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(54) **PUMP GROUP**

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Description

[0001] The present invention relates to a pump group for a cooling system of a vehicle.

[0002] In the description, the term "vehicle" means any means of locomotion that comprises an internal combustion engine and also hybrid powered vehicles, without any limitation related to type or size, i.e. an automobile or an articulated vehicle.

[0003] In other words, the present invention relates to the automotive sector and specifically to the thermal management system of a vehicle.

[0004] In particular, said cooling system is specific to the cooling of a "operating group" of the vehicle.

[0005] In particular, in the present description, "operating group" means a specific component or group of components for carrying out a specific operation required for vehicle movement. In a preferred embodiment, the "operating group" comprises the engine group, for example an internal combustion engine or an electric motor.

[0006] In additional embodiment variants, the "operating group" comprises other components of the vehicle, both mechanical-type components, such as a transmission assembly, and electrical-type components, such as a "battery assembly" included in the vehicle.

[0007] There are many embodiments in the prior art of pump groups for an operating group cooling system which differ from each other in terms of size and type of drive.

[0008] Specifically, the pump group of the present invention falls within this context, having an electric drive. In other words, the pump group of the present invention comprises at least one electric motor which drives the rotation of the impeller included therein, thus propelling the cooling liquid which flows in the cooling system to which the pump group is fluidically connectable.

[0009] There are multiple known technical solutions of pump groups comprising an electric drive in which the main problem of this type of pump group has been confronted, i.e. the need to effectively cool the electric motor of the pump group and its related components.

[0010] In particular, there are known embodiments of pump groups in which the cooling liquid present in the chamber where the impeller is housed is also used to cool the electric motor and its related components. Even more specifically, in the prior art the cooling liquid is used to cool the rotor of the electric motor. Examples of known pump groups of this type are disclosed in US2012/230850A1, DE1653752A1, US 3 688 140 A, JPS58122395A, DE934454C and FR2542042A1.

[0011] However, these embodiments have complex geometries particularly due to the need to develop a hydraulic portion, i.e. a portion in which said cooling liquid flows, which is particularly complex. In addition, some pump groups have particularly large dimensions that poorly meet the needs of the automotive sector which require compact dimensions and overall sizes so that they take up as little space as possible.

[0012] The purpose of the present invention is therefore to provide a pump group for a cooling system of an operating group of a vehicle effectively cools all the controlling electronic components, thus solving the problems mentioned above.

[0013] This purpose is achieved by a pump group according to claim 1. The dependent claims relate to preferred embodiment variants having further advantageous features.

[0014] The subject matter of the present invention is described below in detail, in reference to the enclosed drawings, in which:

- figures 1a and 1b show two longitudinal cross-sectional views of a pump group according to the present invention along different cross-sectional planes, according to a possible embodiment, shown in a vertical operating position;
- figure 2 shows a longitudinal cross-sectional view of a pump group according to the present invention, according to a possible embodiment, shown in a horizontal operating position;
- figure 3 shows a longitudinal cross-sectional view of a pump group according to the present invention, according to a possible embodiment, shown in an inclined operating position.

[0015] In the above figures, the reference number 1 refers to a pump group for a cooling system of an operating group of a vehicle as a whole, preferably for cooling the operating group, for example an internal combustion operating group.

[0016] The pump group 1 of the present invention lies mainly lengthwise with respect to an axis X-X.

[0017] The pump group 1 of the present invention comprises an impeller 2 rotatable about said axis X-X. In other words, said impeller 2 has a center of rotation which lies on said axis X-X.

[0018] Preferably, the impeller 2 is of the radial type being specially designed to perform a suction action on the cooling liquid preferably in the axial direction, and to perform a propelling action preferably in the radial direction. In particular, the "cooling liquid" is a water-based liquid, for example a solution comprising water and glycol, which circulates in the cooling system of the vehicle to which the pump group 1 of the present invention is fluidically connectable.

[0019] Furthermore, according to the present invention the pump group 1 comprises a shaft 3 that lies lengthwise along the axis X-X. Preferably, said shaft 3 comprises a rotating end 32 on which the impeller 2 is integrally mounted.

[0020] According to the present invention, the pump group 1 comprises an electric motor 4 suitable for rotating the shaft 3.

[0021] The electric motor 4 comprises a rotor 41 and a stator 42. According to a preferred embodiment, the rotor 41 and the stator 42 are arranged concentrically

with respect to the axis X-X.

[0022] According to the present invention, the rotor 41 is integrally mounted, for example keyed, on said shaft 3: the rotation of the shaft 3 and in turn of the impeller 2 corresponds to the electronically controlled rotation of the rotor 41. The stator 42 axially and circumferentially surrounds the rotor 41. In particular, the stator 42 comprises a plurality of stator coils forming stator poles.

[0023] According to a preferred embodiment, the pump group 1 comprises an electronic control board operationally connected to the motor shaft 3 and suitable for controlling the rotation thereof about the axis X-X. In other words, the electronic board controls the operation of the electric motor 4, hence the rotation of the shaft 3 and in turn of the impeller 2.

[0024] According to the present invention, the pump group 1 comprises a pump body 5 which lies parallel and mainly around the axis X-X. The pump body 5 is suitable for containing the various operating components of the pump group 1 and is suitable for being fluidically connectable to the vehicle cooling system.

[0025] According to the present invention, the pump body 5 comprises along the axis X-X:

- a first impeller casing 6 in which the impeller 2 is housed in an impeller chamber 60 through which the cooling liquid flows;
- a separating and supporting element 7 comprising a collar 70 which engages and rotatably supports the shaft 3;
- a motor casing 8 in which the electric motor 4 is housed inside a motor chamber 80.

[0026] In particular, the impeller chamber 60 and the motor chamber 80 are sealed from each other. In other words, the "hydraulic portion" in which the cooling liquid flow is exclusively in the impeller casing 6 separated from the "electrical portion" contained in the motor casing 8 by the presence of the separating and supporting element 7.

[0027] According to a preferred embodiment, said separating and supporting element 7 substantially has the shape of a flange and is engaged sealingly by the impeller casing 6 on one side and by the motor casing 8 on the other side.

[0028] Preferably, the shaft 3 straddles the separating and supporting element 7 identifying the impeller end 32, on the one hand, and a motor end 34 on which the electric motor 4 34 is engaged opposite the other side.

[0029] According to the invention, the collar 70 extends by an axial section parallel to the axis X-X, comprising an axial passage 700 along which the shaft 3 is housed and extends.

[0030] According to the invention, the collar 70 has a tapered cross-section comprising a pointed end 70' proximal to the rotor 41, preferably housed in the stator 42.

[0031] In other words, the collar 70 has a flange end 70" proximal to the impeller 2 with a cross-section greater than the pointed end 70'. The flange end 70" is therefore suitable for supporting greater loads and forces.

[0032] According to a preferred embodiment, the separating and supporting element 7 comprises a sealing member 9 for providing a hydraulic seal between the impeller casing 6 and the motor casing 7.

[0033] Preferably, the sealing member 9 is housed in the collar 70, in particular in the axial passage 700.

[0034] Preferably the sealing member 9 is positioned axially proximal to the impeller chamber 60.

[0035] According to a preferred embodiment, the sealing member 9 is of the type comprising a first sealing member 91 and a second sealing member 92 mutually suitable for axially delimiting an airtight chamber 95.

[0036] Preferably, the first sealing member 91 is of the water-tight type.

[0037] Preferably, the second sealing member 92 is of the oil-tight type. Preferably, the second sealing member 92 is an oil retainer.

[0038] According to a preferred embodiment, the separating and supporting element 7 comprises at least one vent channel 79 for fluidly connecting the airtight chamber 95 to the outside environment.

[0039] According to the present invention, the pump group 1 comprises an amount of oil suitable for cooling the motor 41 and the stator 42 by convection.

[0040] Such quantity of oil is stored in the motor chamber 80 and is then moved by rotation of the rotor 41.

[0041] Consequently, the oil is suitable for promoting cooling by thermal convection under both static and dynamic conditions.

[0042] According to the present invention, the oil and cooling liquid circulate in separate portions of the pump group 1 without ever mixing. This eventuality is indeed prevented by the presence of the sealing member 9 and by the rotating member 35.

[0043] Preferably, the oil is of the dielectric type.

[0044] According to a preferred embodiment, the oil has a viscosity such that it allows for easy movement of the rotor 41. In other words, the presence of oil does not in any way hamper the movement of the rotor 41.

[0045] According to the invention, as mentioned earlier, the shaft 3 comprises a rotating member 35 operationally connected to the collar 70.

[0046] According to the invention, the rotating member 35 is housed in the axial passage 700.

[0047] According to a preferred embodiment, the rotating member 3 is radially engaged with the shaft 3 and the collar 70, particularly with the wall defining the axial passage 700.

[0048] According to a preferred embodiment, the rotating member 35 is a bearing, preferably a double-row ball bearing. In other words, the rotating member 35 has two rings of ball bearings 351, 352 axial spaced apart along the axis X-X.

[0049] This means that a first ring of ball bearings 351 is proximal to the electric motor 4 and the second ring of ball bearings 352 is proximal to the impeller 2.

[0050] According to the present invention, the rotating member 35 does not serve an oil-tightness function.

[0051] According to the invention, the collar 70 comprises a lubrication conduit 75 through which the oil is free to flow in order to keep the rotating member 35 lubricated.

[0052] According to a preferred embodiment, the collar 70 comprises a plurality of lubrication conduits 75, preferably evenly spaced apart angularly.

[0053] Preferably, the collar 70 comprises at least three lubrication conduits 75. In this way, each side comprises at least one lubrication conduit 75 with respect to an imaginary plane on which the axis X-X lies.

[0054] According to a preferred embodiment in which the oil has a specific viscosity and the lubrication conduit 75 has a diameter that allows the oil to flow as a function of the viscosity thereof.

[0055] According to the invention, the lubrication conduit 75 comprises an inlet 750 suitable for receiving oil and promoting the flow thereof through the lubrication conduit 75 toward the rotating member 35.

[0056] According to the invention, said inlet 750 has larger dimensions than the diameter of the lubrication conduit 75.

[0057] According to a preferred embodiment, said inlet 750 also serves the purpose of acting as an oil compartment or tank so as to collect a predefined quantity of oil and allow it to flow into the corresponding lubrication conduit 75. Preferably, the inlet 750 is suitable for acting as a funnel for the oil toward the lubrication conduit 75. According to a preferred embodiment, the oil that is contained in the inlet 750 is suitable for lubricating the rotating member 35.

[0058] According to a preferred embodiment, the lubrication conduit 75 is positioned axially ao as to allow oil to flow to the second ring of ball bearings 352.

[0059] Preferably, the lubrication conduit 75 lubricates both the first ring of ball bearings 351 and the second ring of ball bearings 352.

[0060] According to a preferred embodiment, the first ring of ball bearings 351 is lubricated directly by the oil in the motor chamber 80.

[0061] Preferably, the second ring of ball bearings is also lubricated by the oil in the motor chamber 80, which lubricates the first ring of ball bearings 351.

[0062] According to the invention, the amount of oil is such that it establishes a free surface that is higher than the lubrication conduit 75 with respect to the axis X-X, so as to ensure a flow of oil to the rotating member 35.

[0063] According to the invention, the quantity of oil is such that it establishes a free surface that is higher than the lubrication conduit 75 with respect to the axis X-X in any spatial position of the pump group 1.

[0064] In other words, according to a preferred embodiment, the pump group 1 is positionable in the vehicle in a vertical position or in a horizontal position or in an inclined position, and still have the same cooling properties, ensuring a high level of cooling of the electrical components. Preferably, the rotating member 35 is still lubricated so as to operate effectively, thus ensuring a high rotational speed of the impeller 2.

[0065] Innovatively, the pump group amply fulfills the intended purpose by solving the typical problems of the prior art.

[0066] Indeed, the pump group advantageously comprises oil suitable for promoting the convection cooling of the "electrical portion" of the pump group.

[0067] Advantageously, the pump group effectively cools both the stator and the rotor by taking advantage of the fact that said rotor drives the oil and promotes forced convection.

[0068] Advantageously, the oil effectively lubricates the rotating member which operates under optimal conditions.

[0069] Advantageously, the heat generated by the electronic components is effectively carried and transmitted to the cooling liquid through the oil and the collar.

[0070] Advantageously, the presence of the oil is such that it evens out the temperature inside the motor chamber.

[0071] Advantageously, the pump group has a very limited number of components.

[0072] Advantageously, the pump group has extremely simple assembly steps.

[0073] Advantageously, the amount of oil and the number and/or positioning of the lubrication conduits are such that lubrication of the rotating member in any position of the pump group is assured. Advantageously, the pump group is positionable inside a vehicle in any position.

[0074] Advantageously, the lubrication conduits are designed to ensure an inflow of lubricating oil even at the startup of the vehicle. In other words, the lubrication conduits advantageously store a quantity of oil employable during vehicle startup.

[0075] It is clear that a person skilled in the art may make changes to the invention described above in order to meet incidental needs, the scope of protection being solely defined in the following claims.

Claims

1. A pump group (1), for a cooling system of an operating group of a vehicle, preferably the engine assembly, which lies with respect to an axis (X-X) and comprises:

   i) an impeller (2) rotatable about the axis (X-X);
   ii) a shaft (3) that lies along the axis (X-X) comprising an impeller end (32) onto which the impeller (2) is integrally mounted;
   iii) an electric motor (4) comprising a rotor (41) integrally mounted on the shaft (3) and a stator (42) axially and circumferentially surrounding the rotor (41); vi) a pump body (5) comprising,

along the axis (X-X):

- an impeller casing (6) in which the impeller (2) is housed in an impeller chamber (60) in which the cooling liquid circulates;
- a separating and supporting element (7) comprising a collar (70) which engages and rotatably supports the shaft (3);
- a motor casing (8) in which the electric motor (4) is housed inside a motor chamber (80);

wherein the impeller chamber (60) and the motor chamber (80) are mutually fluid-tightly separated;
wherein the motor chamber (80) contains an amount of oil suitable for cooling the rotor (41) and the stator (42) by convection, wherein the rotation of the rotor (41) propels the oil;
wherein the collar (70) lies along an axial section parallel to the axis (X-X) comprising an axial passage (700) which houses the shaft (3) and along which the shaft (3) extends;
wherein the shaft (3) comprises a rotating member (35) operationally connected to the collar (70), housed in the axial passage (700), wherein the collar (70) comprises a lubrication conduit (75) through which oil flows lubricating the rotating member (35);
wherein the conduit (75) comprises an inlet (750) having larger dimensions than the diameter of the lubrication conduit (75), suitable for accommodating oil and promote the outflow of said oil into the lubrication conduit (75) towards the rotating member (35);
wherein the amount of oil is such that it identifies a free surface, which is higher than the lubrication conduit (75) relative to the axis (X-X), to ensure an inflow of oil to the rotating member (35) in any spatial position of the pump group (1);
wherein the pump group (1) is **characterized in that** the collar (70) has a tapered section comprising a pointed end (70') proximal to the rotor (41).

2. Pump group (1) according to claim 1, wherein said oil is of the dielectric type.

3. Pump group (1) according to any one of the preceding claims, wherein the collar (70) comprises a plurality of lubrication conduits (75), preferably angularly equidistant.

4. Pump group (1) according to any one of the preceding claims, wherein the oil has a specific viscosity and the lubrication conduit (75) has a diameter that allows the oil to flow as a function of the viscosity thereof.

5. Pump group (1) according to any one of the preceding claims, wherein said inlet (750) is an oil compartment or tank so as to collect a predefined quantity of oil and allow it to flow into the corresponding lubrication conduit (75).

6. Pump group (1) according to any one of the preceding claims, wherein the rotating member (35) is a bearing, preferably a double row ball bearing.

7. Pump group (1) according to any one of the preceding claims, wherein the separating and supporting element (7) comprises a sealing member (9), housed in the collar (70), in the axial passage (700), proximal to the impeller chamber (60), wherein said sealing member (9) is suitable for ensuring a hydraulic seal between the impeller casing (6) and the motor casing (7).

8. Pump group (1) according to claim 7, wherein the sealing member (9) comprises a first sealing element (91) of the water-tight type and a second sealing element (92) of the oil-tight type comprising an airtight chamber (95) therebetween.

Patentansprüche

1. Pumpengruppe (1) für ein Kühlsystem einer Betriebsgruppe eines Fahrzeugs, vorzugsweise der Motoranordnung, die in Bezug auf eine Achse (X-X) liegt und umfasst:

i) ein Laufrad (2), das um die Achse (X-X) drehbar ist;
ii) eine Welle (3), die entlang der Achse (X-X) liegt und ein Laufradende (32) umfasst, auf das das Laufrad (2) integral montiert ist;
iii) einen Elektromotor (4), der einen Rotor (41), der integral auf der Welle (3) montiert ist, und einen Stator (42) umfasst, der den Rotor (41) axial und umfänglich umgibt;
iv) einen Pumpenkörper (5), der entlang der Achse (X-X) umfasst:

- ein Laufradgehäuse (6), in dem das Laufrad (2) in einer Laufradkammer (60) untergebracht ist, in der die Kühlflüssigkeit zirkuliert;
- ein Trenn- und Stütz- bzw. Trägerelement (7), das eine Manschette bzw. einen Kragen (70) umfasst, die bzw. der die Welle (3) in

Eingriff nimmt und drehbar stützt bzw. trägt;
- ein Motorgehäuse (8), in dem der Elektromotor (4) im Inneren einer Motorkammer (80) untergebracht ist;
wobei die Laufradkammer (60) und die Motorkammer (80) fluiddicht voneinander getrennt sind;
wobei die Motorkammer (80) eine Ölmenge enthält, die zum Kühlen des Rotors (41) und des Stators (42) durch Konvektion geeignet ist, wobei die Drehung des Rotors (41) das Öl antreibt bzw. vorwärts treibt;
wobei der Kragen (70) entlang eines axialen Abschnitts parallel zu der Achse (X-X) liegt, umfassend einen axialen Durchgang (700), der die Welle (3) unterbringt und entlang dem sich die Welle (3) erstreckt;
wobei die Welle (3) ein rotierendes Glied (35) umfasst, das betriebsfähig mit dem Kragen (70) verbunden ist, und zwar untergebracht in dem axialen Durchgang (700), wobei der Kragen (70) einen Schmierkanal (75) umfasst, durch den Öl fließt, das das rotierende Glied (35) schmiert;
wobei der Kanal (75) einen Einlass (750) umfasst, der größere Abmessungen als der Durchmesser des Schmierkanals (75) aufweist, geeignet zum Unterbringen von Öl und Fördern des Abflusses des Öls in den Schmierkanal (75) zu dem rotierenden Glied (35) hin;
wobei die Ölmenge derart ist, dass sie eine freie Fläche bzw. Oberfläche identifiziert, die höher ist als der Schmierkanal (75) relativ zu der Achse (X-X), um einen Zufluss von Öl zu dem rotierenden Glied (35) in einer beliebigen räumlichen Position der Pumpengruppe (1) sicherzustellen;
wobei die Pumpengruppe (1) **dadurch gekennzeichnet ist, dass** der Kragen (70) einen verjüngten Abschnitt aufweist, der ein spitzes Ende (70') proximal zu dem Rotor (41) umfasst.

2. Pumpengruppe (1) nach Anspruch 1, wobei das Öl vom dielektrischen Typ ist.

3. Pumpengruppe (1) nach einem der vorhergehenden Ansprüche, wobei der Kragen (70) eine Mehrzahl von Schmierkanälen (75) umfasst, die vorzugsweise winklig äquidistant sind.

4. Pumpengruppe (1) nach einem der vorhergehenden Ansprüche, wobei das Öl eine spezifische Viskosität aufweist und der Schmierkanal (75) einen Durchmesser aufweist, der das Fließen des Öls in Abhängigkeit von seiner Viskosität erlaubt.

5. Pumpengruppe (1) nach einem der vorhergehenden Ansprüche, wobei der Einlass (750) ein Ölraum oder -tank ist, um eine vordefinierte Ölmenge zu sammeln und diesem zu erlauben, in den entsprechenden Schmierkanal (75) zu fließen.

6. Pumpengruppe (1) nach einem der vorhergehenden Ansprüche, wobei das rotierende Glied (35) ein Lager, vorzugsweise ein zweireihiges Kugellager, ist.

7. Pumpengruppe (1) nach einem der vorhergehenden Ansprüche, wobei das Trenn- und Stützelement (7) ein Dichtungsglied (9) umfasst, das in dem Kragen (70) in dem axialen Durchgang (700) proximal zu der Laufradkammer (60) untergebracht ist, wobei das Dichtungsglied (9) geeignet ist, eine hydraulische Abdichtung zwischen dem Laufradgehäuse (6) und dem Motorgehäuse (7) sicherzustellen.

8. Pumpengruppe (1) nach Anspruch 7, wobei das Dichtungsglied (9) ein erstes Dichtungselement (91) des wasserdichten Typs und ein zweites Dichtungselement (92) des öldichten Typs umfasst, die eine luftdichte Kammer (95) dazwischen umfassen.

Revendications

1. Groupe de pompe (1), pour un système de refroidissement d'un groupe de fonctionnement d'un véhicule, de préférence l'ensemble moteur, qui se situe par rapport à un axe (X-X) et comprend :

i) un impulseur (2) pouvant tourner autour de l'axe (X-X) ;
ii) un arbre (3) qui se situe le long de l'axe (X-X) comprenant une extrémité d'impulseur (32) sur laquelle l'impulseur (2) est monté d'un seul bloc ;
iii) un moteur électrique (4) comprenant un rotor (41) monté d'un seul bloc sur l'arbre (3) et un stator (42) entourant de manière axiale et de manière circonférentielle le rotor (41) ;
iv) un corps de pompe (5) comprenant, le long de l'axe (X-X) :

- un carter d'impulseur (6) dans lequel l'impulseur (2) est abrité dans une chambre d'impulseur (60) dans laquelle le liquide de refroidissement circule ;
- un élément de séparation et de support (7) comprenant un collier (70) qui vient en prise avec et supporte de manière rotative l'arbre (3) ;
- un carter de moteur (8) dans lequel le moteur électrique (4) est abrité à l'intérieur d'une chambre de moteur (80) ;

dans lequel la chambre d'impulseur (60) et la chambre de moteur (80) sont séparées mutuellement de manière étanche aux fluides ;
dans lequel la chambre de moteur (80) contient une quantité d'huile appropriée pour refroidir le rotor (41) et le stator (42) par convection, dans lequel la rotation du rotor (41) propulse l'huile ;
dans lequel le collier (70) se situe le long d'une section axiale parallèle à l'axe (X-X) comprenant un passage axial (700) qui abrite l'arbre (3) et le long duquel l'arbre (3) s'étend ;
dans lequel l'arbre (3) comprend un organe rotatif (35) relié de manière fonctionnelle au collier (70), abrité dans le passage axial (700), dans lequel le collier (70) comprend un conduit (75) de lubrification à travers lequel de l'huile coule lubrifiant l'organe rotatif (35) ;
dans lequel le conduit (75) comprend une entrée (750) ayant des dimensions plus grandes que le diamètre du conduit (75) de lubrification, appropriée pour contenir de l'huile et faciliter l'écoulement de ladite huile dans le conduit (75) de lubrification vers l'organe rotatif (35) ;
dans lequel la quantité d'huile est telle qu'elle identifie une surface libre, qui est plus haute que le conduit (75) de lubrification par rapport à l'axe (X-X), pour assurer une arrivée d'huile au niveau de l'organe rotatif (35) dans n'importe quelle position spatiale du groupe de pompe (1) ;
dans lequel le groupe de pompe (1) est **caractérisé en ce que** le collier (70) a une section effilée comprenant une extrémité pointue (70') à proximité du rotor (41).

2. Groupe de pompe (1) selon la revendication 1, dans lequel ladite huile est du type diélectrique.

3. Groupe de pompe (1) selon l'une quelconque des revendications précédentes, dans lequel le collier (70) comprend une pluralité de conduits (75) de lubrification, de préférence équidistants de manière angulaire.

4. Groupe de pompe (1) selon l'une quelconque des revendications précédentes, dans lequel l'huile a une viscosité spécifique et le conduit (75) de lubrification a un diamètre qui permet à l'huile de couler en fonction de la viscosité de celle-ci.

5. Groupe de pompe (1) selon l'une quelconque des revendications précédentes, dans lequel ladite entrée (750) est un compartiment ou un réservoir d'huile de façon à collecter une quantité d'huile prédéfinie et à lui permettre de couler dans le conduit (75) de lubrification correspondant.

6. Groupe de pompe (1) selon l'une quelconque des revendications précédentes, dans lequel l'organe rotatif (35) est un roulement, de préférence un roulement à double rangée de billes.

7. Groupe de pompe (1) selon l'une quelconque des revendications précédentes, dans lequel l'élément de séparation et de support (7) comprend un organe d'étanchéité (9), abrité dans le collier (70), dans le passage axial (700), à proximité de la chambre d'impulseur (60), dans lequel ledit organe d'étanchéité (9) est approprié pour assurer un joint hydraulique entre le carter d'impulseur (6) et le carter de moteur (7).

8. Groupe de pompe (1) selon la revendication 7, dans lequel l'organe d'étanchéité (9) comprend un premier élément d'étanchéité (91) du type étanche à l'eau et un second élément d'étanchéité (92) du type étanche à l'huile comprenant une chambre étanche à l'air (95) entre ceux-ci.

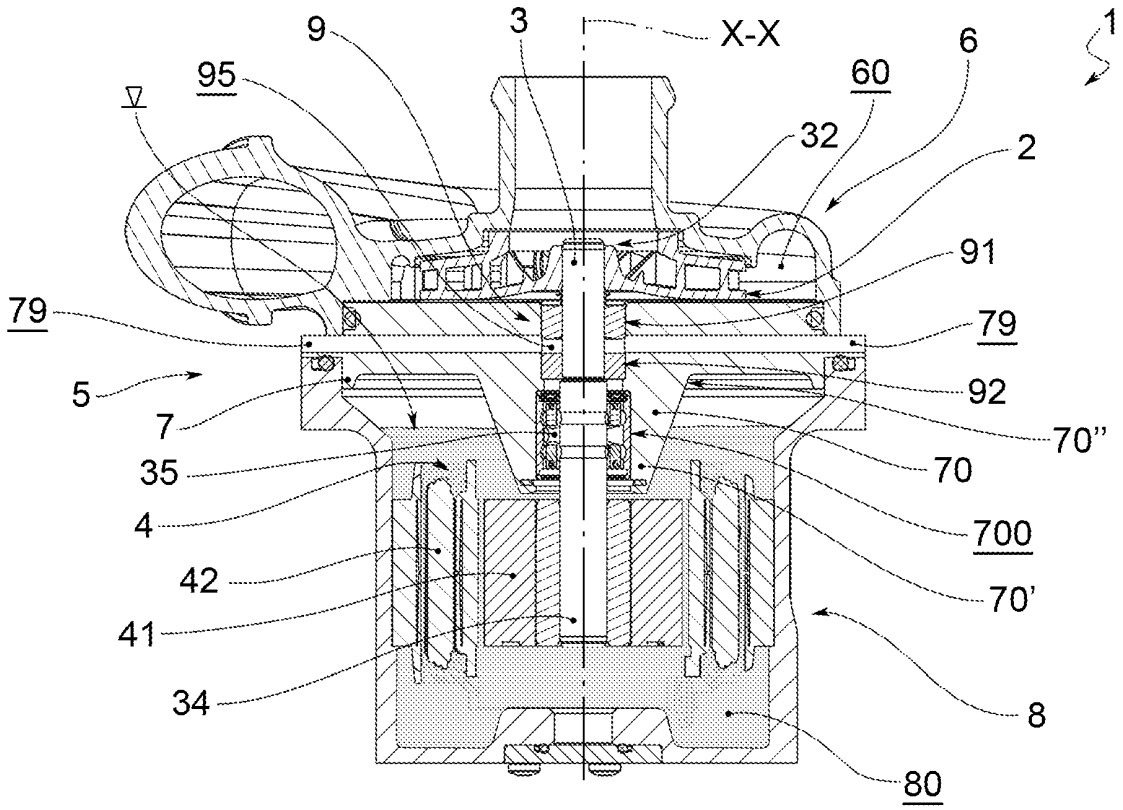

1
9
3
X-X
6
95
60
32
2
91
79
79
5
92
7
70''
35
70
4
700
42
70'
41
8
34
80

FIG.1a

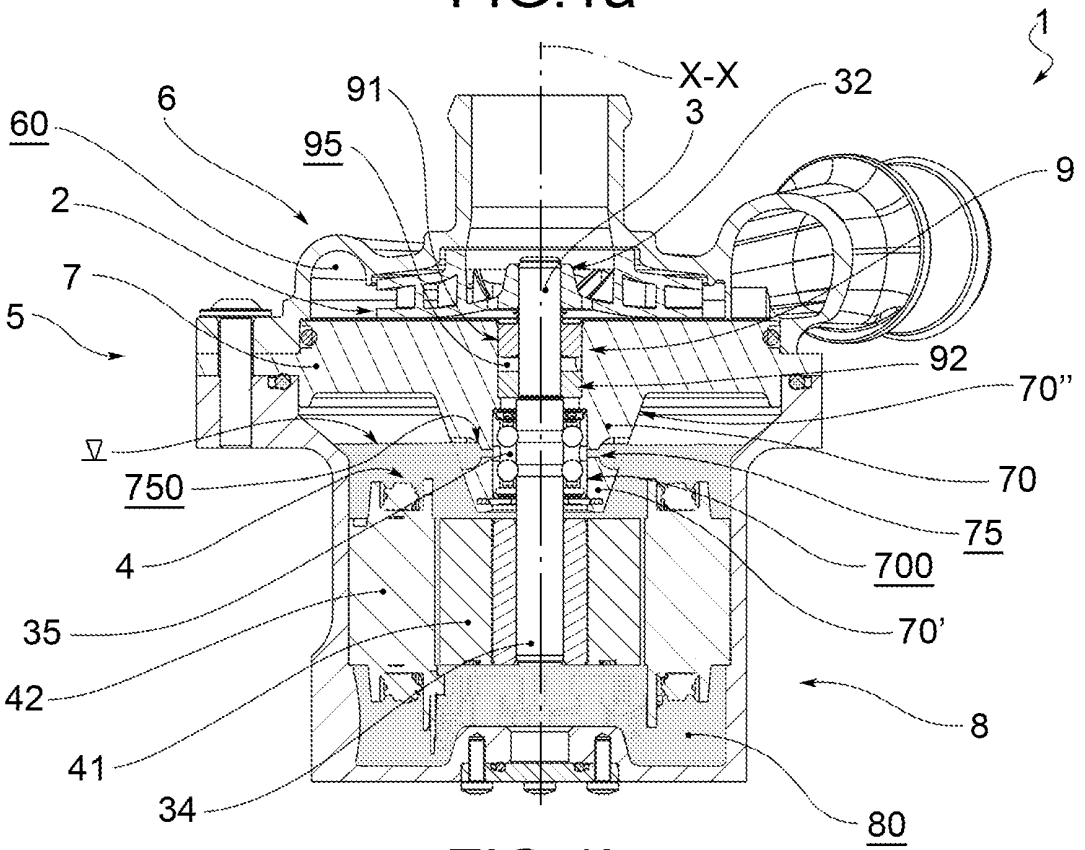

1
X-X
91
32
6
3
60
95
9
2
7
92
5
70''
750
70
75
4
700
35
70'
42
8
41
34
80

FIG.1b

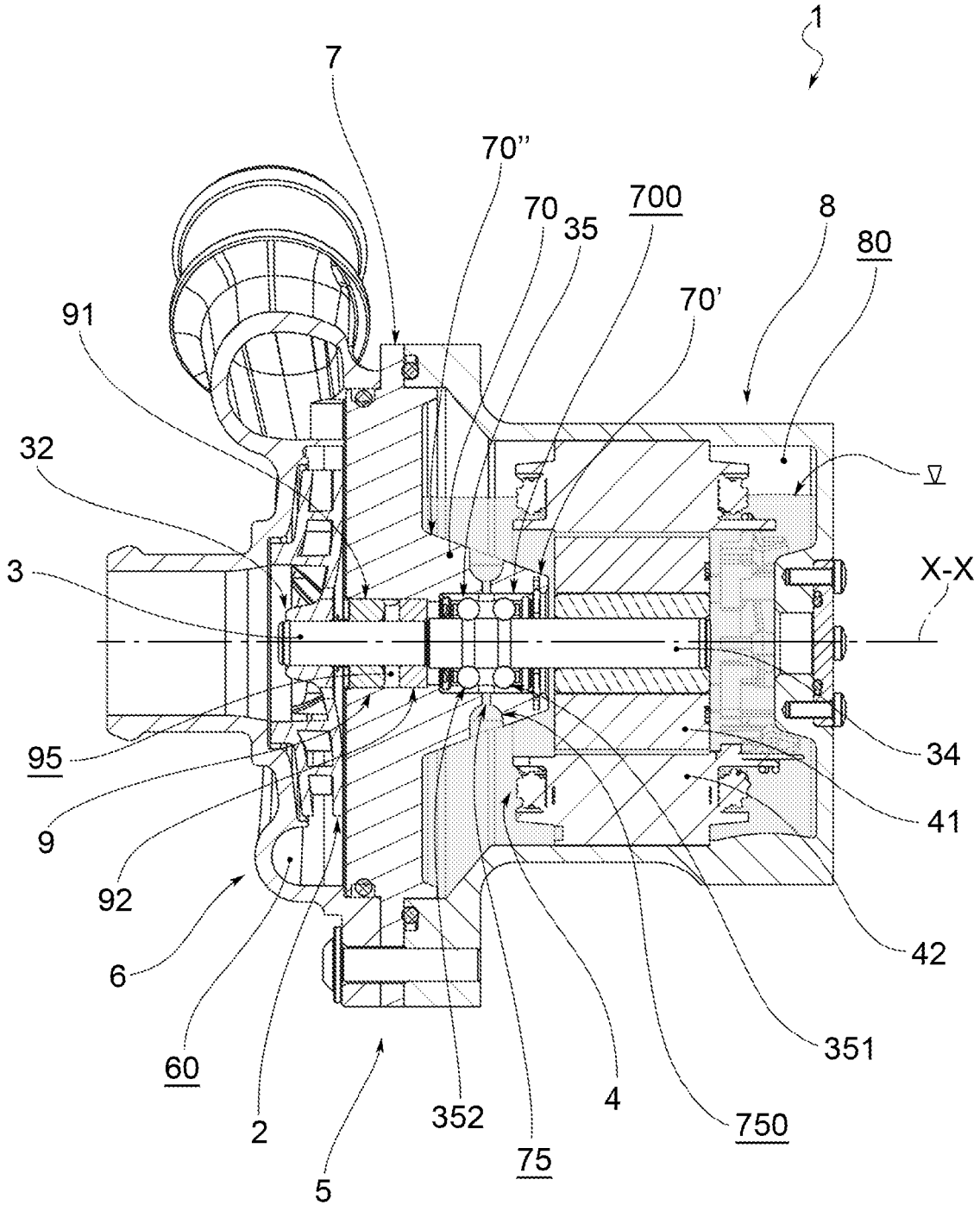

1
7
70''
70
35
700
8
80
70'
91
32
3
X-X
95
34
41
9
92
42
6
60
351
2
352
4
750
75
5

FIG.2

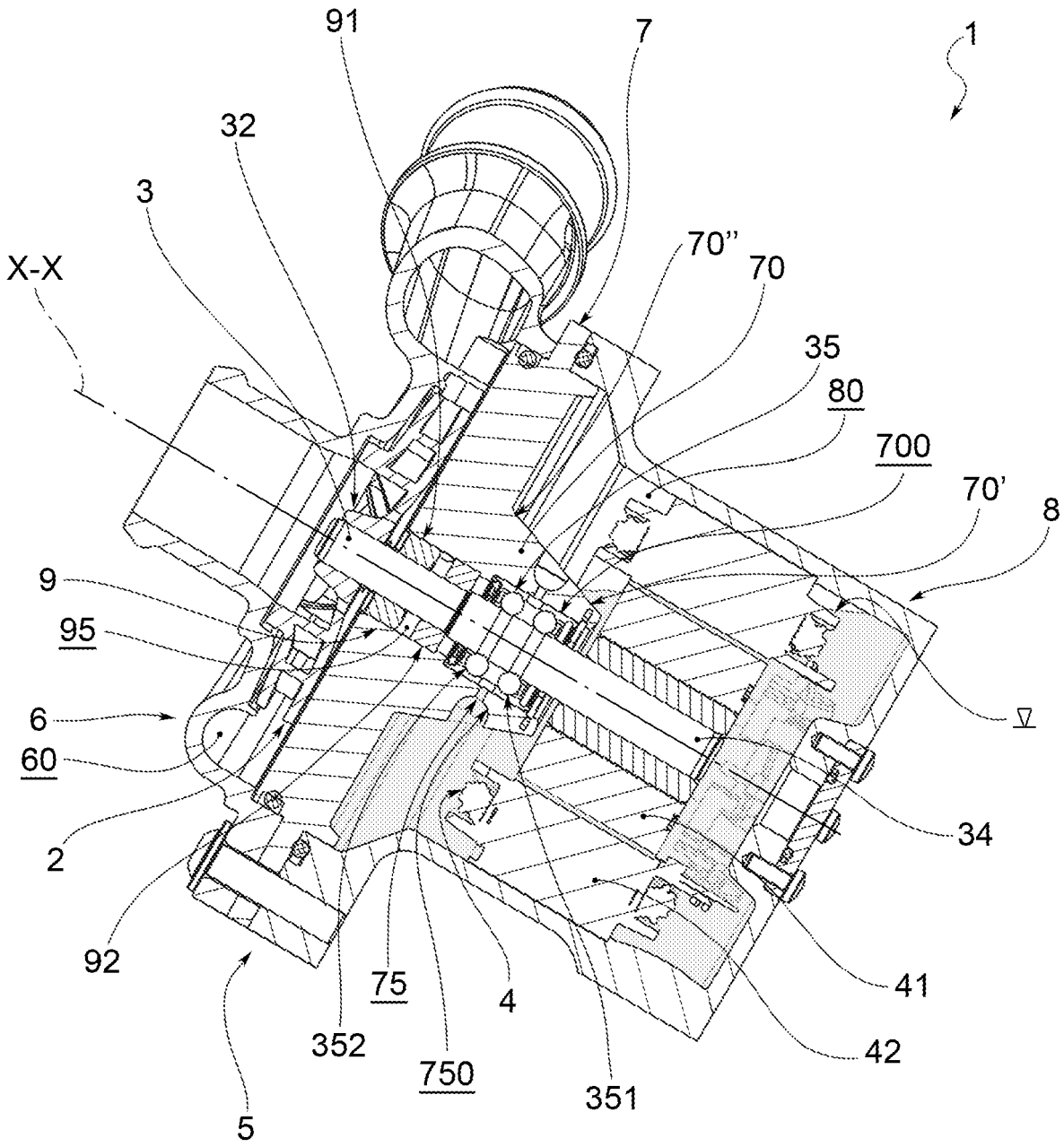

91
7
1
32
3
X-X
70''
70
35
80
700
70'
8
9
95
6
60
2
92
75
352
750
4
351
5
34
41
42

FIG.3

REFERENCES CITED IN THE DESCRIPTION

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