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(54) **VARIABLE DELIVERY VANE OIL PUMP**

FLÜGELZELLE-ÖLPUMPE MIT VERÄNDERLICHER FÖRDERUNG

POMPE A HUILE A PALETTES A DEBIT VARIABLE

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(56) References cited:

FR-A- 778 346 GB-A- 2 074 247
US-A- 3 111 905 US-A- 3 143 079
US-A- 3 153 384 US-A1- 2001 055 538

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Description

TECHNICAL FIELD

[0001] The present innovation relates to a variable delivery vane oil pump.

[0002] In particular, the present innovation relates to a variable delivery vane oil pump of the type comprising a rotor, which is mounted to turn about its longitudinal axis, and presents a plurality of outwardly radially open grooves; a stator, which extends about the rotor, and is eccentrically mounted with respect to the rotor itself; a plurality of vanes, each of which is slidingly mounted inside a respective groove, and presents an outer edge arranged essentially in contact with the stator; and adjusting means for selectively controlling the eccentricity between the rotor and the stator and, therefore, the delivery of the pump.

BACKGROUND ART

[0003] The known variable delivery vane oil pumps of the type described above present some drawbacks mainly deriving from the fact of presenting a relatively high sliding friction between the vanes and the stator.

[0004] US 3153384, US 3111905 and US 3143079 disclose variable delivery oil pumps having elements radially interposed between the outer edges of the vanes and the stator.

DISCLOSURE OF INVENTION

[0005] It is the object of the present innovation to provide a variable delivery vane oil pump, which is free from the aforementioned drawbacks.

[0006] According to the present innovation, there is provided a variable delivery vane oil pump, as claimed in the attached claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The present innovation will now be described with reference to the accompanying drawings illustrating a non-limitative embodiment example thereof, in which:

figure 1 is a schematic longitudinal section of a preferred embodiment of the vane pump of this innovation;

figure 2 is a section taken along line II-II in figure 1; and

figure 3 is a section taken along line III-III in figure 1.

BEST MODE FOR CARRYING OUT THE INVENTION

[0008] With reference to figures from 1 to 3, it is indicated as a whole by 1, a variable delivery vane pump, for feeding oil to a lubrication circuit (not shown) of an internal combustion engine (not shown) of a vehicle (not

shown).

[0009] The pump 1 comprises a supporting case 2, which has an essentially parallelepiped rectangular section, and comprises, in turn, a first plate 3 laterally limited by an essentially flat surface 4. The plate 3 is provided with a cavity 5, which presents a longitudinal axis 6 orthogonal to the surface 4, opens outwardly at the surface 4, and is axially closed by a second plate 7 arranged in contact with the surface 4 itself.

[0010] The pump 1 further comprises a power shaft 8, which is mounted through the plates 3 and 7 to turn about the axis 6, and carries a keyed cylindrical rotor 9, which is housed inside the cavity 5, and presents a width, measured parallelly to the axis 6, essentially equal to the width of the cavity 5, also measured parallelly to the axis 6.

[0011] The cavity 5 further houses inside a stator 10, which extends about the rotor 9, presents a width, measured parallelly to the axis 6, essentially equal to the width of the cavity 5 also measured parallelly to the axis 6, and is internally limited by an essentially cylindrical surface 11 arranged in eccentric position with respect to the rotor 9.

[0012] The stator 10 is hinged to the plate 3 to oscillate, with respect to the plate 3 itself and under the control of an adjusting device 12 of a known type, about a fulcrum axis 13 parallel to the axis 6 and therefore allowing to selectively control the eccentricity between the rotor 9 and the surface 11.

[0013] The rotor 9 presents two cylindrical reciprocally opposite cavities 14, which are obtained coaxially to the axis 6, and one facing the plate 3 and the other the plate 7, and is provided with a plurality of radial grooves 15 (in the case shown, six grooves 15), which are obtained through the rotor 9 parallelly to the axis 6, are uniformly distributed about the axis 6, radially outwardly open at an outer surface 16 of the rotor 9 coaxially to the axis 6, and further open axially outwardly at the cavities 14.

[0014] Each groove 15 is slidingly engaged by a vane 17 presenting an outer edge 18, which extends parallelly to the axis 6, and is arranged essentially in contact with the surface 11 of the stator 10 by arranging an annular sliding element 19 in between.

[0015] The annular sliding element 19 presents a width, measured parallelly to the axis 6, essentially equal to the width of a vane 17 also measured parallel to the axis 6, and circumferentially coupled both to the stator 10, and to the vanes 17.

[0016] Each vane 17 axially projects from the respective groove 15 inside the cavities 14, and presents an inner edge 20, which extends parallel to the axis 6, and is essentially arranged in contact with two annular elements 21, each of which is accommodated inside one of the cavities 14, extends about the shaft 8, and presents a diameter larger than the diameter of the shaft 8 and smaller than the diameter of the respective cavity 14 so as to float inside the respective cavity 14 itself.

[0017] Each pair of respectively adjacent vanes 17 circumferentially defines a respective pumping chamber

22, which is further limited radially by the rotor 9 and by the annular sliding element 19 and axially by the plates 3 and 7, is shifted by the rotor 9 about the axis 6 and through a suction inlet 23 and a delivery outlet 24 of the oil, and presents, following the rotation of the rotor 9 about the axis 6 and the eccentricity between the rotor 9 and the surface 11 of the stator 10, a variable volume.

[0018] Furthermore, with regard to this, it is important to state that the volume of each chamber 22 at the inlet 23 and the outlet 24 and, therefore, the delivery of the pump 1 are selectively controlled by shifting the stator 10 about the axis 13 and, therefore, modifying the eccentricity between the rotor 9 and the surface 11 of the stator 10 itself.

[0019] As shown in figure 2, each vane 17 comprises a plurality of foils 25 (in the case shown, four foils 25), which are reciprocally overlapped, and are slidingly radially coupled one to the other to ensure a relatively efficient fluidtight coupling between the vane 17 and the annular sliding element 19.

[0020] According to a variation not shown, the annular sliding element 19 is housed inside a respective cavity, which are obtained in the stator 10, and opens outwardly at the surface 11, and projects outwardly from the respective cavity to arrange itself in contact with the respective vanes 17.

[0021] The operation of the pump 1 is easily inferred from the above description and does not require any further explanations.

Claims

1. A variable delivery vane oil pump, the pump comprising a rotor (9), which is mounted to turn about a determined longitudinal axis (6), thereof, and presents a plurality of grooves (15) outwardly radially open at one surface (16) thereof essentially coaxial to said axis (6); a stator (10), which extends about the rotor (9), and is eccentrically mounted with respect to the rotor (9) itself; a plurality of vanes (17), each of which is slidingly mounted inside one respective said groove (15), and presents an outer edge (18) facing the stator (10); and adjusting means (12) for selectively controlling the eccentricity between the rotor (9) and the stator (10); and whereby the vane oil pump comprises a single annular sliding element (19) arranged between the stator (10) and the outer edges (18) of the vanes (17) and slidingly circumferentially coupled to the stator (10) and to the vanes (17);
the vane oil pump being **characterised by** two annular elements (21) arranged on opposite bands of the rotor (9) parallel to and extending about said longitudinal axis (6); each vane (17) axially projecting from said respective groove (15) and presenting an inner edge (20) arranged in contact with said annular elements (21).

2. An oil pump according to claim 1, in which each vane (17) comprises at least two foils (25) reciprocally overlapping and slidingly coupled one to the other.

Patentansprüche

1. Flügelzelle-Ölpumpe mit veränderlicher Förderung, wobei die Pumpe einen Rotor (9) umfasst, der eingebaut ist, um sich um eine vorgegebene Längsachse (6) desselben zu drehen und eine Mehrzahl von Rillen (15) aufweist, die auf einer im Wesentlichen koaxial zur Achse (6) verlaufenden Oberfläche (16) derselben radial nach außen offen sind; einen Stator (10), der sich um den Rotor (9) erstreckt und exzentrisch in Bezug auf den Rotor (9) eingebaut ist; eine Mehrzahl von Flügeln (17), wobei jeder verschiebbar innerhalb einer jeweiligen Rille (15) eingebaut ist und eine Außenkante (18) aufweist, die dem Stator (10) zugewandt ist; und Verstellmittel (12) zum selektiven Steuern der Exzentrizität zwischen dem Rotor (9) und dem Stator (10); und wobei die Flügelzelle-Ölpumpe ein einzelnes, ringförmiges, verschiebbares Element (19) umfasst, das zwischen dem Stator (10) und den Außenkanten (18) der Flügel (17) angeordnet und verschiebbar umfangseitig mit dem Stator (10) und mit den Flügeln (17) gekoppelt ist; wobei die Flügelzelle-Ölpumpe durch zwei ringförmige Elemente (21) gekennzeichnet ist, die auf gegenüberliegenden Seiten des Rotors (9) parallel zur und sich um die Längsachse (6) erstreckend angeordnet sind; wobei jeder Flügel (17) axial aus der jeweiligen Rille (15) auskragt und eine Innenkante (20) aufweist, die im Kontakt mit den ringförmigen Elementen (21) angeordnet ist.
2. Ölpumpe nach Anspruch 1, wobei jeder Flügel (17) wenigstens zwei Folien (25) umfasst, die sich gegenseitig überlappen und verschiebbar aneinander gekoppelt sind.

Revendications

1. Pompe à huile à palettes à débit variable, la pompe comprenant un rotor (9), qui est monté pour tourner autour d'un axe longitudinal déterminé (6), de celui-ci, et présente une pluralité de rainures (15) ouvertes radialement vers l'extérieur au niveau d'une surface (16) de celui-ci sensiblement coaxiale avec ledit axe (6); un stator (10), qui s'étend autour du rotor (9), et est monté de manière excentrique par rapport au rotor (9) lui-même; une pluralité de palettes (17), chacune desquelles est montée de manière coulissante à l'intérieur d'une dite rainure respective (15), et présente un bord extérieur (18) faisant face au stator (10); et des moyens de réglage (12) pour commander de manière sélective l'excentricité entre le

rotor (9) et le stator (10) ; et moyennant quoi la pompe à huile à palettes comprend un unique élément coulissant annulaire (19) agencé entre le stator (10) et les bords extérieurs (18) des palettes (17) et couplé de manière circonférentielle et coulissante au stator (10) et aux palettes (17) ; la pompe à huile à palettes étant **caractérisée par** deux éléments annulaires (21) agencés sur des bandes opposées du rotor (9) parallèles et s'étendant autour dudit axe longitudinal (6) ; chaque palette (17) faisant saillie axialement à partir de ladite rainure respective (15) et présentant un bord intérieur (20) agencé en contact avec lesdits éléments annulaires (21).

2. Pompe à huile selon la revendication 1, dans laquelle chaque palette (7) comprend au moins deux feuilles (25) se chevauchant mutuellement et couplées l'une à l'autre de manière coulissante.

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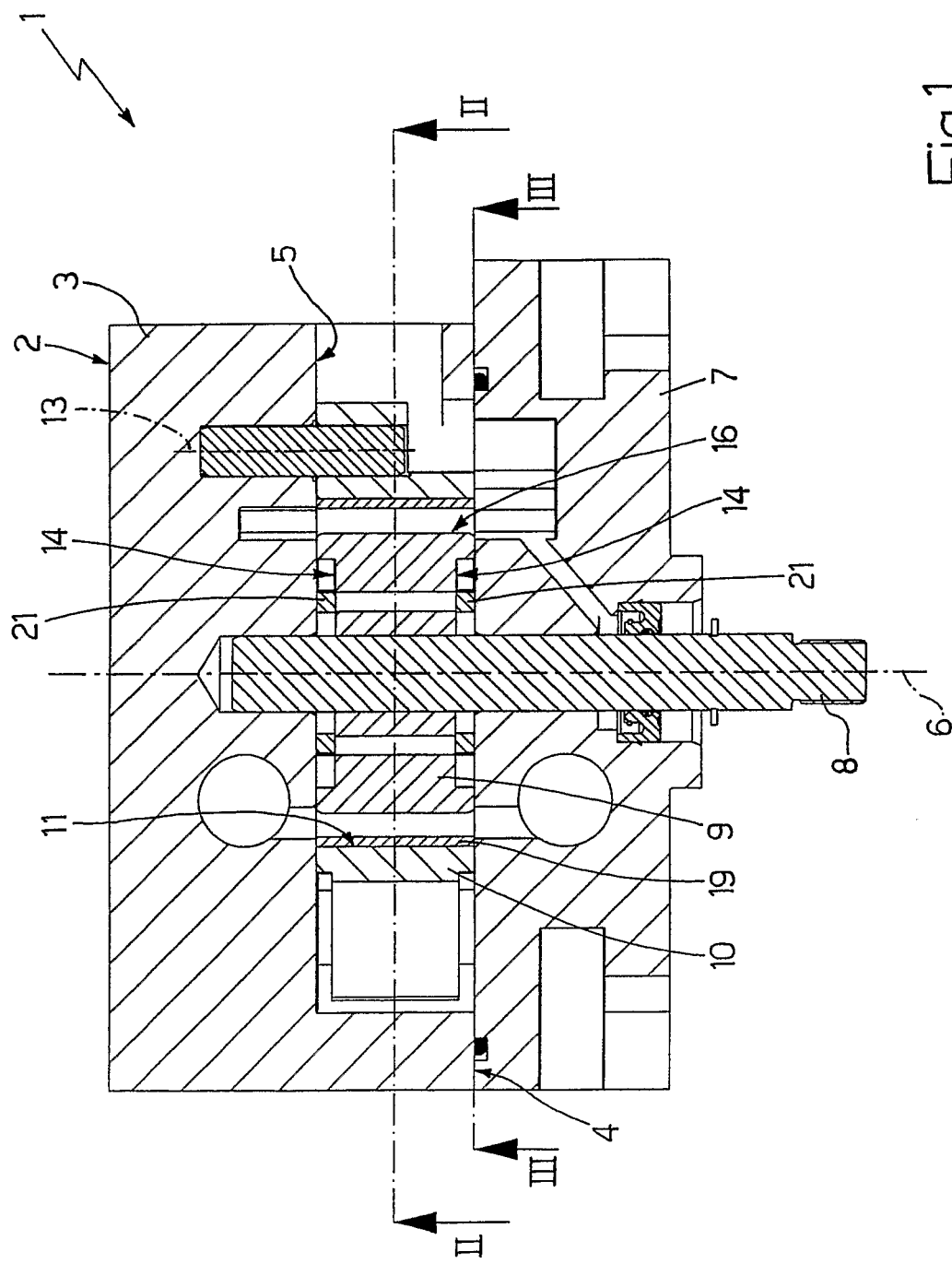


Fig.1

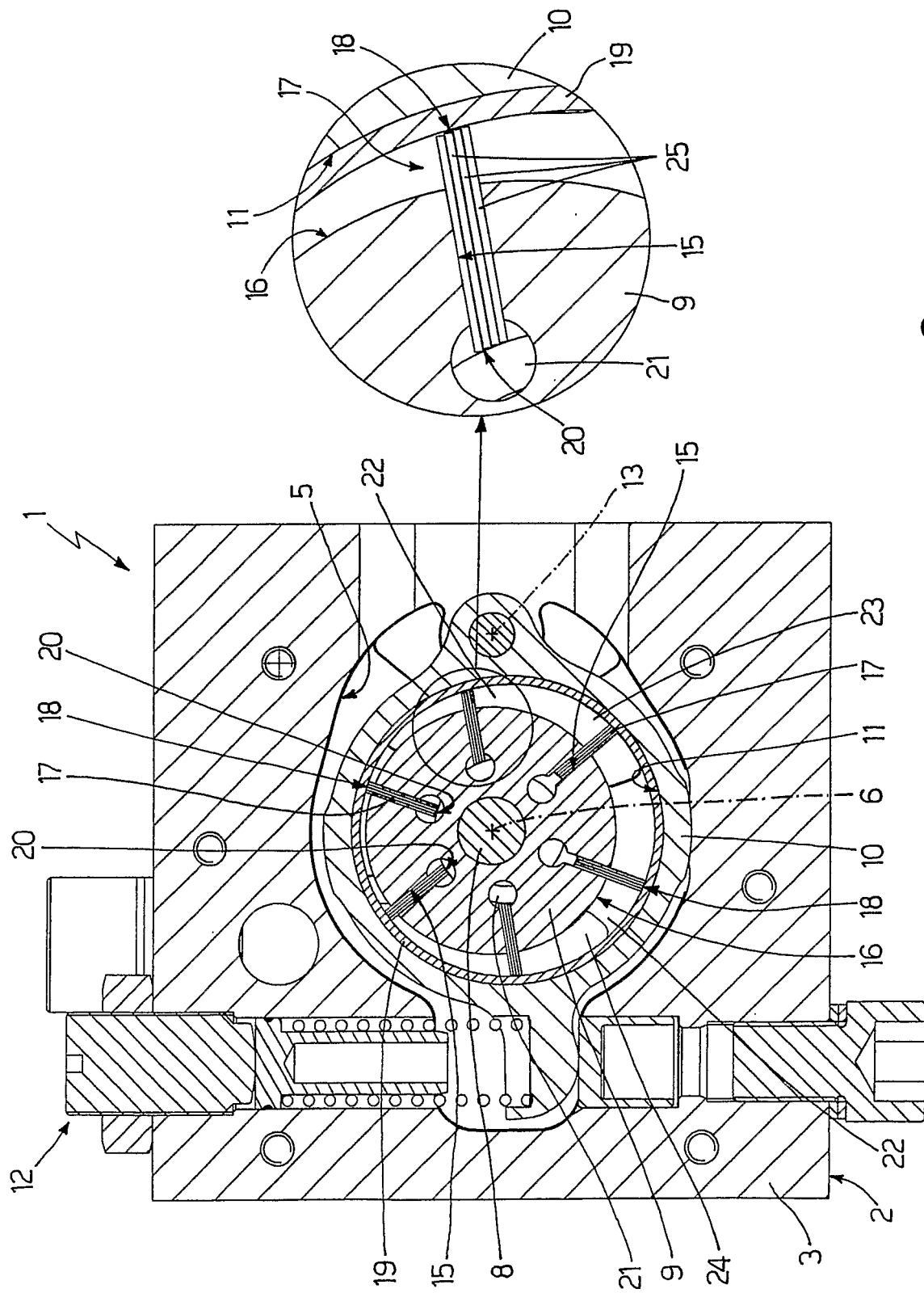


Fig. 2

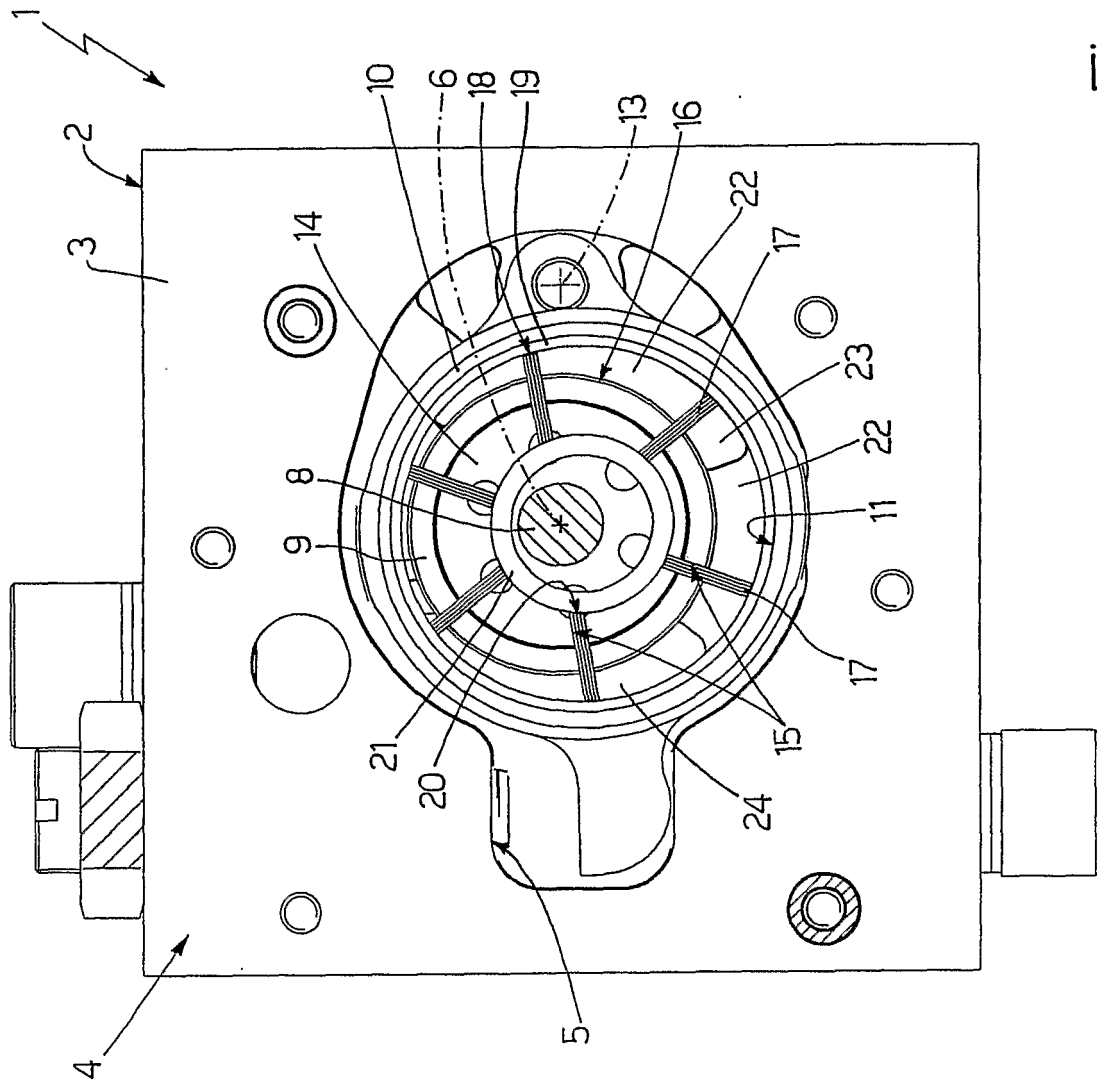


Fig.3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3153384 A [0004]
- US 3111905 A [0004]
- US 3143079 A [0004]