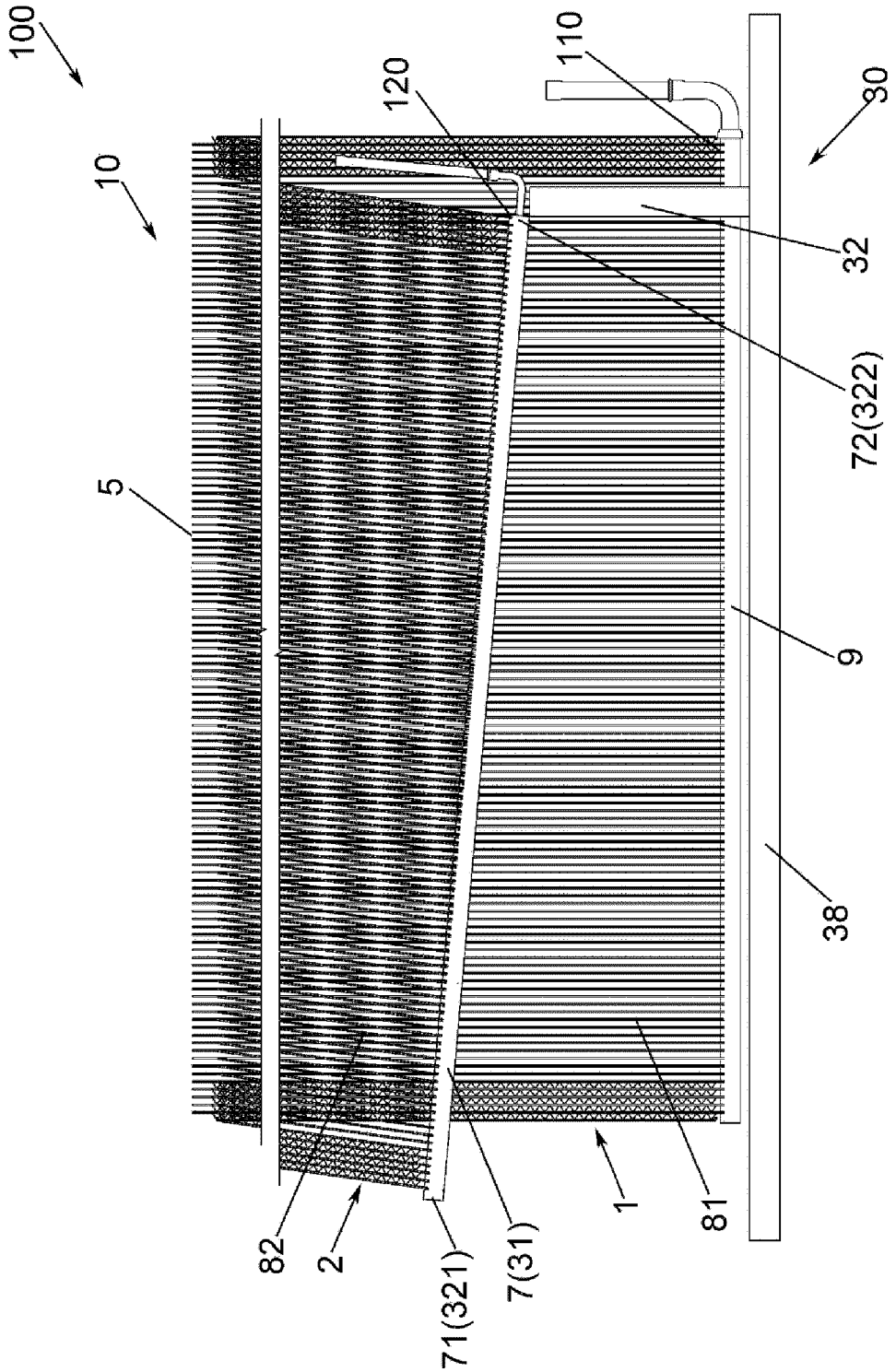


Fig. 8

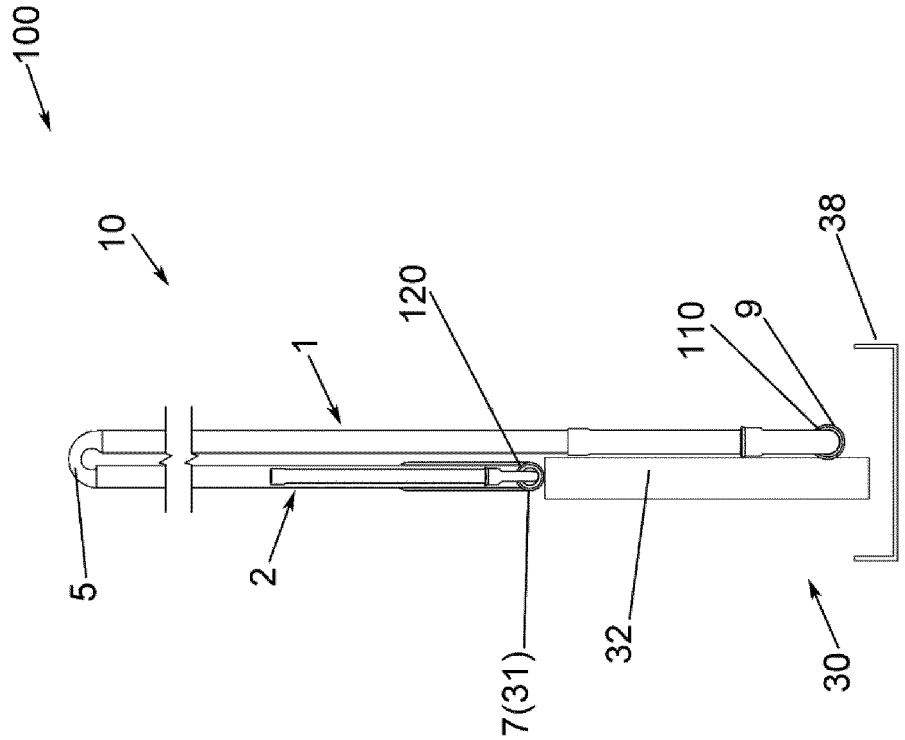


Fig. 9

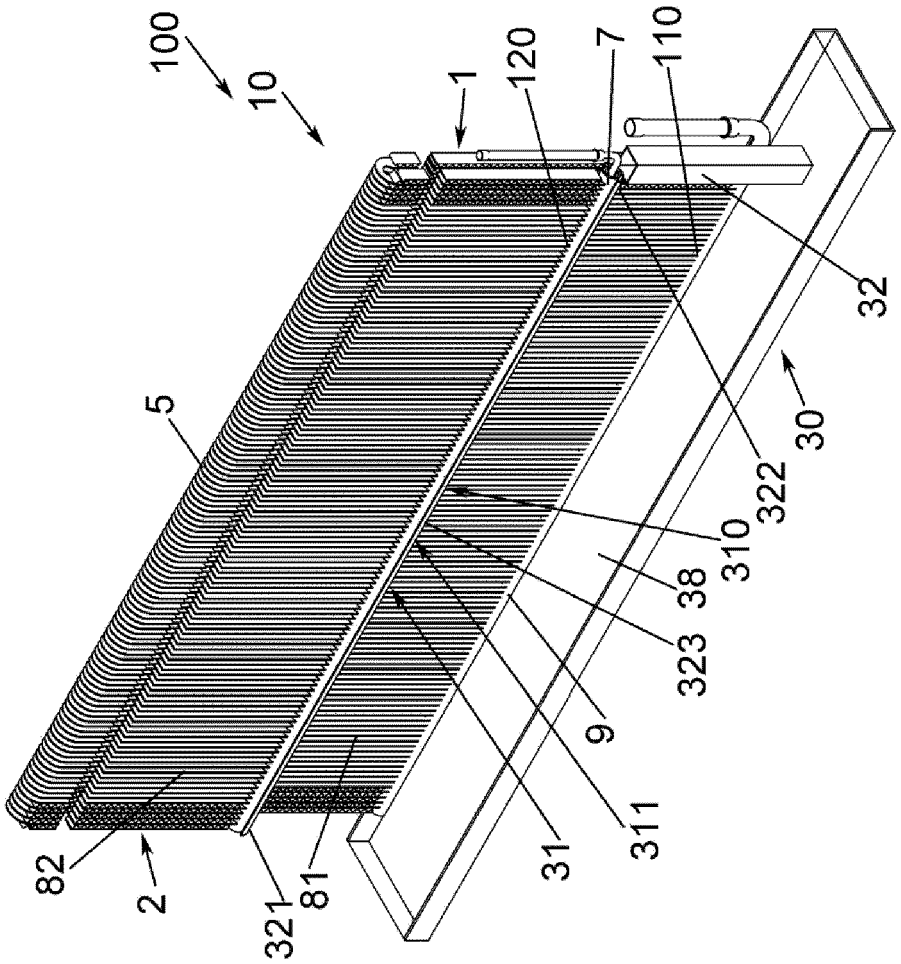


Fig. 10

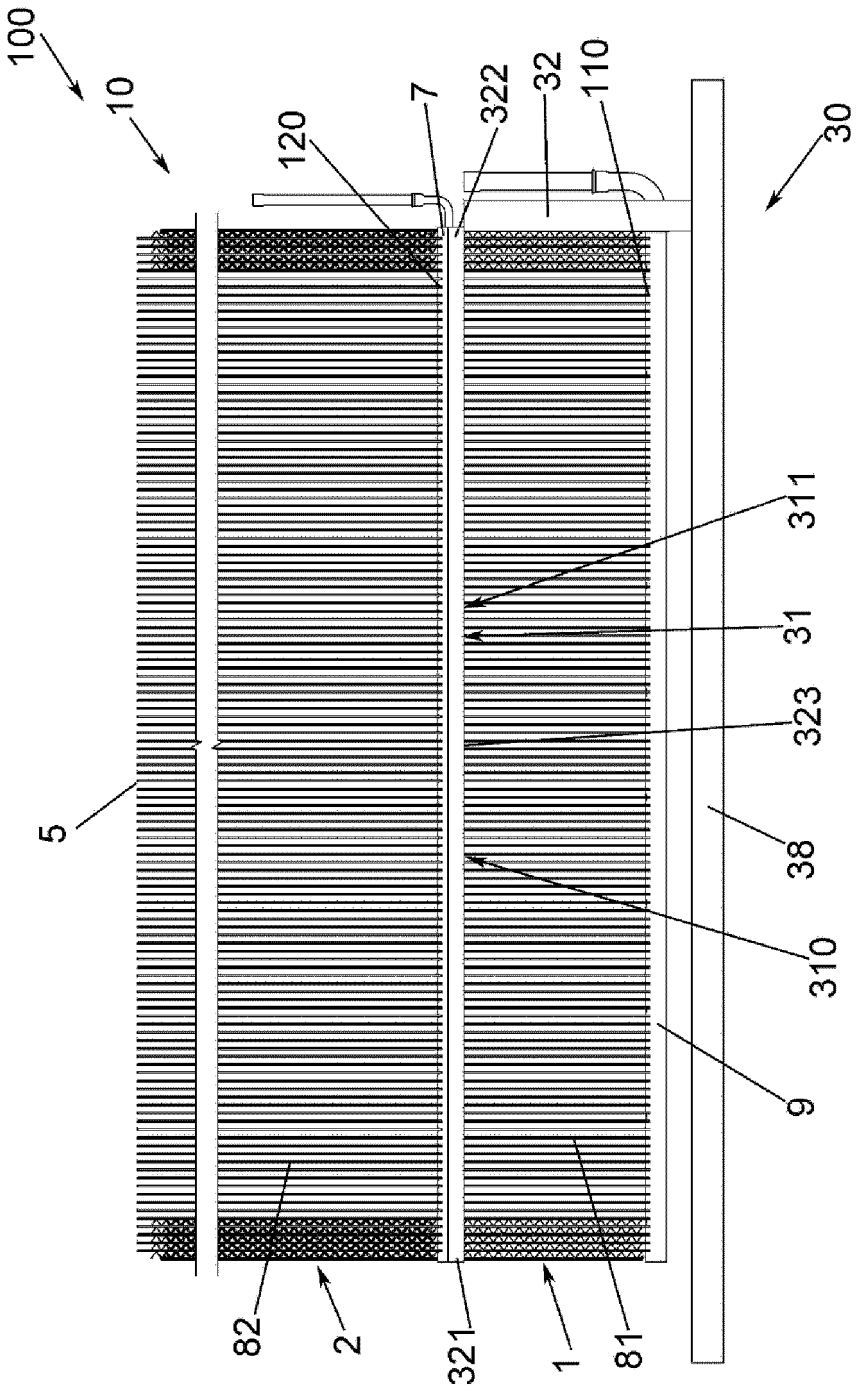


Fig. 11

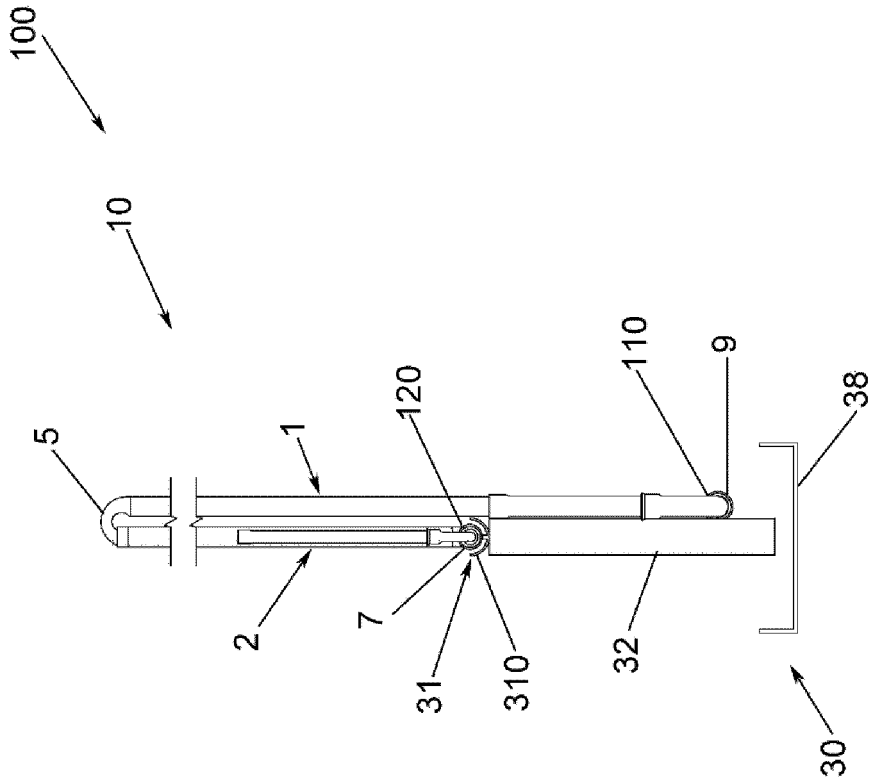


Fig. 12

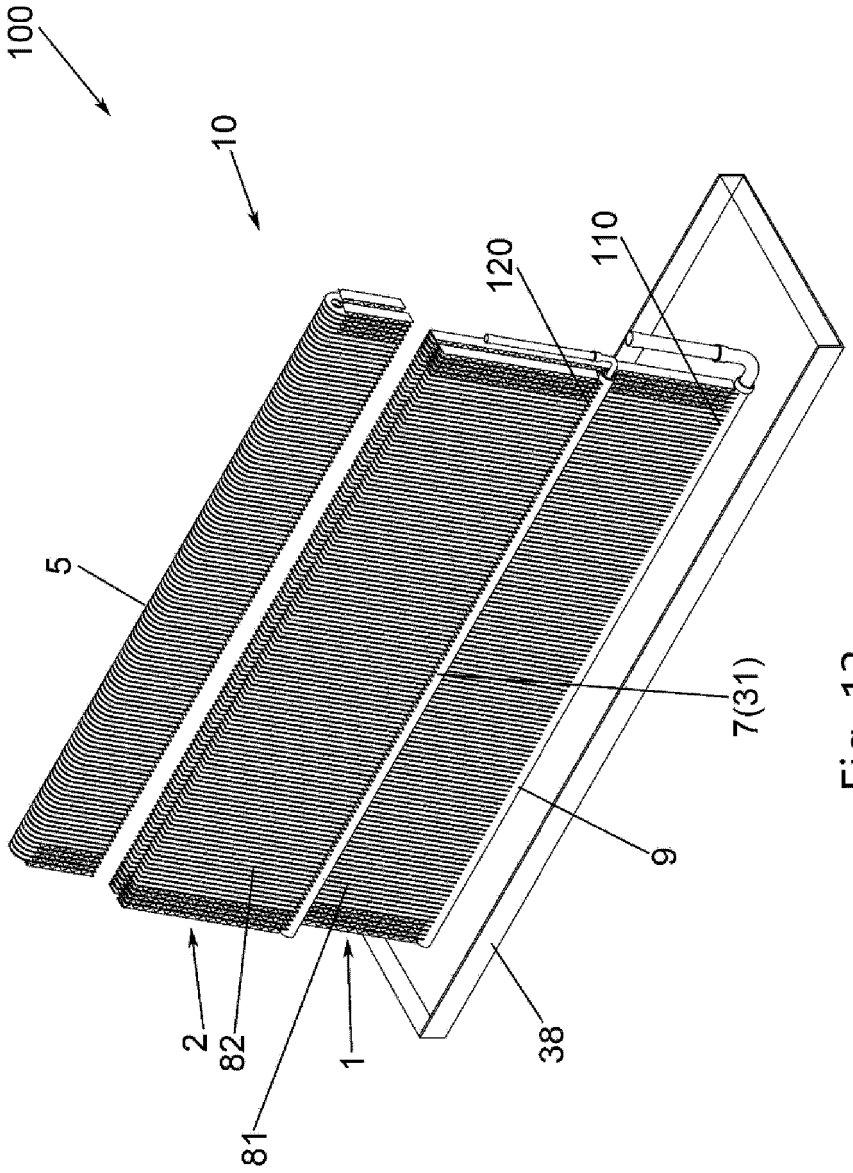


Fig. 13

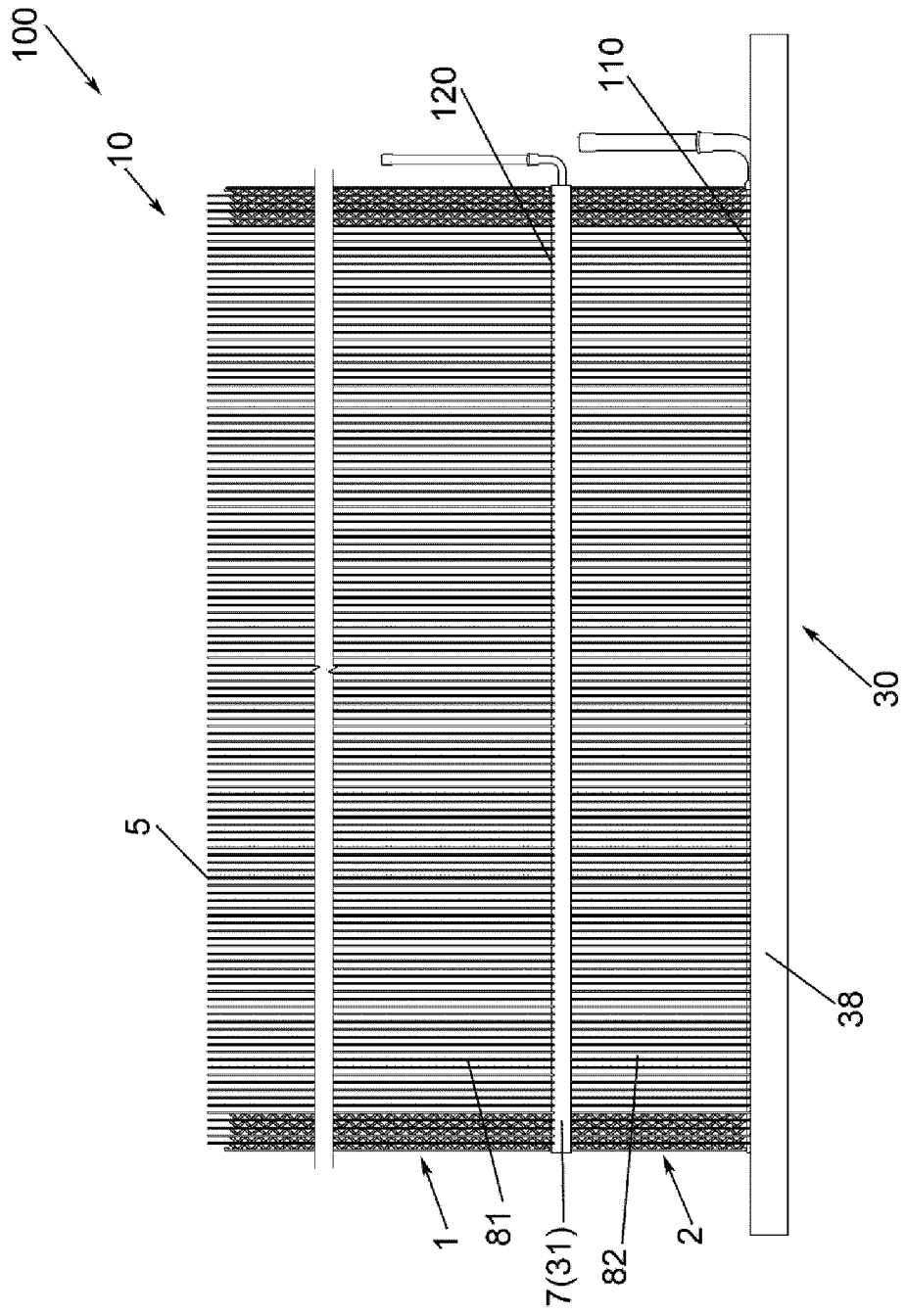


Fig. 14

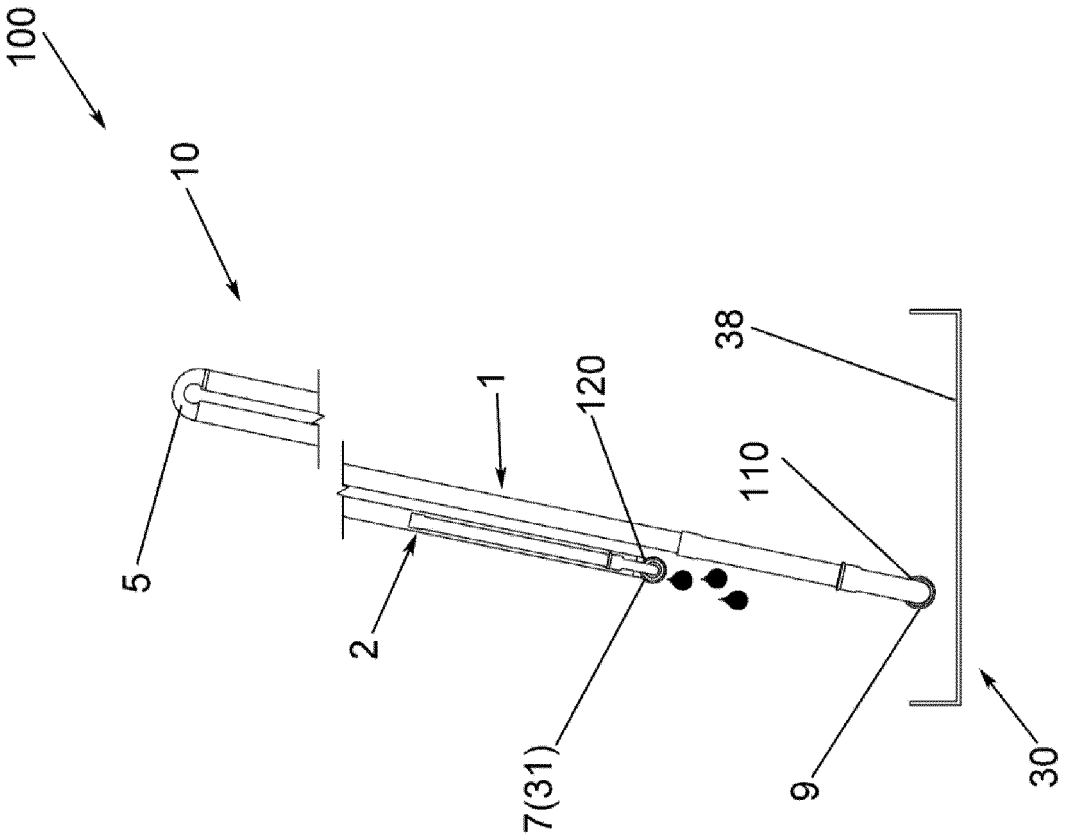


Fig. 15

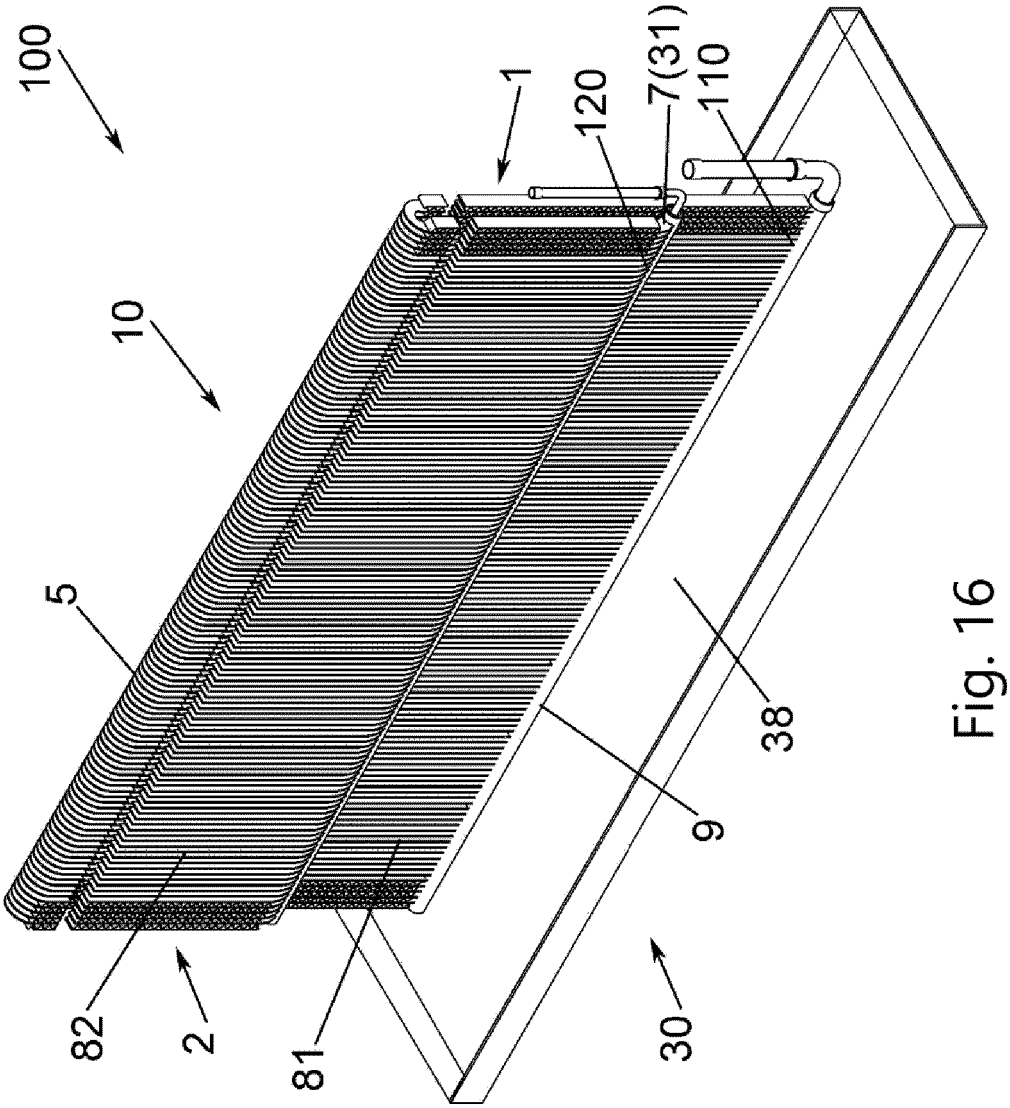


Fig. 16

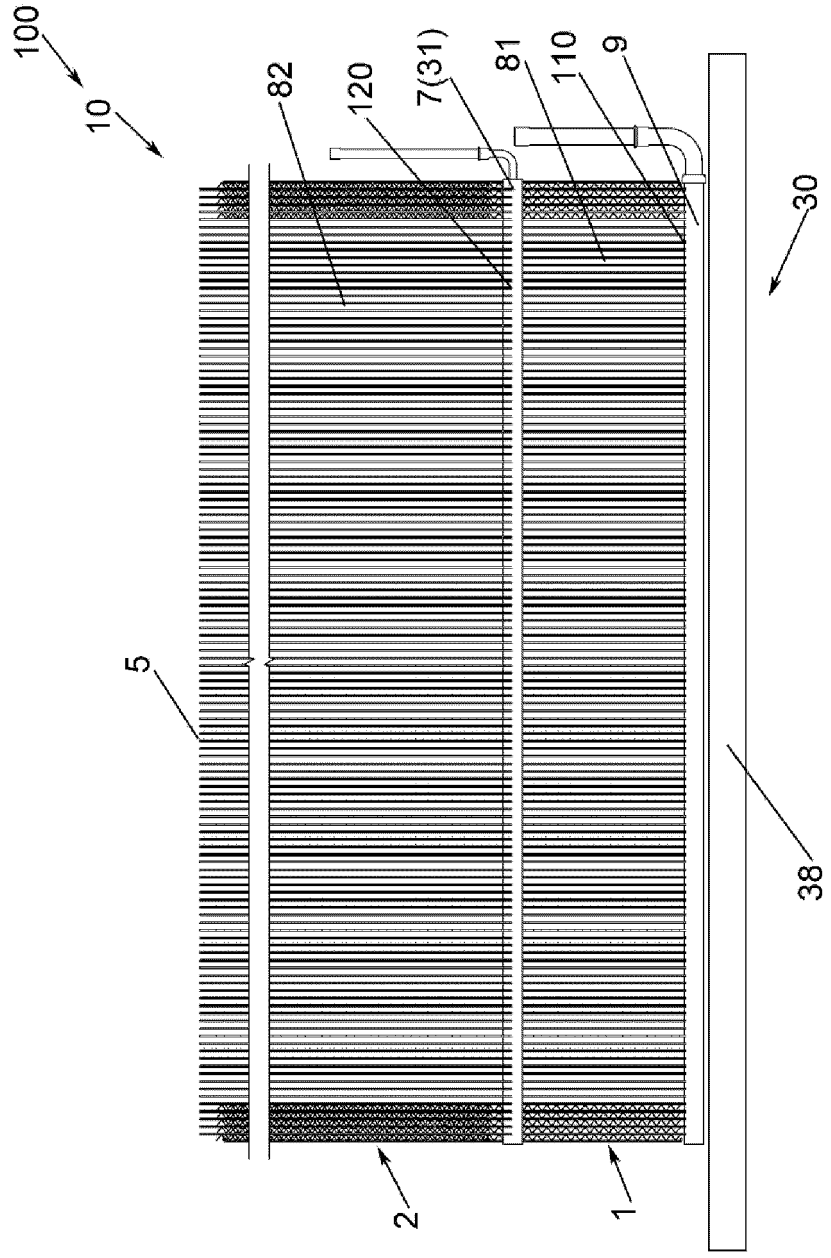


Fig. 17

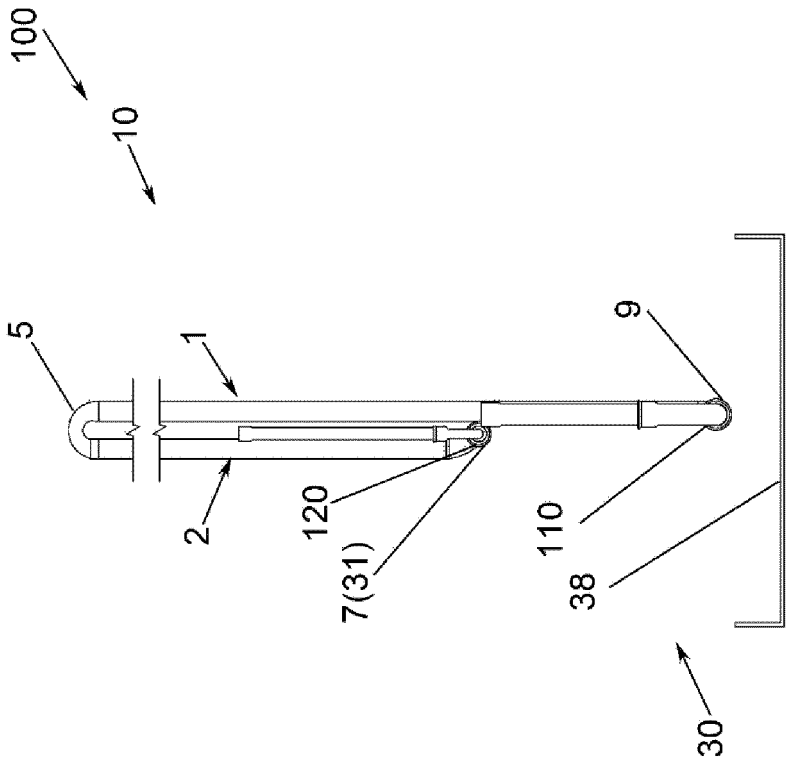


Fig. 18

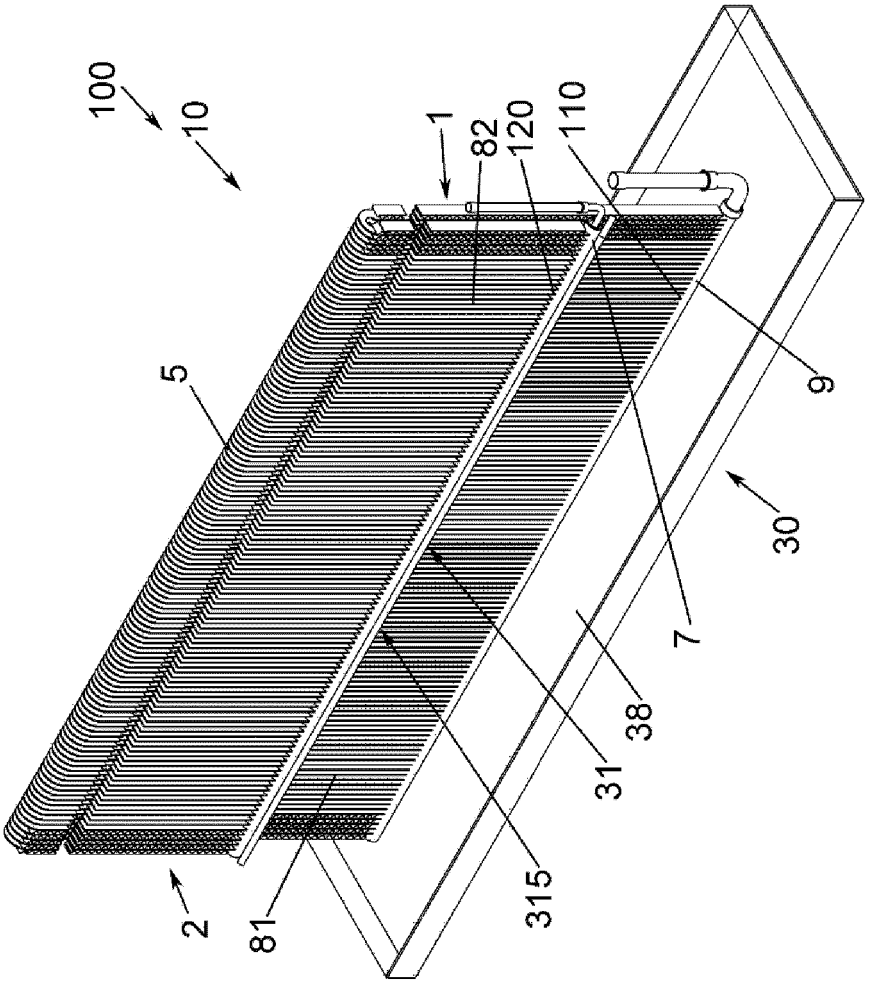


Fig. 19

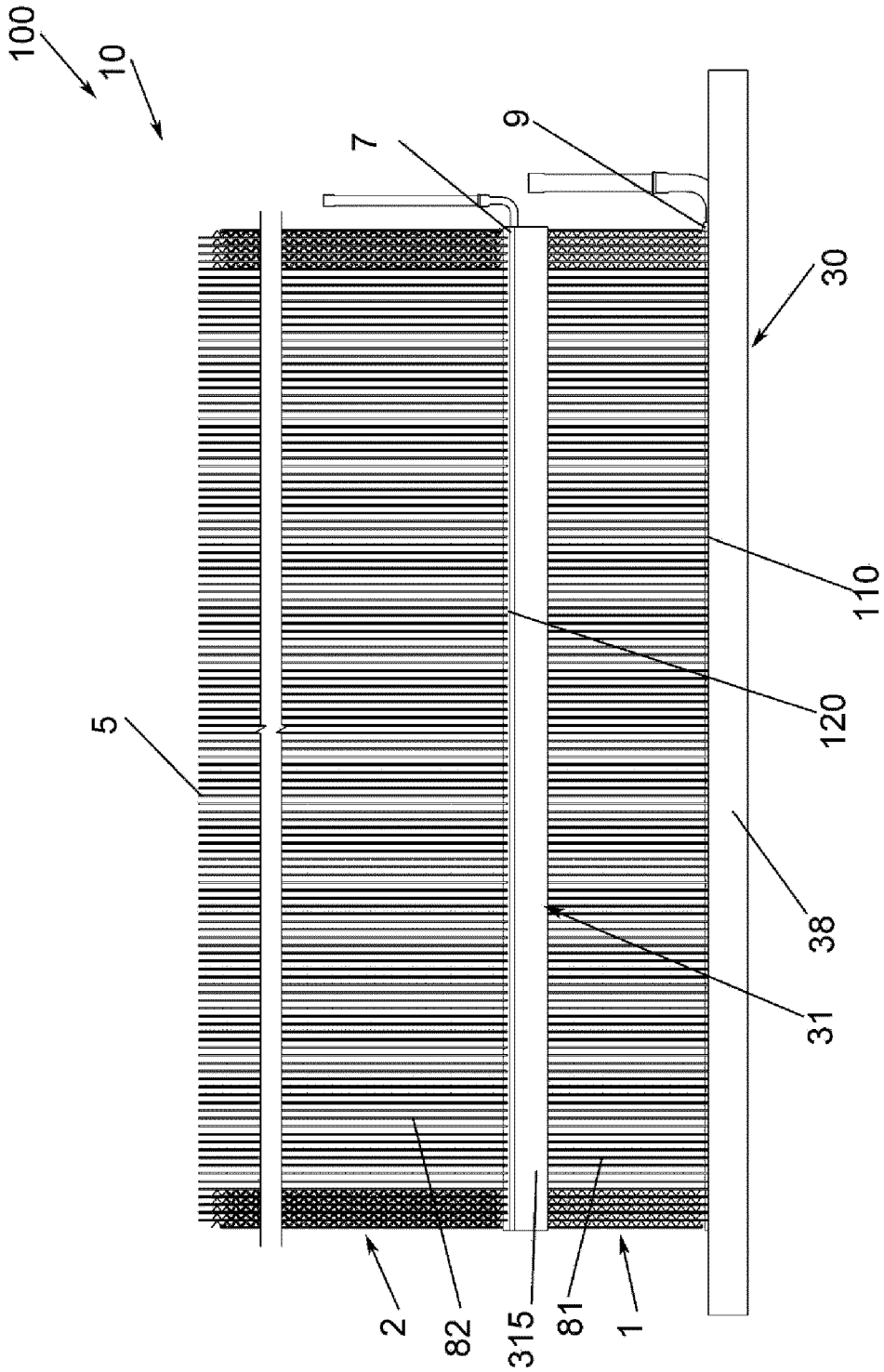


Fig. 20

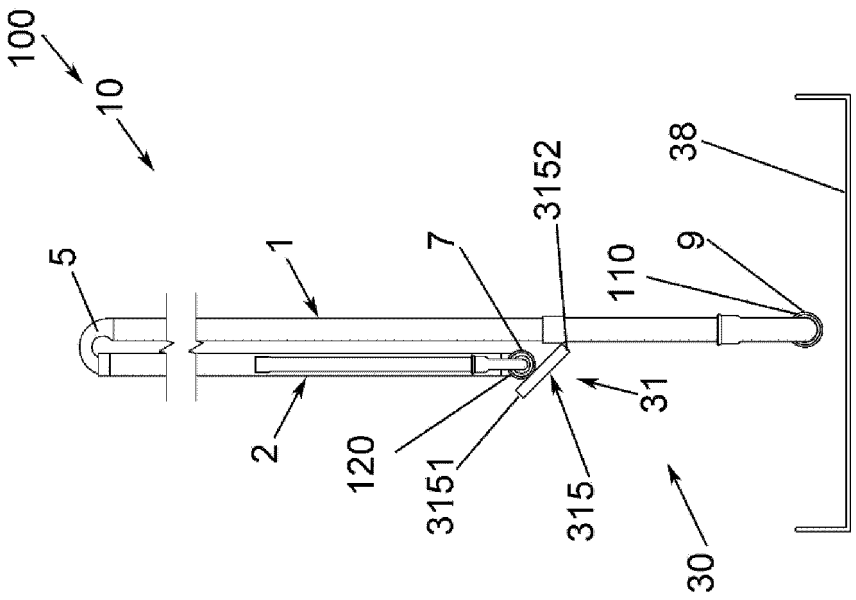


Fig. 21

# INTERNATIONAL SEARCH REPORT

International application No.
**PCT/CN2022/132757**

**A. CLASSIFICATION OF SUBJECT MATTER**

F28F9/02(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)

F28

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)

CNTXT, DWPI, ENTXTC, VEN, WPABS, WPABSC: 导流, 导水, 换热, 集管, 集流管, 歧管, 冷凝水, 接水, 接水盘, 芯体, 吹水, guid+, water, exchang+, manifold, condensat+, pan, cor+, water w blowing

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| PX | CN 216694564 U (DANFOSS AS) 07 June 2022 (2022-06-07)<br>description, paragraphs [0047]-[0060], and figures 1-21 | 1-20 |
| PX | CN 217716107 U (SANHUA (HANGZHOU) MICRO CHANNEL HEAT EXCHANGER CO., LTD.) 01 November 2022 (2022-11-01)<br>description, paragraphs [0084]-[0023], and figures 1-50 | 1-4, 20 |
| X | JP H1073285 A (CORONA CORP.) 17 March 1998 (1998-03-17)<br>description, paragraphs [0005]-[0021], and figure 5 | 1-2, 8-10, 15, 18, 19 |
| Y | JP H1073285 A (CORONA CORP.) 17 March 1998 (1998-03-17)<br>description, paragraphs [0005]-[0021], and figure 5 | 3-7, 11-14, 16, 17 |
| Y | CN 211824033 U (SANHUA (HANGZHOU) MICRO CHANNEL HEAT EXCHANGER CO., LTD.) 30 October 2020 (2020-10-30)<br>description, paragraphs [0032]-[0059], and figures 1-9 | 3-4, 17 |
| Y | JP 2006242458 A (DENSO CORP.) 14 September 2006 (2006-09-14)<br>description, paragraphs [0025]-[0080], and figures 1-9 | 5-7, 11-14, 16 |

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* 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 | Date of mailing of the international search report |
|---|---|
| **29 January 2023** | **08 February 2023** |
| Name and mailing address of the ISA/CN<br>**China National Intellectual Property Administration (ISA/CN)**<br>**China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**<br>Facsimile No. **(86-10)62019451** | Authorized officer<br><br>Telephone No. |

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/132757

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
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| A | CN 202902995 U (SANHUA HOLDING GROUP CO., LTD.; DANFOSS A/S) 24 April 2013 (2013-04-24)<br>entire document | 1-20 |
| A | JP 2014145490 A (SHARP K. K.) 14 August 2014 (2014-08-14)<br>entire document | 1-20 |

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**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
**PCT/CN2022/132757**

| Patent document cited in search report | | | Publication date (day/month/year) | Patent family member(s) | Publication date (day/month/year) |
|---|---|---|---|---|---|
| CN | 216694564 | U | 07 June 2022 | None | |
| CN | 217716107 | U | 01 November 2022 | None | |
| JP | H1073285 | A | 17 March 1998 | None | |
| CN | 211824033 | U | 30 October 2020 | None | |
| JP | 2006242458 | A | 14 September 2006 | None | |
| CN | 201926095 | U | 10 August 2011 | None | |
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