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

(11) **EP 2 051 036 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.04.2009 Bulletin 2009/17

(51) Int Cl.:
F28F 9/04 *(2006.01)* ***F28F 9/26*** *(2006.01)*

(21) Application number: **08017524.3**

(22) Date of filing: **06.10.2008**

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

(30) Priority: **18.10.2007 DE 102007049932**

(71) Applicant: **AGCO GmbH**
87616 Marktoberdorf (DE)

(72) Inventor: **Honzek, Robert**
87647 Oberthingau (DE)

(74) Representative: **Morrall, Roger**
AGCO Limited
Abbey Park
Stoneleigh
Kenilworth CV8 2TQ (GB)

(54) **Connecting element for a fluid bearing pivotal component**

(57) The invention relates to a connecting element (1), for example for a heat exchanger (3). The connecting element (1), which has an inlet line (13) and an outlet line (14), is rotatably arranged around an inlet element (35) projecting from a housing (34) of the heat exchanger. The connecting element (1) is also connected to a support (2) which is pivotally mounted at its end remote from the connecting element (1) on a bearing (21) carried by the heat exchanger.

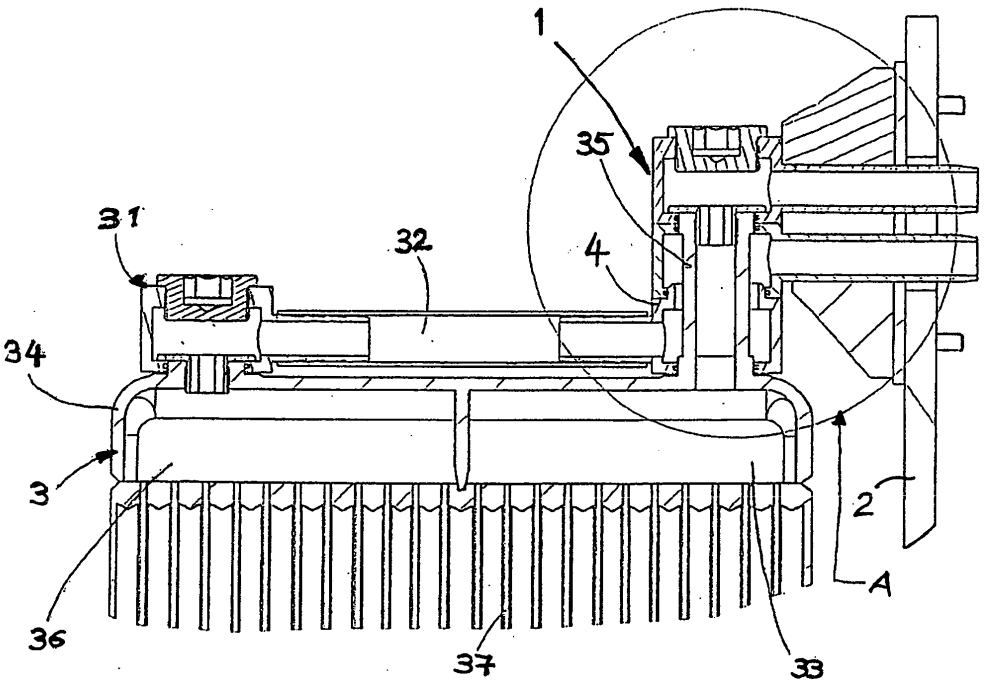

FIG. 2.

EP 2 051 036 A1

Description

[0001] The invention relates to a connecting element for a fluid containing pivotal component, in particular a heat exchanger.

[0002] Cooling of utility vehicles, in particular of farm machinery and construction machinery, takes place by means of a plurality of cooling circuits integrated into the utility vehicles, inside which circuits a heat exchanger may be fitted in each case. The heat exchangers ensure that a coolant cannot exceed a specific temperature. Owing to the limited space available inside the utility vehicles the heat exchangers are fitted so as to be optimally compact, the heat exchangers conventionally being arranged in succession in the direction of travel of the utility vehicle. The individual heat exchangers are fitted in the utility vehicles so as to be non-rotatable. The heat exchangers also each comprise an inlet line and an outlet line for supplying and removing the coolant into the heat exchangers.

[0003] The compact and non-rotatable arrangement of the heat exchangers inside the utility vehicles makes access to a particular heat exchanger difficult during repair, cleaning and maintenance tasks. It is precisely when utility vehicles are used in a dusty environment, such as use of farm tractors on dry soils, that particles of dirt and dust cannot be prevented from accumulating in the cooling meshes of the heat exchangers. These particles of dirt and dust therefore have to be removed several times a day using brooms, compressed air or high pressure cleaners in order to prevent a reduction in the effectiveness of cooling of the utility vehicle. The heat exchangers are not accessible due to the successive and non-rotatable arrangement thereof. Individual heat exchangers of the cooling system are accordingly arranged to move, so they can be pivoted about an axis of rotation and/or linearly displaced for cleaning and are therefore freely accessible.

[0004] EP 0 952 024 discloses a radiator arrangement of a motor vehicle in which the heat exchangers are not arranged in succession but are spatially arranged around a chamber. Providing that at least one heat exchanger is arranged so as to move, accessibility in order to remove dirt is much improved.

[0005] A requirement of all the movably arranged heat exchangers known from the prior art however is that the inlet and outlet lines for supplying and removing the coolant are flexible rather than rigid. In practice hose lines are used for this purpose which, owing to the flexibility of the hose, allow movement of the heat exchanger.

[0006] Use of hose lines has the drawback however that production costs are much higher compared with inflexible pipe lines. The screw joints used for connecting the inlet and outlet lines may also become loose due to the movement of the hose line and can therefore lead to leaks. The movement of the heat exchangers also means that the hose lines have to have an excess length. This additional installation space reduces the overall installation space in the region of the cooling system. Sharp edges also have to be avoided in the region of movable hose lines in order to prevent damage to the surface of the hoses during movement. It is precisely in utility vehicles with fewer units that predominantly sharp-edged but inexpensive sheet metal parts are used, these edges thus require edge protection elements.

[0007] The object underlying the present invention accordingly lies in constructing the heat exchangers inside the utility vehicle in such a way that they can move and the supply and removal of the coolant is implemented compactly and inexpensively.

[0008] This object is achieved according to the invention by a connecting element having the features of claim 1. Advantageous embodiments of the invention are identified in the subclaims.

[0009] The advantages achieved with the invention lie in particular in the fact that the connecting element, which comprises an inlet line and an outlet line, is rotatable about an inlet element of the heat exchanger thus allowing rotation of the heat exchanger without an additional adjustment of the inlet line and outlet line. The heat exchanger can thereby be simply rotated during cleaning, repair and/or maintenance without the described drawbacks of flexible hose lines having to be accepted and having to keep installation space for excess lengths available. Consequently cleaning, repair and/or maintenance of the heat exchangers are possible under operationally reliable and cost-optimised circumstances.

[0010] A further advantage lies in the fact that the connecting element is coupled to both the inlet line and the outlet line, via which the fluid can flow into and out of the heat exchangers. This arrangement of the inlet line and outlet line in one component makes it possible to quickly and easily fit or disassemble the heat exchanger.

[0011] Details of the invention will be described in more detail with reference to the drawings, in which:

Fig. 1 shows a fluid bearing pivotal component with connecting element and support;

Fig. 2 shows a detail of a sectional view through the heat exchanger and the connecting element;

Fig. 3 shows an enlarged view of a first embodiment of the connecting element with a banjo bolt;

Fig. 4 shows a fastening element for fastening the connecting element to the support;

Fig. 5 shows an enlarged view of a second embodiment of the connecting element with axial fixing of an annular piece through a support.

[0012] Fig. 1 shows a fluid containing pivotable component 3, which will hereinafter be called a heat exchanger 3, comprising a connecting element 1 and a support 2. The fluid containing pivotable component 3 can also

be a filter for example.

[0013] The support 2 is rotatably coupled at one its ends to the connecting element 1 by at least one coupling element 51, 51'. At its end remote from the connecting element 1 the support 2 is also rotatably arranged in a bearing 21 that adjoins the heat exchanger 3. One side of the heat exchanger 3 also comprises an outlet element 31 which is connected to the connecting element 1 by a line 32.

[0014] Since the support 2 is permanently fitted in the utility vehicle and the heat exchanger 3 is rotatably mounted on the connecting element 1 and the bearing 21, the heat exchanger 3 can be rotated about the support 2 with the outlet element 31 and the line 32.

[0015] Fig. 2 shows a detail of a sectional view through the heat exchanger 3 and the connecting element 1 analogous to Fig. 1, the section plane extending through the centre line of the line 32 from Fig. 1.

[0016] The heat exchanger 3 comprises a housing 34 on which the outlet element 31 and an inlet element 35 are arranged. The inlet element 35 can be formed in this case for example by a connecting branch that projects from the housing 34. Arranged inside the housing 34 is a first reservoir 33 which is in fluid communication with the inlet element 35. A cooling mesh 37 is also arranged in the housing 34. Heat exchange of a fluid with air or a different fluid takes place across the cooling mesh 37. An additional second reservoir 36 arranged in the housing 34 is connected to the outlet element 31 and the cooling mesh 37.

[0017] The fluid can thus flow via the inlet element 35 into the first reservoir 33. Heat exchange of the fluid with air or a different fluid takes place across the cooling mesh 37 that is connected downstream of the first reservoir 33 before the fluid collects in the second reservoir 36. The fluid can leave the second reservoir 36 via the outlet element 31 and a line 32 connected downstream of the outlet element 31.

[0018] The inlet element 35 is surrounded by a connecting member 4 and the connecting element 1. The connecting element 1 is rotatably arranged on the inlet element 35 and the connecting member 4 is non-rotatably arranged on the inlet element 35. The connecting member 4 is also connected to the line 32. When the heat exchanger 3 is rotated about the support 2 the connecting member 4 co-rotates with the heat exchanger 3, while the connecting element 1, owing to its coupling to the support 2, remains in the original position.

[0019] Fig. 3 shows an enlarged view of a first embodiment of the connecting element 1 with a banjo bolt 18. The enlarged view corresponds to the region A designated in Fig. 2.

[0020] In the present embodiment the connecting element 1 comprises two annular pieces 11, 12 which are rotatably arranged on the inlet element 35. The first annular piece 11 is securely connected to the second annular piece 12 at one end respectively. For example the two annular pieces can be welded to each other. It is also possible for the connecting element 1 to be constructed in one piece or to comprise more than two annular pieces. At its end remote from the first annular piece 11 the second annular piece 12 is connected to the connecting member 4. The banjo bolt 18, which is connected to the first annular piece 11 and the inlet element 35, prevents axial movement of the first annular piece 11 and second annular piece 12. The end of the first annular piece 11 that is remote from the banjo bolt 18 is closed for example by a screw plug 180.

[0021] An inlet line 13 is also arranged on the first annular piece 11 and ends into a recess 17 located inside the first annular piece 11. A fluid is supplied via this inlet line 13 to the connecting element 1. This recess 17 is connected to the reservoir 33 via a passage 38 located in the inlet element 35. An outlet line 14, via which the fluid can flow out of the connecting element 1, is also arranged on the second annular piece 12.

[0022] In the present embodiment the first annular piece 11 is formed in one piece with the inlet line 13 and the second annular piece 12 is formed in one piece with the outlet line 14 respectively. However there is also the possibility for example that the connecting element 1 includes a respective threaded connection for an appropriately formed inlet line and outlet line.

[0023] The outlet line 14 is connected to a first cavity 19. The cavity 19 is formed between a circumferential surface of the external diameter of the inlet element 35 and a circumferential surface of the internal diameter of the second annular piece 12. The internal diameter of the second annular piece 12 can be variably configured by an appropriately shaped recess in the second annular piece 12 and an associated reduction in the material of the second annular piece 12, and the volume of the cavity 19 may thus be changed. The first cavity 19 is in fluid communication to a second cavity 19', arranged inside the connecting member 4, by a connecting passage 15.

[0024] The second cavity 19' is formed between the circumferential surface of the external diameter of the inlet element 35 and a circumferential surface of the internal diameter of the connecting element 4. The internal diameter, and therewith the volume of the cavity 19', can be influenced by an appropriately shaped recess in the connecting member 4 or by an associated reduction in the material of the connecting member 4. The cavity 19' is also in fluid communication with the line 32.

[0025] The fluid issuing from the outlet element (not visible in Fig. 3) of the heat exchanger can therefore flow into the cavity 19' via the line 32. The fluid flows onwards into the cavity 19 by means of connecting passage 15 and leaves the connecting element 1 via the outlet line 14.

[0026] To prevent escape of fluid from the respective cavities inside the connecting element 1 and inside the connecting member 4, sealing rings 16 are arranged in the transition region between the two annular pieces 11, 12 and in the transition region between the second annular piece 12 and the connecting member 4 for respective sealing of the transition region.

[0027] At least one coupling element 51, 51' is also arranged on one face of the connecting element 1. In this embodiment a first coupling element 51' is associated with the first annular piece 11 and a second coupling element 51 with the second annular piece 12. At the end that opposes the connecting element 1 the respective coupling element 51, 51' is coupled to a fastening element 5. The fastening element 5 can be constructed as a screw-on metal sheet for example and is connected to the support 2.

[0028] Fig. 4 shows a fastening element 5 for fastening the connecting element 1 to the holder 2. The fastening element 5, which is connected to the connecting element 1 by means of a coupling element 51, 51', is connected to the support 2, not shown in Fig. 4, for example by means of at least one screw connection 52. When the heat exchanger is rotated, corresponding rotation of the connecting element 1 is prevented by means of this connection of the fastening element 5 to the support 2 permanently connected in the utility vehicle.

[0029] Fig. 5 shows an enlarged view of a second embodiment of the connecting element with axial fixing of the annular pieces 11, 12 through the support 2. In this second embodiment the first annular piece 11 does not comprise a screw plug 180 (cf. Fig. 3) for sealing the first annular piece 11, or a banjo bolt 18 (cf. Fig. 3) for axially fixing the first and second annular pieces 11, 12.

[0030] The first and second annular pieces 11, 12 are axially fixed by screwing of the fastening element 5 coupled to the connecting element 1 to the support 2. Separate sealing of the first annular piece 11 on the end of the first annular piece 11 that is remote from the second annular piece 12 is no longer necessary therefore.

Claims

1. A connecting element (1) for a fluid containing pivotable component (3), comprising an inlet element (35) and an outlet element (31),
wherein

   - the connecting element (1) surrounds the inlet element (35) and is arranged so as to pivot about the inlet element (35),
   - the connecting element (1) comprises an inlet line (13) and an outlet line (14), wherein the inlet line (13) can be fluidically connected or is connected to a container or a continuative line via the inlet element (35),
   - the outlet line (14) is connected to a first cavity (19) provided between a circumferential surface of the external diameter of the inlet element (35) and a circumferential surface of the internal diameter of the connecting element (1), wherein the first cavity can be fluidically connected to the outlet element (31).

2. A connecting element according to claim 1, wherein the first cavity (19) is connected to a second cavity (19') that provided between the circumferential surface of the external diameter of the inlet element (35) and the circumferential surface of the internal diameter of a connecting member (4) that surrounds the inlet element, and the second cavity (19') can be fluidically connected to the outlet element (31).

3. A connecting element (1) according to any one of the preceding claims, wherein the connecting element (1) can be fastened to the inlet element (35) in the axial direction by means of a banjo bolt (18).

4. A connecting element according to any one of the preceding claims, wherein the connecting element (1) comprises two annular pieces (11, 12), wherein the inlet line (13) is arranged on a first annular part (11) and the outlet line (14) is arranged on a second annular part (12).

5. A connecting element according to any one of the preceding claims, wherein the connecting element (1) can be connected to a fastening element (5) by at least one coupling element (51, 51').

6. A connecting element according to claim 5, wherein the fastening element (5) can be fastened to a support (2).

7. A connecting element according to claim 6, wherein the end of the support (2) that is remote from the fastening element (5) is pivotably arranged in a bearing (21) carried by the component (3).

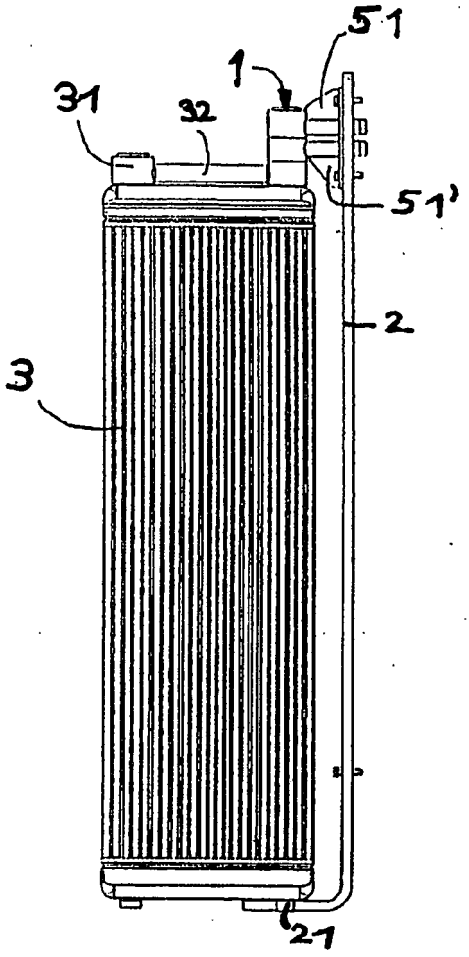

FIG. 1.

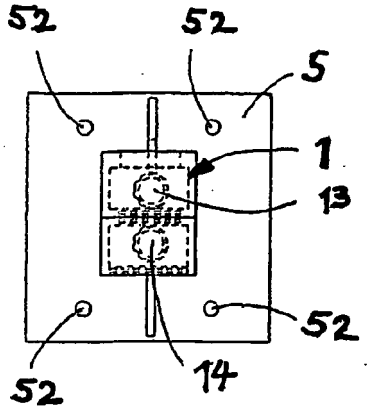

FIG. 4.

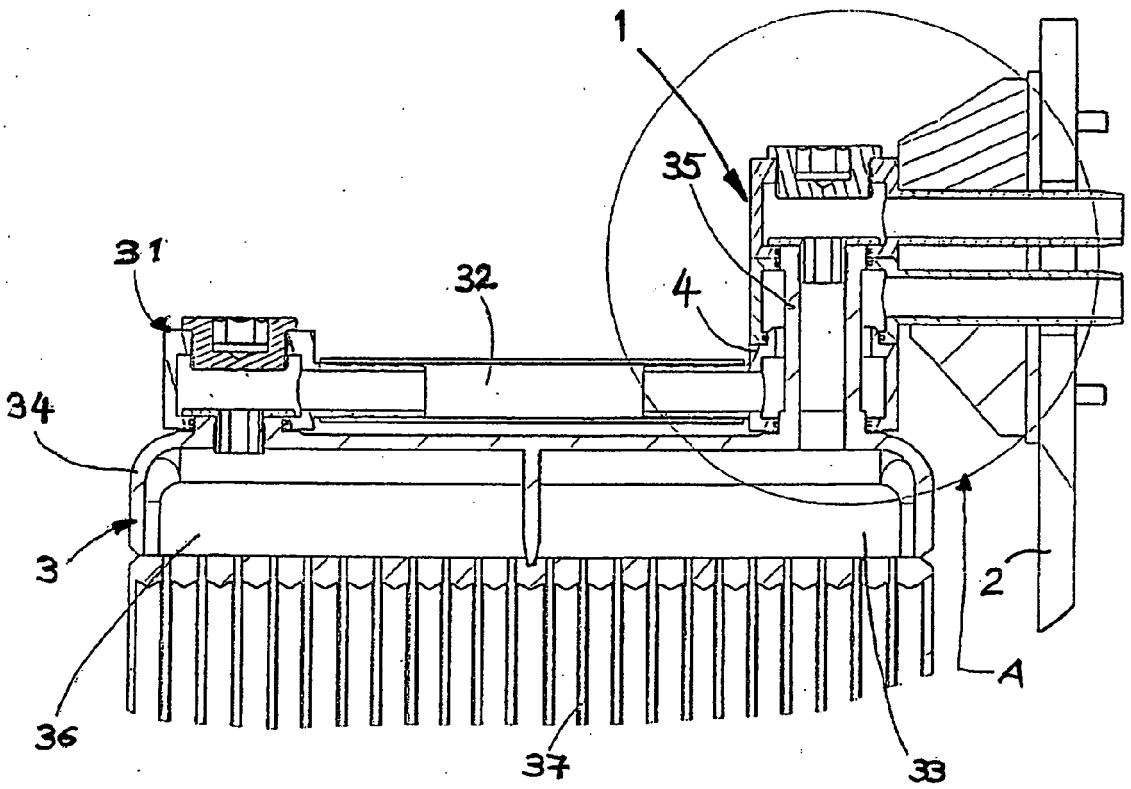

FIG. 2.

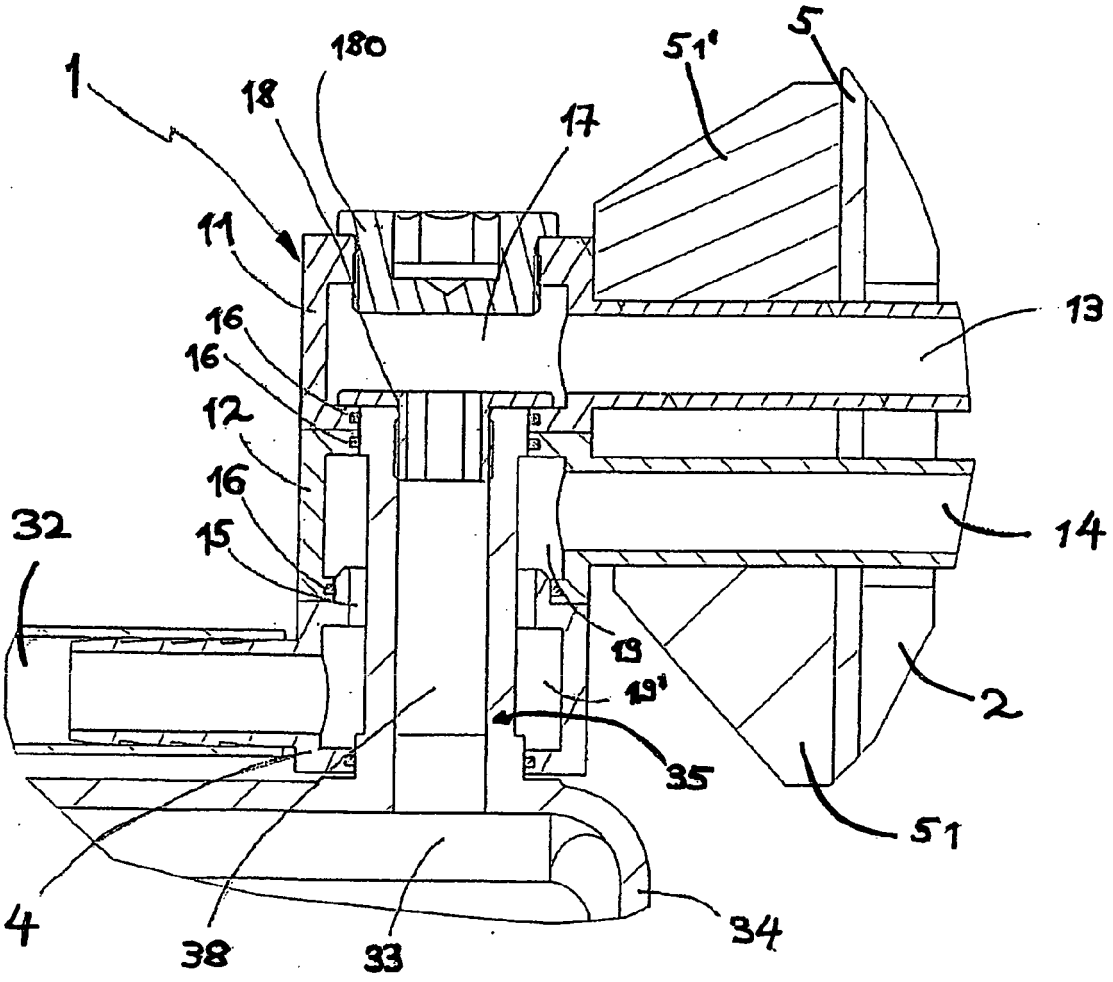

FIG. 3.

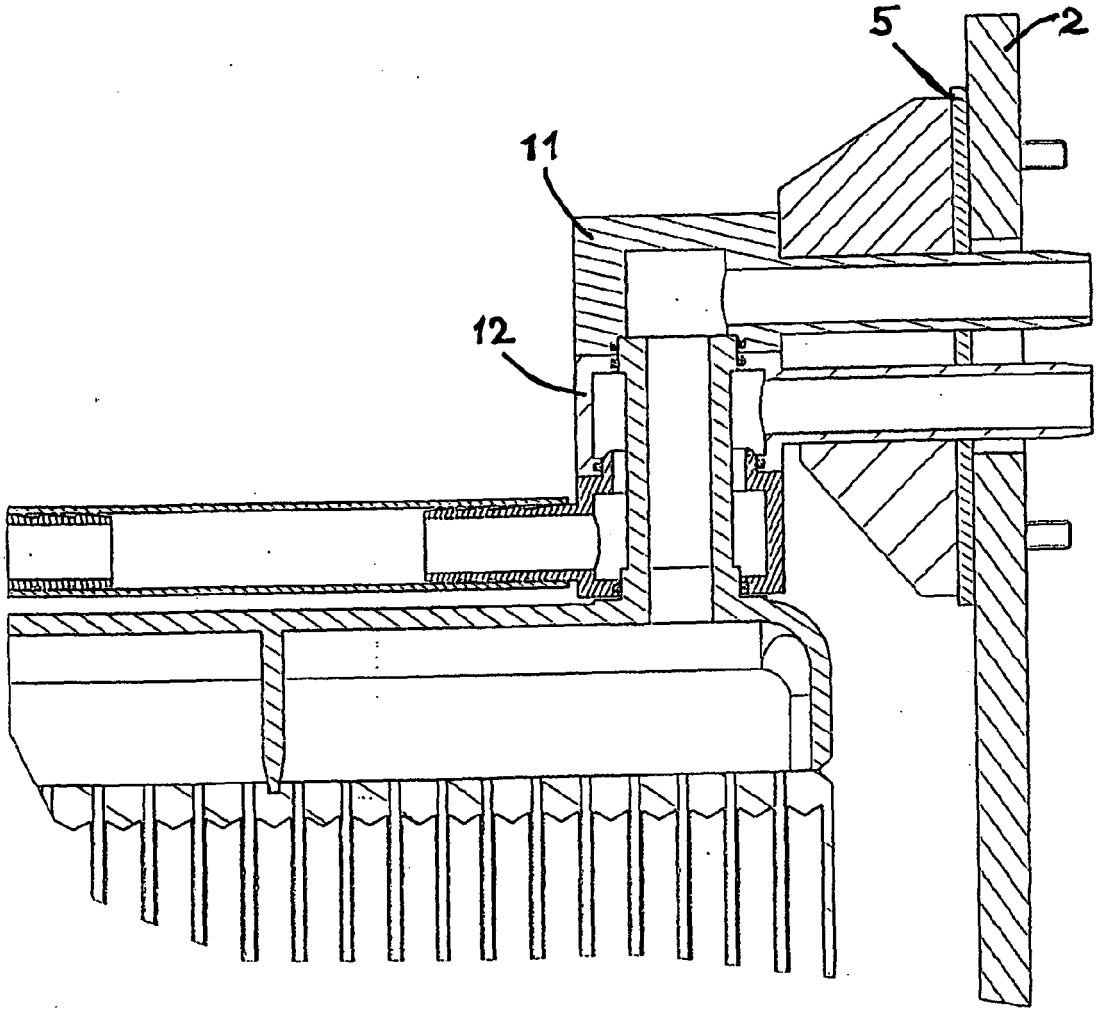

FIG. 5.

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 01 7524

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2006/005959 A1 (MAEDA KENICHIRO [JP] ET AL) 12 January 2006 (2006-01-12) * paragraphs [0002], [0099] - [0101]; figure 2 *	1,7	INV. F28F9/04 F28F9/26
A	US 2004/191085 A1 (STUTTS LARRY RODNEY [US] ET AL) 30 September 2004 (2004-09-30) * the whole document *	1-7	
P,A	EP 1 849 641 A (DELPHI TECH INC [US]) 31 October 2007 (2007-10-31) * the whole document *	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

F28F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 January 2009	Martínez Rico, Celia

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 01 7524

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30-01-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006005959 A1	12-01-2006	DE 102005029883 A1	09-02-2006
		JP 2006044636 A	16-02-2006
US 2004191085 A1	30-09-2004	NONE	
EP 1849641 A	31-10-2007	NONE	

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- EP 0952024 A **[0004]**