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(54) IMPROVED NECK CLOSURE FOR FLUIDIC CIRCUITS OF A TERRESTRIAL VEHICLE

(57) A fluid tight closure (1) for a neck (N) of a fluid circuit of a vehicle, comprises a collar (2), a head (3) defining at least one nipple (6; 7) for connection with a respective tube of the circuit, a through hole (20) set in parallel to the nipple (6), and a cap (8) to close the through hole (20) and removable for refilling the circuit through the neck (N), wherein the head (3) is rotatable with respect to the collar (2) so that the head (3) is angularly adjustable about axis (A) for fitting the nipple with the tubes of the circuit.

An assembly method claim of the closure to the circuit is also provided.

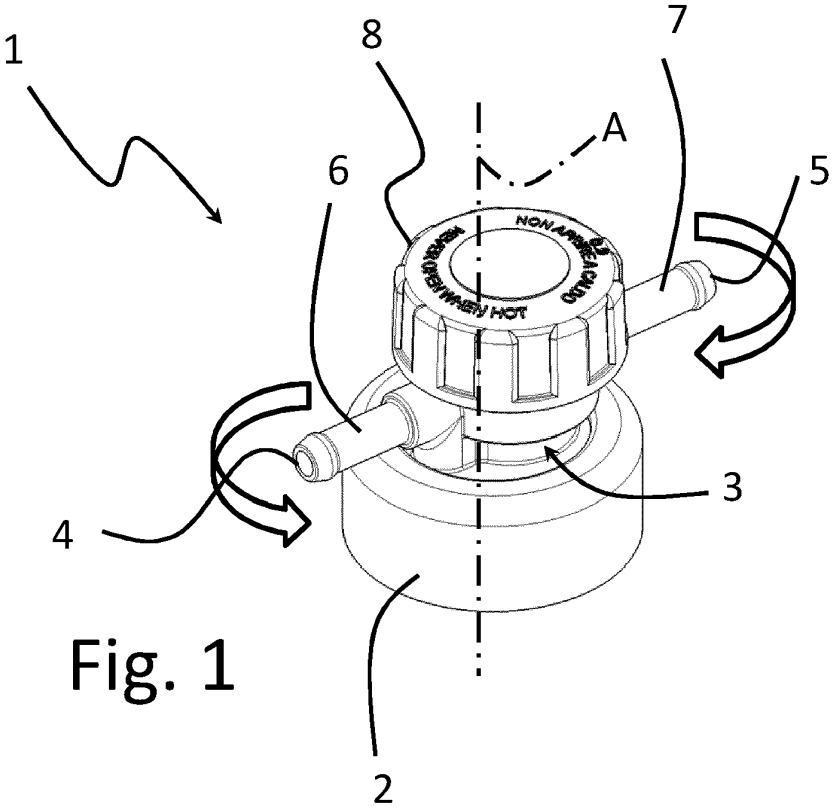

Fig. 1

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Description

[0001] The present invention relates to a closure for a neck of a fluidic circuit of a terrestrial vehicle, for example a wheeled or a tracked vehicle, including commercial vehicles, agricultural vehicles such as harvesters, construction equipment vehicles. In particular, the fluidic circuit can be a cooling circuit of an internal combustion engine, or a fuel circuit.

BACKGROUND OF THE INVENTION

[0002] A filler neck is provided in those fluidic circuits of a terrestrial vehicle, where refilling of the fluid is necessary either because the fluid supplies a consumer for functioning of the latter, e.g. a fuel circuit of an internal combustion engine, or because the fluid is adducted in a closed loop and requires refilling due e.g. to leaks or transpiration/evaporation through fittings.

[0003] In particular, it is known to provide a threaded or bayonet closure of a neck or filler neck, the closure having one or more ports connected to respective tubes of recirculation branches within the fluid circuit. Furthermore, necks or filler necks are normally connected to tanks or other fluid accumulators so that the refilling operation may take place at given time intervals. The user may be alerted by suitable electronic detectors of a low level within the tank or shall periodically check visual or optic level indicators provided in the circuit.

[0004] A fluid circuit of a terrestrial vehicle may have a recirculation line adducting into the tank fluid that may exceed the needs of the consumer or a vent tube connected to external environment so as to avoid overpressure within the circuit. In some cases the layout of the circuit is such that the recirculation line or the vent tube are attached to ports of the closure of the filler neck. In such a case, it is desirable that either assembly of the circuit or maintenance / refilling or both are as simple as possible. This need is also felt during refilling when the ports are attached to relative tubes by connections that need a relatively time consuming work for disconnection. Furthermore, some layouts require a specific angular position of the ports for proper connection with the tubes, in particular where the latter are constrained. The threaded or bayonet closure is attached to the filler neck before connection to the tubes and the angular position of the ports may be incompatible with the tubes and cause errors or loss of time during assembly of the circuit.

SUMMARY OF THE INVENTION

[0005] The scope of the present invention is to provide a closure for a filler neck that solves the above mentioned problems.

[0006] The scope of the present invention is achieved by a fluid tight closure comprising a collar to be rotated about and axis for connection to a neck of a circuit, a head defining at least one nipple for connection with a respective tube of the circuit, a through hole set in parallel to the nipple, and a cap to close the through hole and removable for refilling the circuit through the neck, a ring seal surrounded by collar so as to define a fluid-tight seal between the head and the neck when the collar is firmly attached to the neck, wherein the head is rotatable with respect to the collar so that the head is angularly adjustable about axis.

[0007] According to the present invention, it is provided a method for assembly the above mentioned closure to a fluid circuit comprising a neck, the method comprising the steps of angularly orienting the head in a preferred position so as to connect a tube to the nipple, and rotate the collar with respect to the head so as to fluid-tightly connect the closure to the neck.

[0008] Other embodiments of the invention are described below and in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] For a better understanding of the present invention, the latter will further be disclosed with reference to the accompanying figures in which:

- Figure 1 is a perspective view of a filler neck closure according to the present invention;
- Figure 2 is a top view of a tank provided with the closure of figure 1;
- Figure 3 is a sketch of a cooling circuit of a terrestrial vehicle where the tank of figure 2 is depicted in a side view;
- Figure 4 is a partial section view according to vertical plane comprising line IV-IV of figure 2; and
- Figure 5 is an enlarged detail of figure 4.

DETAILED DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 refers, as a whole, to a closure for a neck N of a tank of a fluidic circuit provided on board of a terrestrial vehicle, comprising a collar 2 for connection to the neck N and a head 3 rotatable with respect collar 2. In particular, collar 2 is releasably connected to neck N by either a threaded connection or a bayonet connection via a rotation about an axis A and head 3 is rotatable with respect to collar 2 about axis A as shown by arrows in figure 1.

[0011] Head 3 comprises a first port 4 and a second port 5 connectable to tubes, preferably flexible tubes or hoses. Connection with tubes can be operated according to many alternatives, including but not limited to, radial interference fitting and quick connections. According to the embodiment of figure 1, first and second ports 4, 5 are defined by a respective nipple 6, 7 having a radially enlarged end portion in order to provide an interference

fitting with a respective tube (not shown). In addition, nipples 6, 7 may be suitable also for fast connections or threaded connections.

[0012] Furthermore, head 3 comprises a cap 8 that is removable from closure 1 when the user, according to a first use of the closure, intends to pour a liquid through neck N during a refilling operation.

[0013] According to a second use of the invention, the user removes closure 1 as a whole from neck N by acting on, namely rotating, collar 2. In the latter case, removal of closure 1 is operated while the tubes are fluidically and mechanically connected ports 4, 5.

[0014] Figure 3 shows a non limiting application of the invention, namely the provision of closure 1 in a cooling circuit for an engine of a terrestrial vehicle. The cooling circuit comprises a radiator R receiving a flow of high temperature cooling fluid from engine E, a tank T, which stores low temperature cooling fluid, a recovery tank RT permanently set at the environment pressure and connected to tank T, and a manifold M attached to engine E and controlling the flow of low temperature cooling fluid entering engine E.

[0015] According to the embodiment of figure 3, cooling circuit defines a cooling flow loop L through engine E, manifold M and radiator R wherein cooling liquid is forced to flow by a pump (not shown). Tank T is attached via a T-junction to flow loop L so that expansion tank T is not subject to a relevant flow of cooling liquid, i.e. the flow generated by the pump in its working condition to cool engine E. Expansion tank T is set at a predefined vertical position in order to define a given piezometric height for loop L and the cooling circuit, to provide an easy position for cooling liquid refilling and cooling liquid level visual check, and to provide venting for air or other gaseous compounds that may generated during functioning or maintenance of the circuit. According to figure 1, a T-junction is located at manifold M and a T-junction J connects radiator R to nipple 6 so that excess cooling liquid within radiator R or the circuit flows to expansion tank T via port 4, and additional cooling fluid needed within loop L is provided via manifold M. Normally, when engine E is cold the cooling liquid level in expansion tank T is lower with respect to the cooling liquid level when engine E is hot.

[0016] According to the layout described above, port 4 is connected by a tube, preferably a hose H1, to radiator R and port 5 is connected by a vent tube, preferably a hose H2, to recovery tank RT. Hoses H1, H2 are attached to fixed parts of the vehicle, e.g. frame beams, stirrups or the like, and are kept in place by straps or similar holders that limit the flexural deformation of hoses H1, H2 in the area of expansion tank T.

[0017] According to figure 4, head 3 comprises a vent valve unit 10 to control the pressure level within tank T by venting tank T to recovery tank RT. Valve unit 10 comprises a first check valve disk 11 biased by a first spring 12 and a second check valve disk 13 biased by a second spring 14. In case inner pressure of tank T drops below a predefined low level set by a pre-load of spring 12, valve unit 10 via disk 11 opens so that a flow of air from port 5, i.e. recovery tank RT and external environment, enters tank T; and in case inner pressure of tank T exceed a predefined high level set by pre-load of spring 14, valve unit 10 opens via disk 13 to vent exceeding pressure via port 5 to recovery tank RT and external environment. In particular, disks 11, 13 are configured to open and close depending on the differential pressure between tank T and recovery tank RT.

[0018] Furthermore, closure 1 is provided with a seal ring 15 surrounded by collar 2 to define fluid-tight seal between neck N and closure 1 when collar 2 is screwed to tank T. In particular, head 3 comprises a bottom flange 16 pressing seal ring 15 on a head surface of neck N when collar 2 is screwed to tank T. Consistently, collar 2 comprises a lateral wall 17, which is preferably cylindrical, and an inner annular wall 18 extending from lateral wall 17 towards axis A. Flange 15 and annular wall 18 interfere along axis A so that annular wall 18 applies a pressure to seal ring 15 via flange 16 when collar 2 is screwed to neck N.

[0019] In order to provide a compact dimension along axis A, head 2 defines a through hole 20 parallel and eccentric to axis A; and a bi- or tri-dimensional contoured channel 21 placed on a side of through hole 20 and fluidically in parallel to through hole 20 with respect to the inner volume of tank T. Bi- or tri-dimensional contoured channel 21 follows a bi- or tri-dimensional path within head 3 so as to reduce vertical dimension of closure 1.

[0020] Port 4 is an end portion of contoured channel 21 and port 5 is fluidically connected to the inner volume of tank T via through hole 20. Preferably ports 4 and 5, more preferably also nipples 6, 7, are coplanar and, even more preferably, the common plane is perpendicular to axis A.

[0021] According to the embodiment of figure 4, through hole 20 receives valve unit 10 so as to provide the relevant pressure control within the inner volume of tank T through connection with port 5. To do so, trough hole 20 defines an enlarged diameter section proximal to cap 8 and a reduced diameter section distal to cap 8. Transition between enlarged diameter section and reduced diameter section defines an abutment 25 where second disk 13 rests due to the load applied by second spring 14. Port 5 is connected to through hole 20 between step 25 and cap 8 so that a flow from inner volume of tank T to port 5 is possible only when inner pressure within tank T overcomes the pre-load of second spring 14 and second disk 13 lifts from abutment 25.

[0022] Furthermore, first disk 11 and first spring 12 are supported by second disk 13 and are configured so as to open and connect port 5 to the inner volume of tank T when pressure at port 5 exceeds the preload of first spring 12. Therefore, considering pressure inside tank T, first disk 11 functions as a depression valve and second disk 13 functions as a pressure valve.

[0023] Preferably, cap 8 is threaded or the like and is

coaxial to through hole 20, and valve unit 10 is attached to cap 8 so that, when the latter is unscrewed, through hole 20 is an extension of neck N for refilling cooling liquid in tank T. Consequently the user, before refilling, removes at the same time both cap 8 and valve unit 10.

[0024] Closure 1 according to the present invention is tightened to neck N during assembly of the circuit and, before seal ring 15 is pressed in a working condition by flange 16, the assembler defines the angular position of head 3 so as to match the layout of hoses or tubes to be connected to ports 4, 5.

[0025] During refilling, the user has a first option to remove cap 8 so that through hole 20 is an extension of neck N; and a second option to remove closure 1 as a whole by rotating collar 2. In such a case, head 3 stays connected to hoses or tubes and refilling is operated directly into neck N.

[0026] When tank T is closed, retention of angular position of head 3 is by friction between neck N, sealing ring 15, flange 16 and annular wall 18, which are packed when collar 2 is tightened. In order to increase friction between flange 16 and annular wall 18, depending on the use of closure 1, it is possible that one or both of flange 16 and annular wall 18 are provided with protrusions or teeth or the like.

[0027] A closure according to the present invention has the following advantages.

[0028] Due to angular decoupling between collar 2 and head 3, during assembly of the fluid circuit it is easier to adjust the angular position of head 3 for easier connection with surrounding tubes or hoses.

[0029] Furthermore, closure 1 provides two alternatives for refilling during maintenance, i.e. by removing cap 8 to preserve ring seal 15 or by removing the closure as a whole to preserve the seal between valve unit 10 and through hole 20. In case of alternate use of both alternatives, working life of seals is improved as each seal undergoes a lower number of removal cycles.

[0030] It is clear furthermore that changes and variations are applicable to the closure according to the present invention without departing from the scope of protection as defined in the attached claims.

[0031] Collar 2 and head 3 are manufactured by injection molding of a polymeric compound but other materials or manufacturing technologies can be used.

[0032] Depending on the circuit in which closure 1 is used, valve unit 10 or recovery tank RT can be omitted. In particular it is possible that only port 4, i.e. a recirculation port, or port 5, i.e. a vent port, are provided on head 3.

Claims

1. Fluid tight closure (1) for a neck (N) of a fluid circuit of a vehicle, comprising a collar (2) to be rotated about and axis (A) for connection to the neck (N), a head (3) defining at least one nipple (6; 7) for connection with a respective tube of the circuit, a through hole (20) set in parallel to the nipple (6), and a cap (8) to close the through hole (20) and removable for refilling the circuit through the neck (N), a ring seal (15) surrounded by collar (2) so as to define a fluid-tight seal between the head (3) and the neck (N) when the collar (2) is firmly attached to the neck (N), wherein the head (3) is rotatable with respect to the collar (2).

2. Closure according to claim 1, wherein the head (3) comprises a flange (16) and the collar (2) comprises an inner annular wall (18) interfering with the flange (16) so that, when the collar (2) is tightened to the neck (N), the seal ring (15) and the flange (16) are pressed by the inner annular wall (18).

3. Closure according to any of the preceding claims, wherein the head (3) comprises a further nipple (7) having a further port (5) fluidically intersecting the through hole (20) and a valve unit (10) to intercept a flow between the through hole (20) and the further port (5) when the cap (8) closes the through hole (20).

4. Closure according to claim 3, wherein the valve unit (10) is attached to and removable with the cap (8).

5. Closure according to any of clams 3 or 4, wherein the valve unit (10) comprises a first check valve disk (11) biased so as to open and let a flow enter from the further port (5) when differential pressure between the further port (5) and the neck (N) is greater than a first predefined level and a second check valve disk (13) biased so as to open and let a flow exit to further port (5) when the differential pressure between the neck (N) and the further port (5) is greater than a second predefined level, the first predefined level being lower than the second predefined level.

6. Closure according to claim 5, wherein the second disk (13) supports the first disk (11).

7. Closure according to any of the preceding claims, wherein through hole (20) is eccentric with respect to said axis (A) and wherein the head (3) defines a bi- or tri-dimensional contoured channel (21) to fluidically connect a port (4) of the nipple (6) to neck (N) when in use.

8. Fluid circuit of a terrestrial vehicle comprising a tank (T) having a neck (N), at least a tube attached to a support and a closure (1); the closure being according to any of the preceding claims and attached to the neck (N), the head (3) being orientable with respect to the collar (2) so that the nipple (6) is fluidically connected to the at least one tube.

9. Circuit according to claims 3 and 8, wherein the cir-

cuit is a cooling circuit comprising a radiator (R) connected to said at least one tube, said tank (T) is an expansion tank and the further nipple (7) is attached to a vent tube attached to a support.

10. Method for assembly a closure according to any of the preceding claims to a circuit tank (T) having a neck (N), comprising the steps of angularly orienting the head (3) in a preferred position so as to connect a tube to the nipple (6), and rotate the collar (2) with respect to the head (3) so as to fluid-tightly connect the closure (1) to the neck (N).

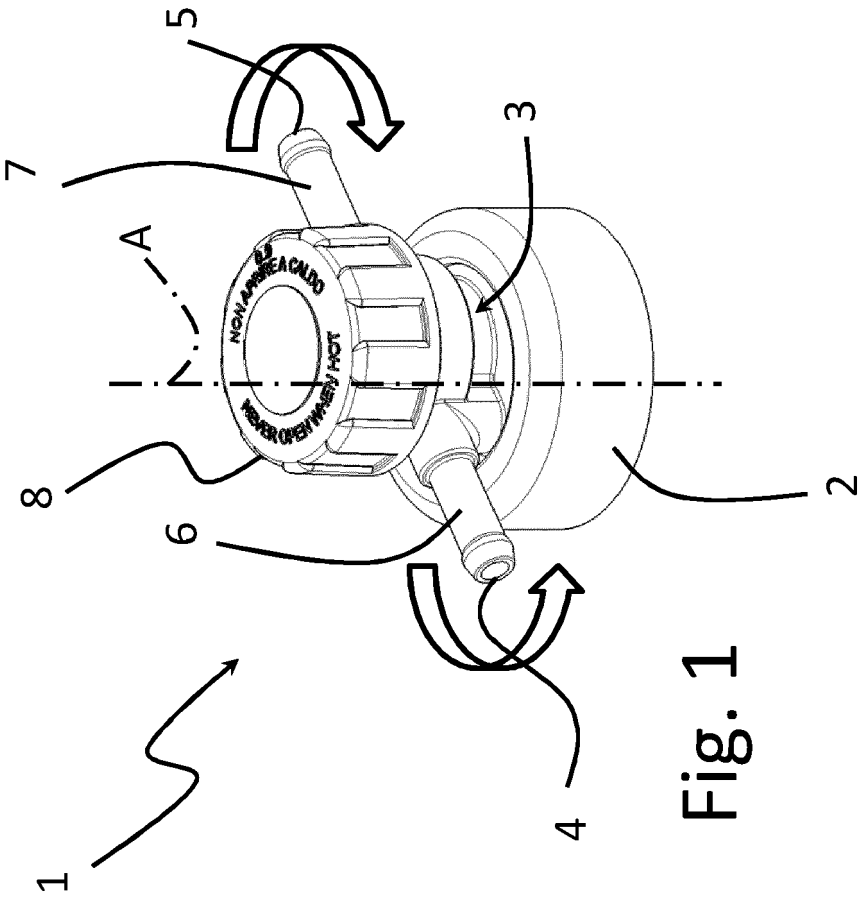

Fig. 1

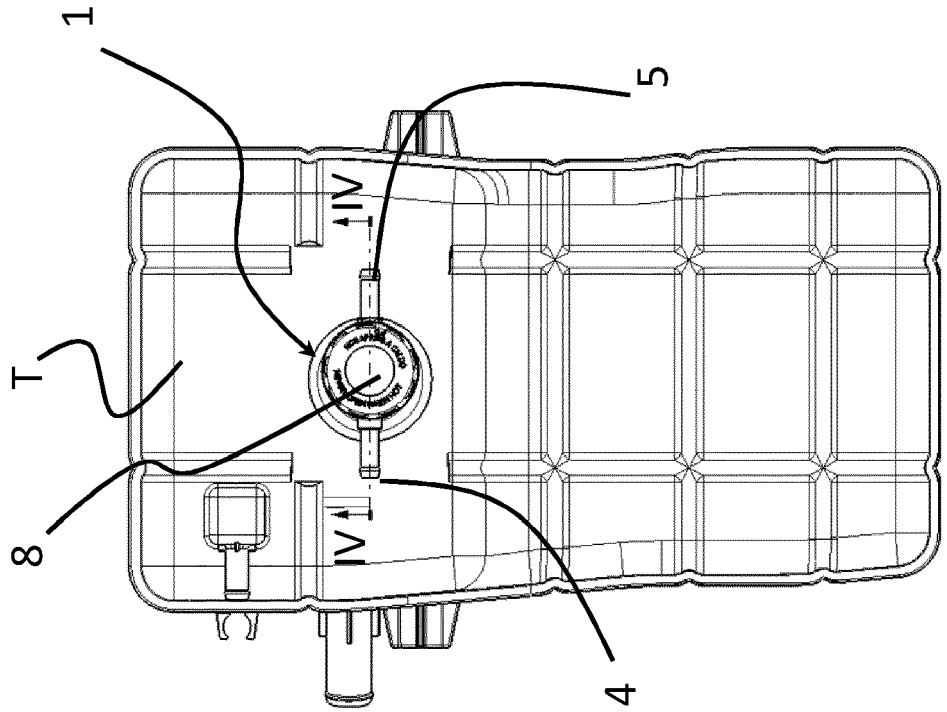

Fig. 2

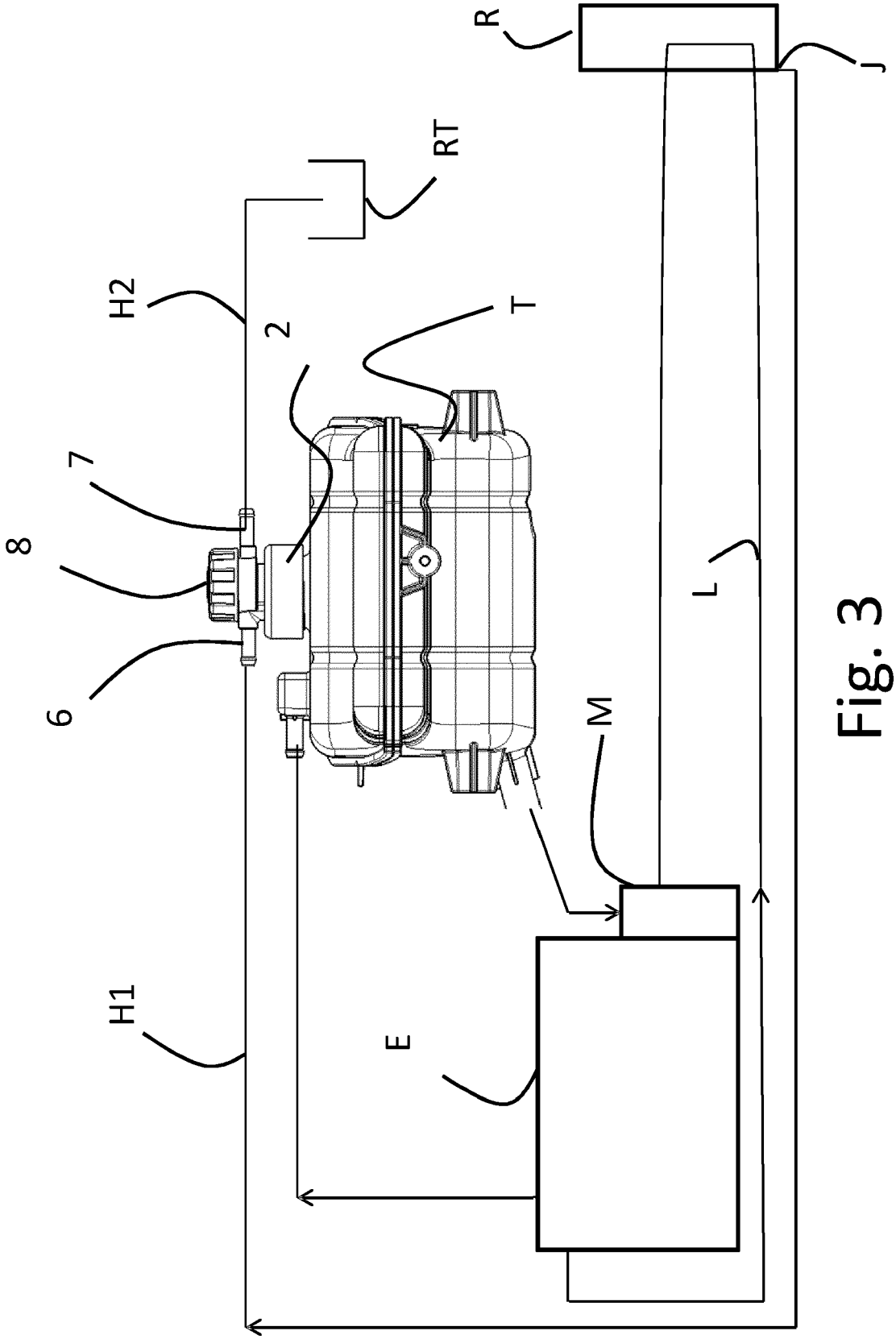

Fig. 3

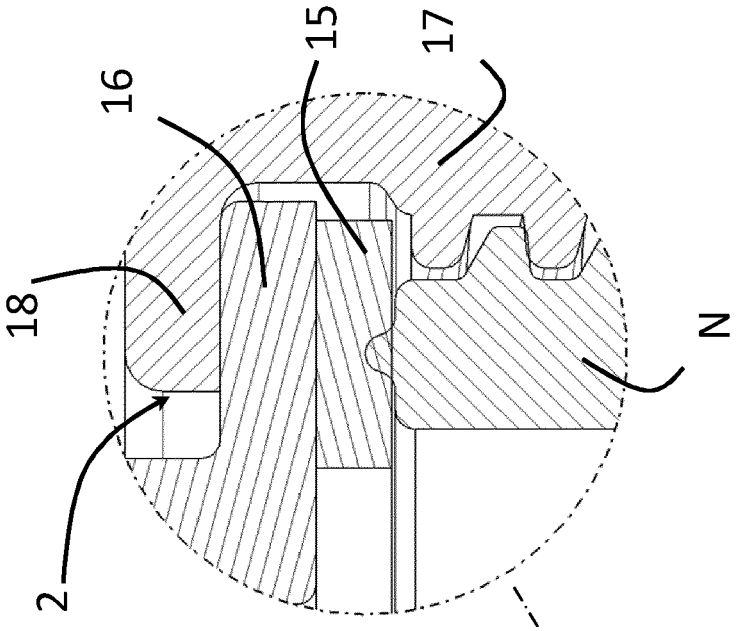

Fig. 5

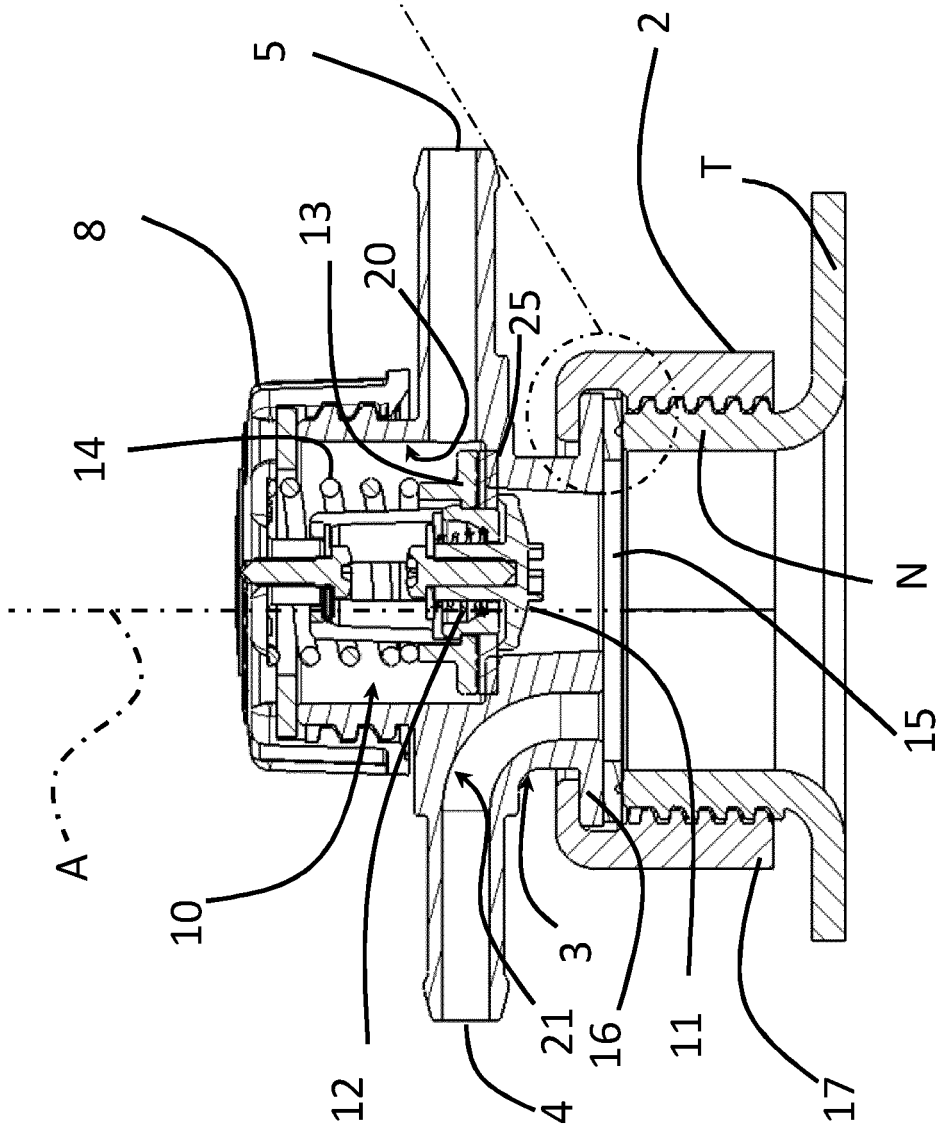

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 17 18 4382

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 871 227 C (BEHR MANFRED DIPL-ING) 19 March 1953 (1953-03-19) * page 2, lines 51-63; figure 1 *	1-10	INV. F01P11/02
A	DE 91 11 021 U1 (BLAU FABRICK FÜR FAHRZEUGTEILE) 2 January 1992 (1992-01-02) * page 1, paragraph 2 - page 2, paragraph 2; figures 1,3 * * page 4, paragraph 5 - page 5, paragraph 1 *	1-10	
A	DE 87 04 178 U1 (RHEIN-CONTI KUNSTSTOFF-TECHNIK) 7 May 1987 (1987-05-07) * page 3, paragraph 2; figures 1-2 * * page 5, lines 4,5 * * page 6, paragraph 3 *	1-10	
A	US 3 027 043 A (NESTIC JOHN M) 27 March 1962 (1962-03-27) * column 2, lines 48-61; figures 1,9 *	1-10	TECHNICAL FIELDS SEARCHED (IPC) F01P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 September 2017	Luta, Dragos

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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26-09-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 871227 C	19-03-1953	NONE	
DE 9111021 U1	02-01-1992	NONE	
DE 8704178 U1	07-05-1987	NONE	
US 3027043 A	27-03-1962	NONE	

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