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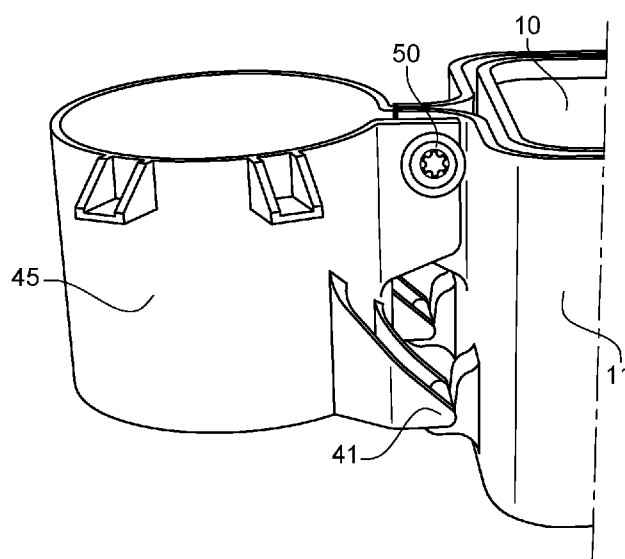
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(54) Title: A HEAT EXCHANGER ASSEMBLY

Fig. 2



(57) Abstract: A heat exchanger assembly, comprising a core (10) and a bottle (20) connected releasably to the core (10) through a first connection (30) configured for fluid communication, wherein the bottle (20) is further connected to the core (10) through a second connection (40), which is configured to enable movement between the bottle (20) and the core (10) when the first connection (30) is released.



A HEAT EXCHANGER ASSEMBLY

5 FIELD OF THE INVENTION

The invention relates to heat exchangers equipped with a bottle. In particular, it relates to condensers equipped with a receiver-drier bottle.

BACKGROUND OF THE INVENTION

10 Heat exchangers for exchanging heat between a first heat exchange medium and a second heat exchange medium are known. An example of such heat exchanger is a condenser utilized within a vehicle air-conditioning loop. A condenser can exchange heat between a refrigerant and air (commonly known air condenser). In another option, a condenser can exchange heat between a refrigerant and a second fluid
15 (commonly known as a plate condenser or water condenser).

A condenser can be equipped with a bottle, in particular a receiver drier bottle. The receiver drier bottle is implemented in the refrigerant fluid circuit to collect and trap liquid and moisture out of the refrigerant fluid, as well as for filtering purposes.

In most cases, for example due to packaging requirements, influence on separation
20 of gas from fluid etc., the receiver drier bottle is positioned vertically in a vehicle. The fluid connection between the core and the bottle is carried out by means of connecting means adapted for conveying the fluid between the core and the bottle. It can occur that the bottle will need removing, for instance for servicing purposes. If the connecting means for conveying the fluid are attached to the top of the bottle,
25 due to space constrains it may be difficult to remove the bottle by pulling it out vertically from the vehicle. For example, the connecting means may stand in the way of the bottle.

It is an object of the invention to provide a heat exchanger assembly with a bottle, which would be adapted for simplified removal of said bottle in environment of restricted space availability.

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SUMMARY OF THE INVENTION

The object of the invention is a heat exchanger assembly comprising a core and a bottle connected releasably to the core through a first connection configured for fluid communication, wherein the bottle is further connected to the core through a second
10 connection, which is configured to enable movement between the bottle and the core when the first connection is released.

Preferably, the second connection comprises a hinge joint enabling hinge movement between the core and the bottle.

Preferably, the hinge joint is releasable.

15 Preferably, the axis A of the hinge joint is parallel to the axis A of the bottle.

Preferably, the axis A of the hinge joint is perpendicular to the axis A of the bottle.

Preferably, the second connection further comprises a fixing arrangement adapted to prevent releasing of the bottle.

Preferably, the fixing arrangement is releasable.

20 Preferably, the fixing arrangement is further adapted to prevent the hinging motion of the hinge joint.

Preferably, the second connection comprises a bottle portion adapted to frictionally hold the bottle.

Preferably, the second connection comprises a core portion adapted to frictionally
25 hold the core.

Preferably, the second connection comprises a core portion integral with the core.

Preferably, the second connection comprises a bottle portion integral with the bottle.

Preferably, the heat exchanger is a plate condenser.

Preferably, the heat exchanger is an air condenser.

5

BRIEF DESCRIPTION OF DRAWINGS

Examples of the invention will be apparent from and described in detail with reference to the accompanying drawings, in which:

10

Fig. 1 shows a heat exchanger assembly according to the first exemplary embodiment;

Fig. 2 shows a closer view of connections between the bottle portion and the core portion of the assembly;

15 Fig. 3 shows details of the bottle portion in front view;

Figs. 4a-4c show various stages of bottle decoupling in the first exemplary embodiment;

Figs. 5a and 5b show various stages of bottle decoupling in the second exemplary embodiment;

20 Fig. 6 and Fig. 7 present two examples of hinged connection;

Figs. 8a and 8b show various stages of bottle decoupling in the third exemplary embodiment;

Fig. 9 presents detailed view of connections between the bottle and the core of the third exemplary embodiment.

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DETAILED DESCRIPTION OF EMBODIMENTS

Fig. 1 shows a heat exchanger assembly according to the first exemplary embodiment. The heat exchanger assembly comprises a core 10 and a bottle 20, in particular a receiver drier bottle.

The bottle 20 is connected releasably to the core 10 through a first connection 30. The first connection 30 is configured to enable fluid communication between the bottle 20 and the core 10 in a known manner, so that the heat exchanger fluid, in particular the refrigerant, can flow between those two elements. In the shown example, the first connection 30 comprises a connector 32 inserted into the bottle 20 and fixed by means of a screwed connection 31. The first connection 30 further comprises a tube 33 which connects the connector 31 with the core 10.

The bottle 20 is further connected to the core 10 through a second connection 40. The second connection 40 is configured to enable movement between the bottle 20 and the core 10 when the first connection 30 is released. In other words, when the connection 30 is released, the bottle 20 is enabled to move in a character defined by the second connection 40. One of examples of such definition is a hinging motion of the bottle 20 with respect to the core 10. In the shown example, there is a hinge joint 41 between the core 10 and the bottle 20. The hinge joint 41 can be realised by additional elements cooperating with the core 10 and the bottle 20. In other envisaged options, at least part of the hinge joint components is integral with any of the bottle 20 and the core 10. In one of the envisaged examples, the hinge joint components are integral with bottle 20 and with the core 10, i.e. one component of the hinge joint is integral with the bottle 20 and the other component is integral with the core 10.

Fig. 2 presents a closer view of connections between the bottle portion and the core portion of the assembly. The second connection 40 comprises a bottle portion 45 and the core portion 11. In this case, the bottle portion 45 and the core portion 11 are adapted to frictionally hold respectively the bottle 20 and the core 10. In greater detail, the bottle portion 45 is shaped so that it at least partially encloses the bottle 20

so that its inner surface engages frictionally the outer surface of the bottle 20. Similarly, the core portion 11 is shaped so that it at least partially encloses the core 10 so that its inner surface engages frictionally to the outer surface of the core 10 (e.g. to the outer edges of plates constituting the core).

5 The second connection 40 may further comprise a fixing arrangement 50 adapted to prevent releasing of the bottle 20. In particular, the releasing of the bottle 20 may be controlled (i.e. prevented and/or allowed) by means of a fixing arrangement 50. In this case, the tightening action of the screw prevents release of the bottle. The fixing arrangement 50 may be releasable. The fixing arrangement 50 may be further
10 adapted to prevent the movement which would normally be enabled by the second connection 40. In this case, the fixing arrangement 50 is adapted to prevent the hinging motion of the hinge joint 41.

Fig. 3 shows details of the bottle portion 45 in front view. The bottle portion 45 has a guiding portion 52 which adapted to guide a component of the fixing arrangement 50.
15 Preferably, it is angled to further facilitate the removal of the bottle.

Figs. 4a-4c show various stages of bottle 20 docoupling in the first exemplary embodiment. In Fig. 4a, the bottle 20 is the starting position. In other words, the bottle 20 is arranged as it would be during the operation of the heat exchanger. The first connection 30 is still attached to the bottle 20, the second connection 40 is in its
20 first position. In Fig. 4b it can be observed that the first connection 20 becomes detached. In particular, the screw 31 and the connector 32 are removed from the bottle 20, so that the tube 33 is no longer providing fluid connection between the bottle 20 and the core 10. The fixing arrangement 50 is also released, in this case by removal of the screw from the guiding portions 52 and 53 of the bottle portion 45 and
25 the core portion 11 respectively. The bottle 20 is allowed to be moved downwards. In Fig. 4c the bottle 20 is angled with respect to its normal position, i.e. it performed a hinged movement about the axis of the hinge 41 of the second connection 40. As it is now not directly under the pipe 33, which in most cases is of a fixed position, it can be easily removed from the bottle portion 45. This is especially beneficial in tight
30 spaces within the vehicle, where the space is limited and the bottle can be moved on only short distances before encountering other vehicle's components.

Figs. 5a and 5b show various stages of bottle decoupling in the second exemplary embodiment. In this example, the second connection comprises a hinge 42 allowing the movement of the bottle 20 with respect to the core 10 about an axis which is substantially parallel the the axis of the bottle 20. Other components of the assembly remain analogous. In Fig. 5a, when the connection 30 is not detached, the bottle 20 is under the tube 33 and the connector 32 when viewed from above, along the axis A of the bottle 20. In Fig. 5b, when the connection 30 is detached, the bottle 20 is moved in a manner allowed by the second connection 40 to a position in which the obstruction by the elements of second connection 30 is reduced. In other words, the elements of the second connection 30, in this case the tube 33 and the connector 32, obstruct the removal of the bottle 20 to a lesser degree. In this case, the bottle 20 can be removed along its axis A and the placement of the connector 32 and the tube 33 is no longer problematic.

It is envisaged that the examples of movement allowed by the second connection 30 shown in Figs. 4a-4c and 5a-5b can be utilized in different scenarios, depending on the space availability and specific requirements.

Fig. 6 and Fig. 7 present two examples of hinged connection. In particular, Fig. 6 shows an example in which the hinge is adapted for an easy assembly and/or release of the components. In Fig. 7, the assembly and/or release of the components is hindered in a sense it requires additional force to be imparted. This maybe advantageous during manufacturing of the assembly, for example for handling the components before final fixing.

Figs. 8a and 8b show various stages of bottle decoupling in the third exemplary embodiment. In this case, the core 10 is that of an air heat exchanger, in this case condenser, where the bottle 20 is placed in parallel to the plane of the core 10. Fig. 8a shows the bottle 20 in which the first connection 30 is not detached. In this case, the bottle 20 may be screwed or plugged in a socket connected with the manifold of the core to provide a fluid connection. In Fig. 8b, the first connection 30 becomes detached so that the bottle 20 can be moved in a manner defined by the second connection 40, after its removal from the socket.

Fig. 9 presents detailed view of connections between the bottle 20 and the core 10 of the example of Fig. 8. In this case, the core portion 11 is integral with the manifold,

e.g. brazed to it, but it may be also attached to the core 10 in other ways. The bottle portion 45 at least partially encompasses the bottle 20. The hinge 43 of the second connection 40 has a hinge axis B which is substantially parallel to the bottle axis A. The second connection 40 is releasable in an analogous manner to the previous

5 examples.

Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of drawings, the disclosure, and the appended claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of

10 these measures cannot be used to the advantage.

Claims

1. A heat exchanger assembly, comprising a core (10) and a bottle (20) connected releasably to the core (10) through a first connection (30) configured for fluid communication, wherein the bottle (20) is further connected to the core (10) through a second connection (40), which is configured to enable movement between the bottle (20) and the core (10) when the first connection (30) is released.
2. A heat exchanger assembly according to claim 1, wherein the second connection (40) comprises a hinge joint (41, 42, 43) enabling hinge movement between the core (10) and the bottle (20).
3. A heat exchanger assembly according to claim 2, wherein the hinge joint (41, 42, 43) is releasable.
4. A heat exchanger assembly according to claim 2 or 3, wherein the axis A of the hinge joint (41) is parallel to the axis (A) of the bottle (20).
5. A heat exchanger assembly according to claim 2 or 3, wherein the axis A of the hinge joint (42, 43) is perpendicular to the axis (A) of the bottle (20).
6. A heat exchanger assembly according to any preceding claim, wherein the second connection (40) further comprises a fixing arrangement (50) adapted to prevent releasing of the bottle (20).
7. A heat exchanger assembly according to claim 6, wherein the fixing arrangement (50) is releasable.

8. A heat exchanger assembly according to claim 7, wherein the fixing arrangement (50) is further adapted to prevent the hinging motion of the hinge joint (41, 42, 43).

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9. A heat exchanger assembly according to any preceding claims, wherein the second connection (40) comprises a bottle portion (45) adapted to frictionally hold the bottle (20).

10 10. A heat exchanger assembly according to any preceding claims, wherein the second connection (40) comprises a core portion (11) adapted to frictionally hold the core (10).

11 11. A heat exchanger assembly according to any of claims 1-9, wherein the second connection (40) comprises a core portion (12) integral with the core (10).

12. A heat exchanger assembly according to any of claims 1-9 or 11, wherein the second connection (40) comprises a bottle portion (41) integral with the bottle (20).

20 13. A heat exchanger assembly according to any preceding claim, wherein the heat exchanger is a plate condenser.

14. A heat exchanger assembly according to any preceding claim, wherein the heat exchanger is an air condenser.

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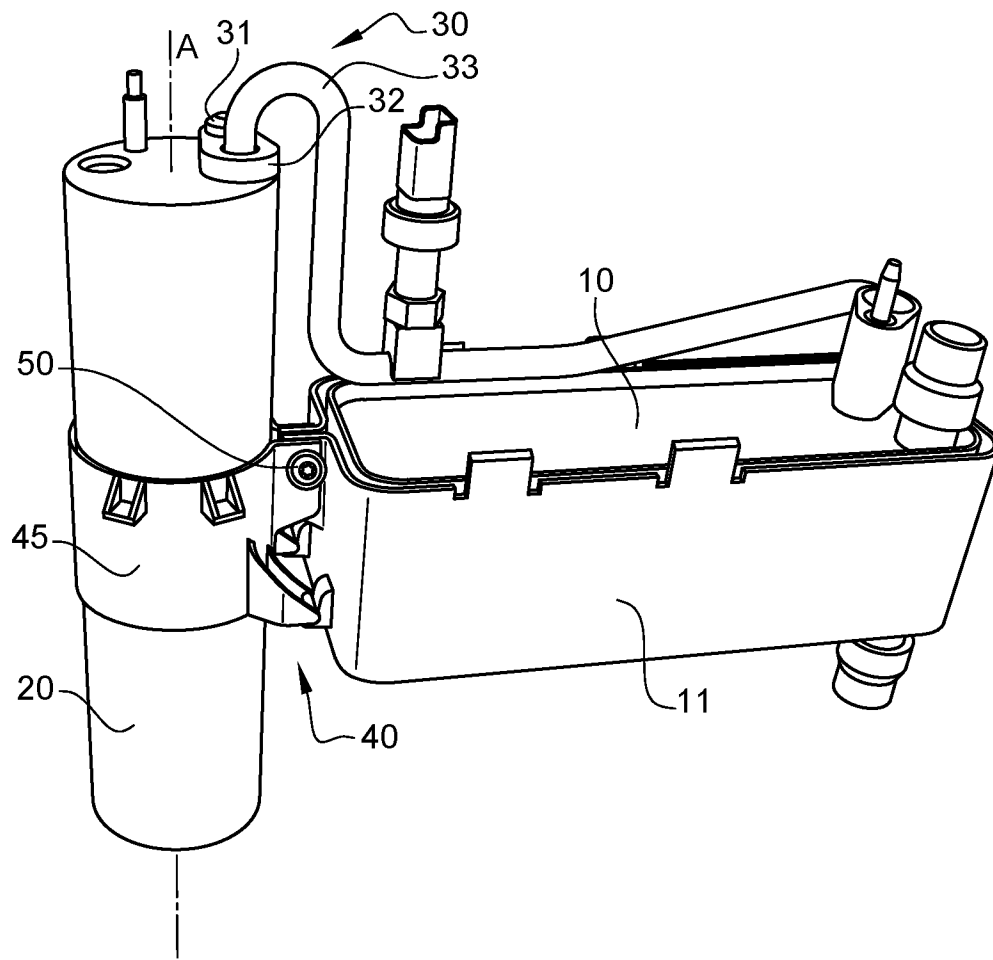
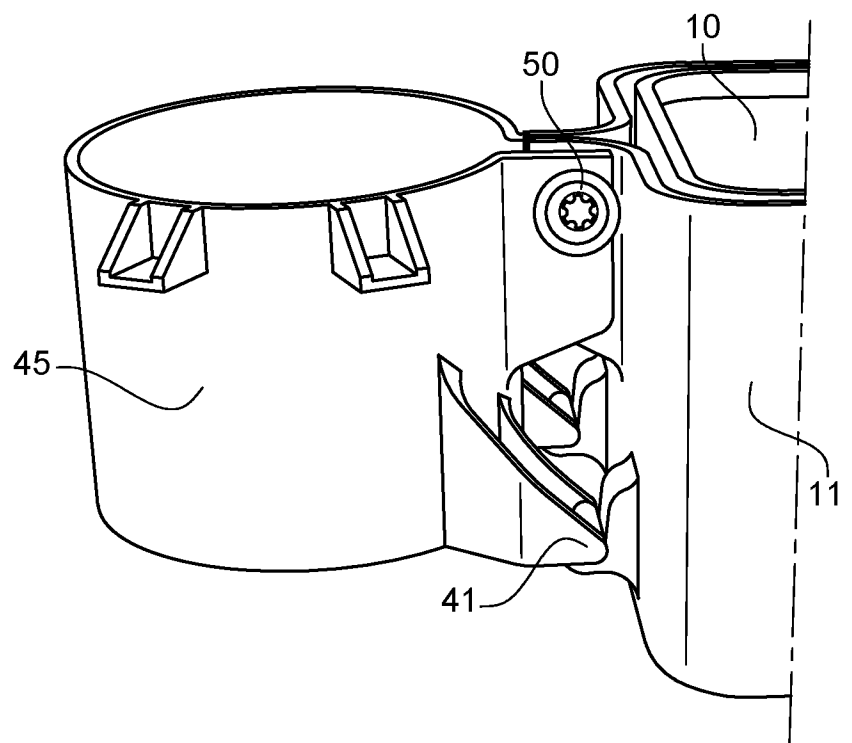


Fig. 1

Fig. 2



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Fig. 3

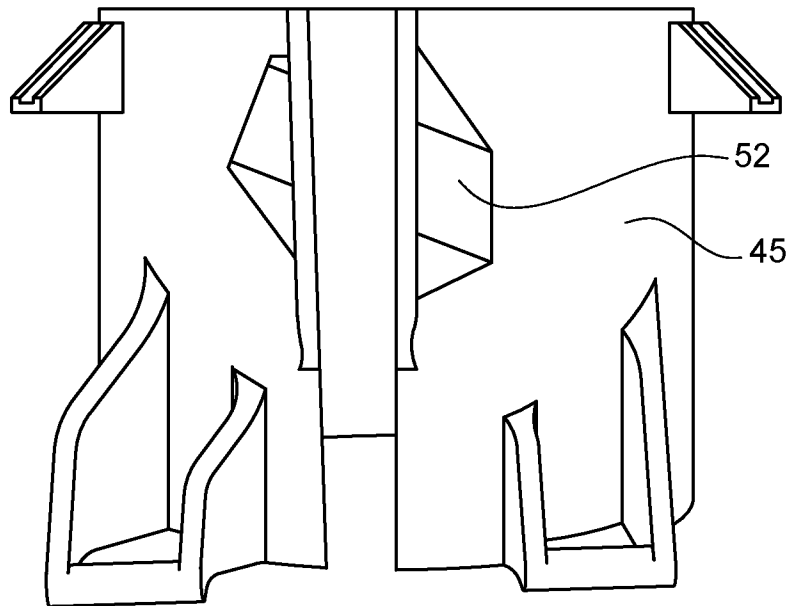


Fig. 4a

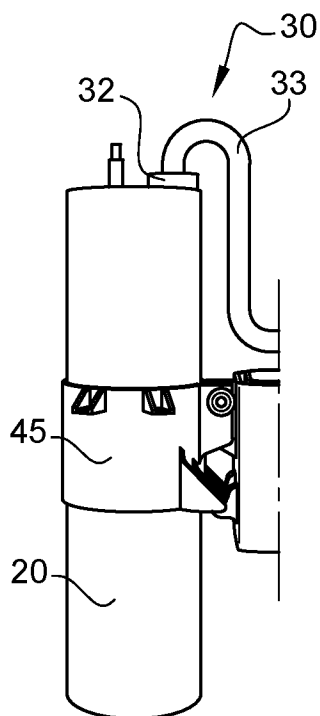


Fig. 4b

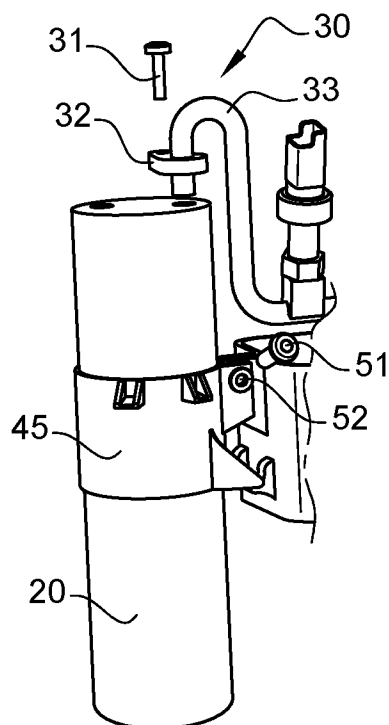


Fig. 4c

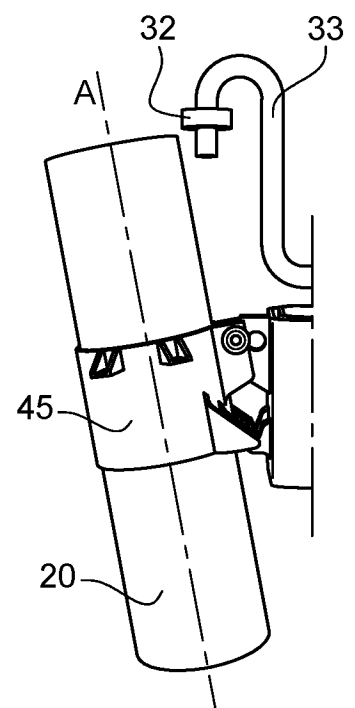


Fig. 5a

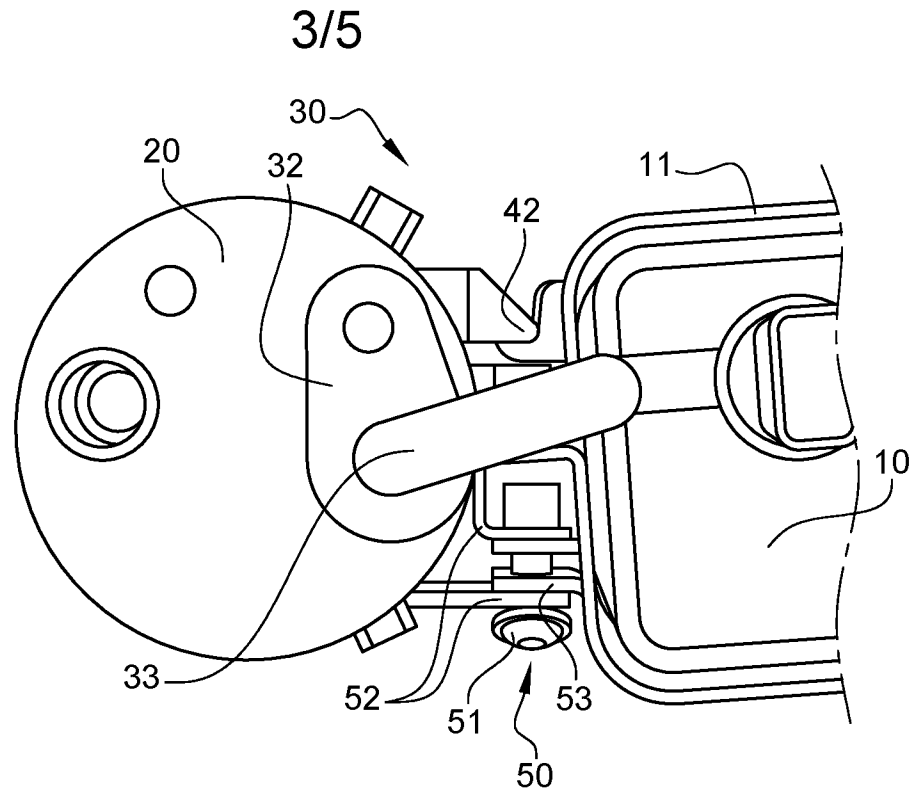
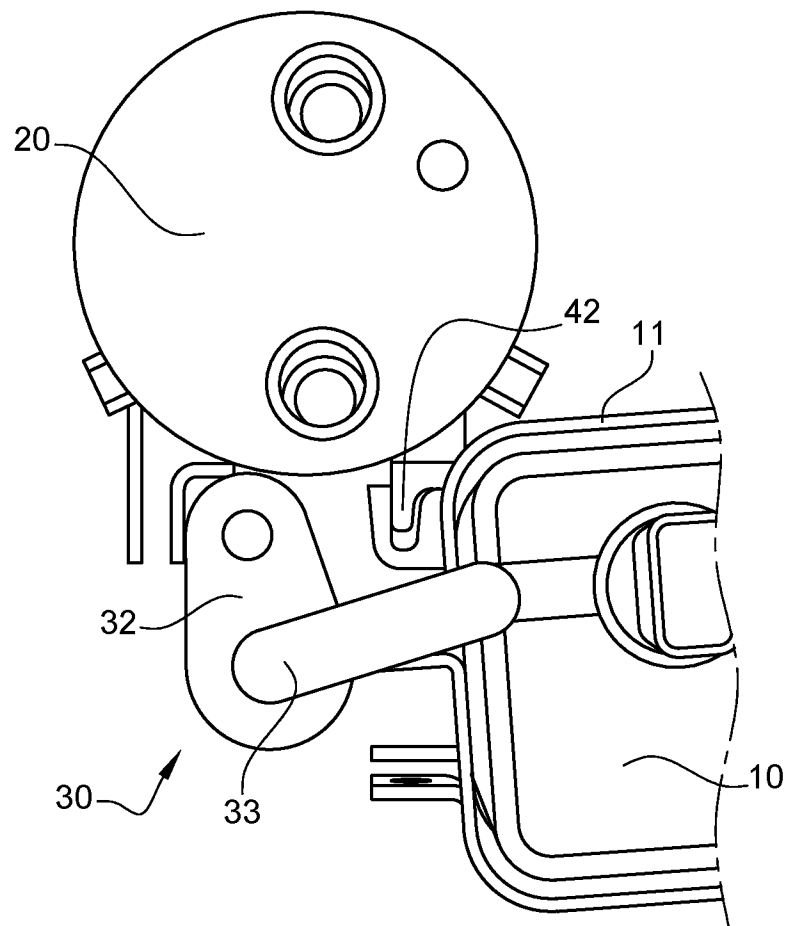


Fig. 5b



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Fig. 6

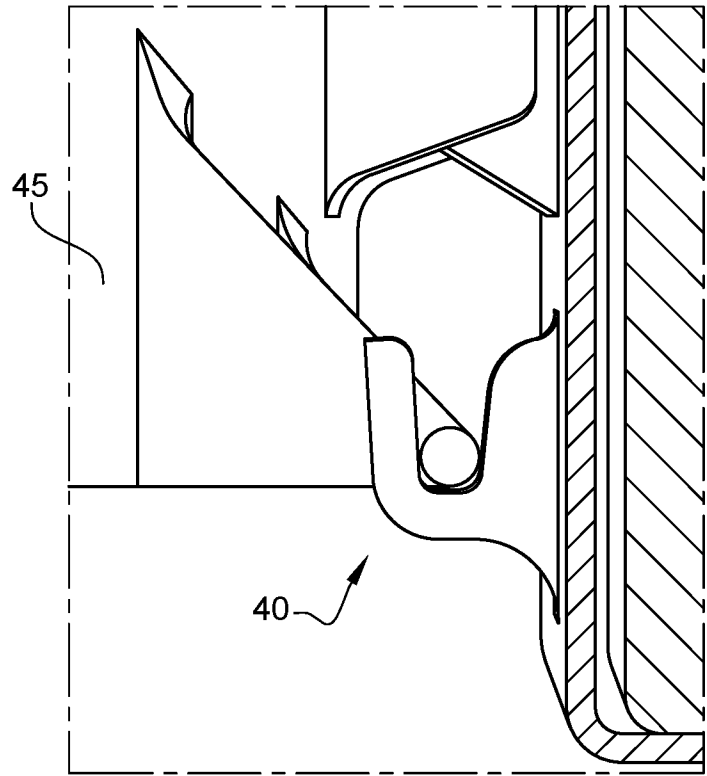
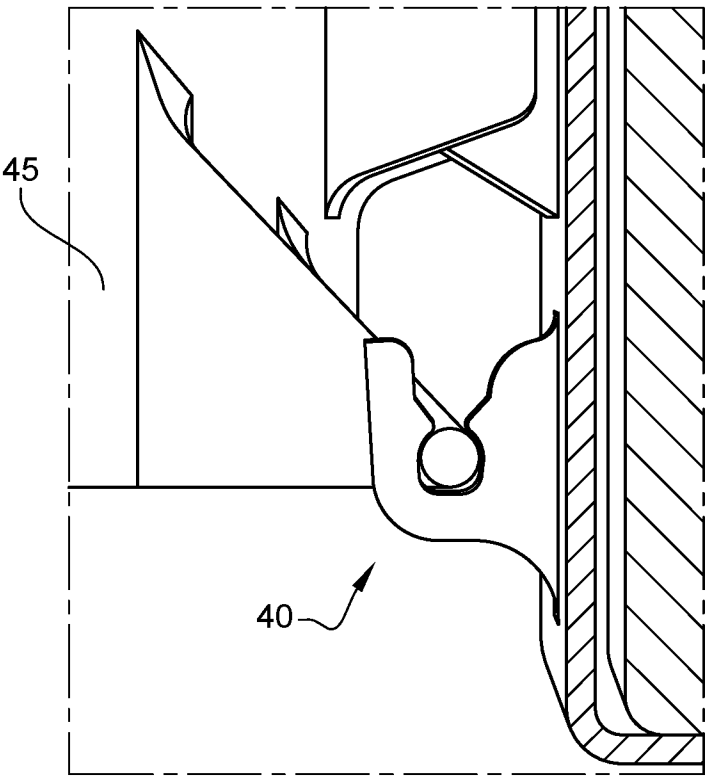


Fig. 7



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Fig. 8a

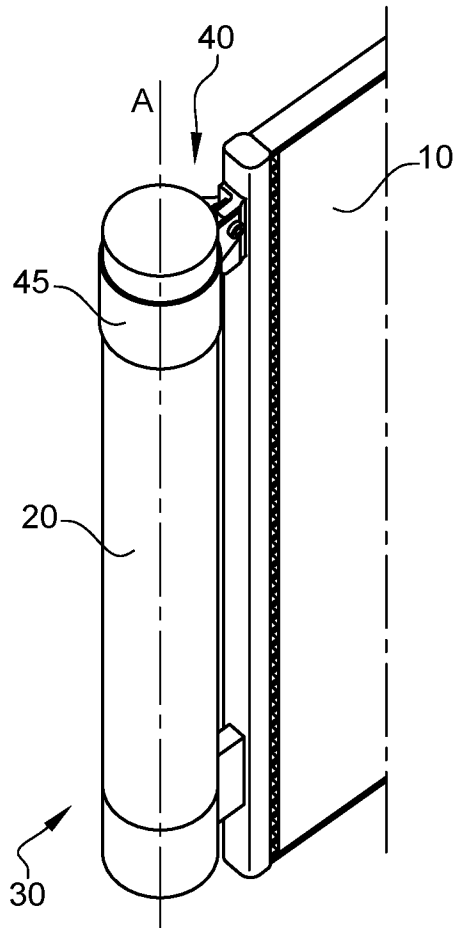


Fig. 8b

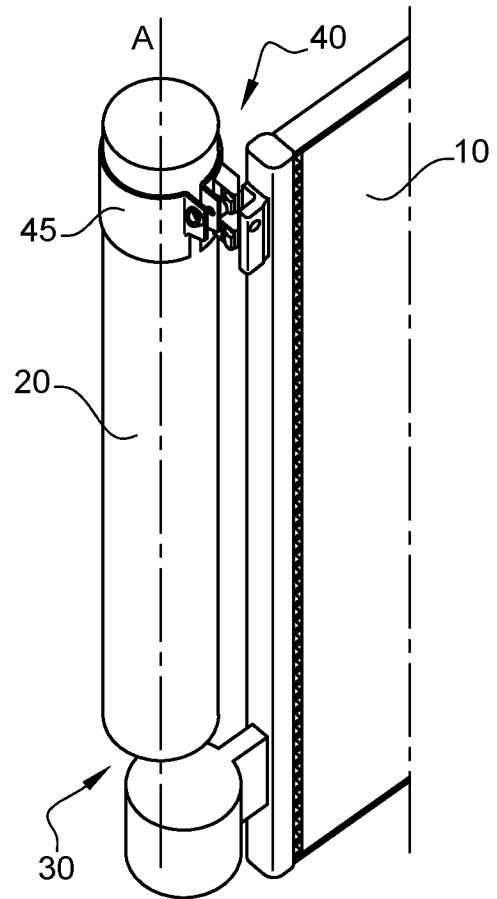
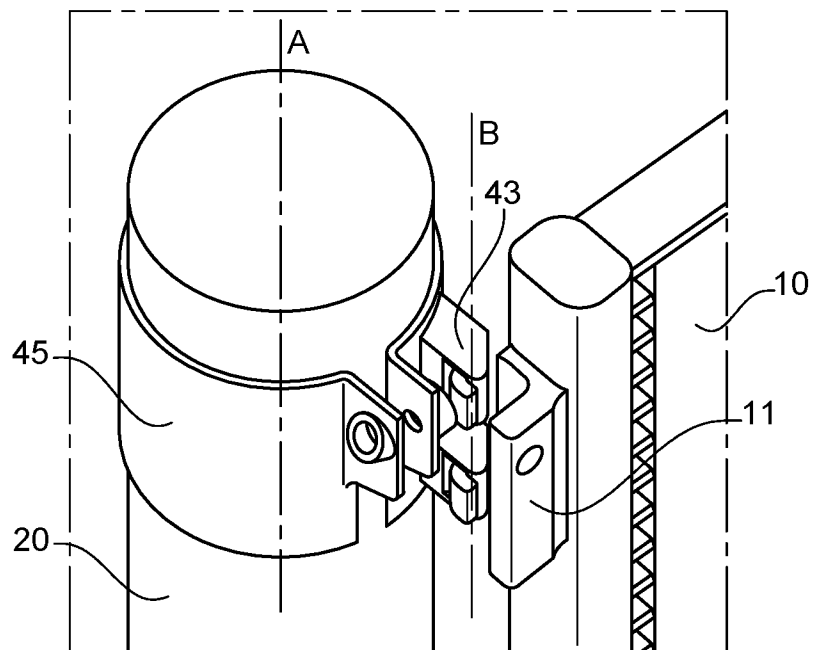


Fig. 9



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/057927

A. CLASSIFICATION OF SUBJECT MATTER
INV. F25B39/04
ADD.

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)
F25B F28D

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 901 573 A (KOBAYASHI HIDEO [JP]) 11 May 1999 (1999-05-11) figures 13-15 -----	1-3,5-7, 11,12,14
X	EP 3 444 545 A1 (VALEO AUTOSYSTEMY SP Z O 0 [PL]) 20 February 2019 (2019-02-20) figure 6 -----	1-3,10, 13
X	EP 3 444 544 A1 (VALEO AUTOSYSTEMY SP Z O 0 [PL]) 20 February 2019 (2019-02-20) figure 1 -----	1,13
X	EP 1 454 779 A2 (SANDEN CORP [JP]) 8 September 2004 (2004-09-08) the whole document -----	1,4,10
X	JP H10 267467 A (CALSONIC CORP) 9 October 1998 (1998-10-09) figure 7 -----	1,4,5, 8-10,14



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

7 April 2020

Date of mailing of the international search report

21/04/2020

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2020/057927

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5901573 A	11-05-1999	KR 970028267 A US 5901573 A	24-06-1997 11-05-1999
EP 3444545 A1	20-02-2019	EP 3444545 A1 WO 2019034643 A1	20-02-2019 21-02-2019
EP 3444544 A1	20-02-2019	EP 3444544 A1 WO 2019034647 A1	20-02-2019 21-02-2019
EP 1454779 A2	08-09-2004	EP 1454779 A2 JP 2004268615 A	08-09-2004 30-09-2004
JP H10267467 A	09-10-1998	JP 3963518 B2 JP H10267467 A	22-08-2007 09-10-1998