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- **Patrosz, Piotr**
80-180 Gdansk (PL)
- **Poznanski, Kazimierz**
83-140 Gniew (PL)
- **Ruda, Piotr**
83-140 Gniew (PL)
- **Gocek, Andrzej**
83-140 Gniew (PL)

(71) Applicant: **FAMA Spółka z ograniczona odpowiedzialnoscia**
83-140 Gniew (PL)

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(72) Inventors:
• **Sliwinski, Pawel**
80-766 Gdansk (PL)

(54) **HYDRAULIC POSITIVE DISPLACEMENT MACHINE**

(57) A hydraulic positive displacement machine with reverse kinematics consisting of a housing with a neck and a working mechanism constituting a planet set on the neck, a curvature with satellites placed between the

planet and the curvature and it has bearings, a collector and channels characterised in that it has rotating housing /1/ relative to neck /2/.

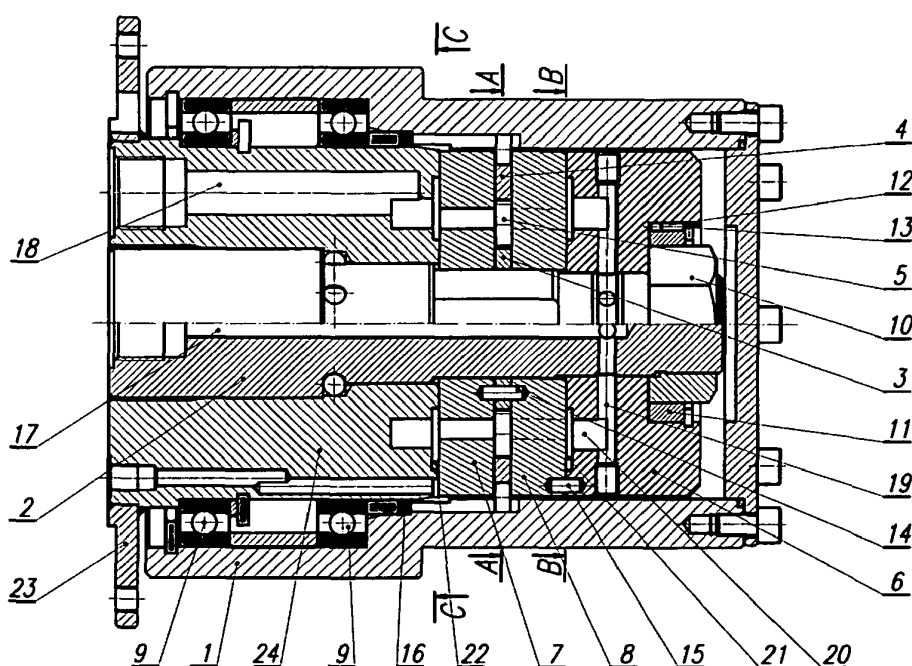


Fig. 1.

Description

[0001] The subject of the invention is a hydraulic positive displacement machine with reverse kinematics designed to work as a hydraulic motor or a hydraulic pump.

[0002] The displacement machine of the planetary cam type, known from Patent Description PL 185724, with axial clearance compensation designed for motor or pump operation in which the working medium is liquid, particularly liquid with low viscosity. The positive displacement machine is of a plate design and the essence of the invention lies in the fact that the plate elements of the machine are axial and integrated with screws located in an axis of eight humps convex to the inside. In addition, the intermediate plates closing the machine's working chambers at the front contain supply channels and channels distributing the working liquid. The supply channels are also connected to the compensation surface volumes located on the external sides of the intermediate plates. This is the reason why the inner front surfaces of the intermediate plates are pressed to the front surfaces of the moving satellites and the rotor interacting with them by the force of pressure of the working fluid reaching the compensation surface volume.

[0003] The positive displacement pump with equipment for a hydraulic drive, known from the description of Invention Patent Application P. 381396, which finds application particularly in the drives of motor vehicles with an all-wheel drive, without using the differential mechanism of the gearbox, clutch and brakes. The pump consists of a casing made of two hemispheres joined by screws. The piston in the form of a flat disc, mounted in the pitch line, interacts with a flat semicircular gate, slide placed on the bearings in the clearance of the driver mounted in the drive shaft. A tiltable block with bearings with a piston is terminated by a control rod. Suction and pressure ports come out of the working chambers. The pump and motor assembly is encased with an open working medium system with recesses in the casing, liquid pipes and a liquid tank open to atmospheric pressure.

[0004] The positive displacement pump known from the description of Invention Patent Application P.381617 or a hydraulic motor with a steady and fluid shift of performance which finds application particularly in the drives of motor vehicles, without using the traditional differential mechanism, gearbox, clutch and brakes. The casing is made of two hemispheres with a rotary joint. The drive shafts with drivers, with slide mounted identical hemispherical hinged gates, are set on the hemispheres of the casing at an acute angle with respect to the cylinder pitch plane. Suction and pressure ports are led out of the working chambers. The pump's performance is controlled by a lever fitted to the rotary hemisphere of the casing. The pump and motor assembly requires that an open working liquid system is installed.

[0005] The satellite working mechanism of a hydraulic displacement machine, known from Patent Description PL 218888, comprising a rotor (WR) formed on a circle

with radius R_1 , teeth and curvature (OB) matching the satellite teeth (ST) contour which is characteristic in that the rotor (WR) humps in tip areas are formed from arcs with a radius in the range $<0.14 R_1; 1.0 R_1>$. The minimum and maximum values of indentations and convexities are within the $W_{min} \leq 0; 0.30 R_1>$ and $U_{max} \leq 0; 0.30$

[0006] $R_1>$ ranges, respectively. The contour of satellite teeth (ST) in the contact area is an involute line which passes into an arc line with radius R_6 in the base area, and then, into an arc line with radius R_7 , and then passes into an arc line with radius R_6 which passes into an involute line in the contact area. In the tip area the line passes into an arc line with radius R_6 , and then, into an arc line with radius R_7 , and then passes into an arc line with radius R_6 . The tooth root height is at most equal to the tooth head height. In another invention the contour of satellite teeth (ST) in the contact area is an involute line where the involute line in the base area passes into an arc line with radius R_8 , and then, in the contact area, passes into an involute line which in the tip area passes into an arc line with radius R_8 .

[0007] The essence of the invention is a hydraulic positive displacement machine with reverse kinematics consisting of a housing with a neck and a working mechanism constituting a planet set on the neck, a curvature with satellites placed between the planet and the curvature and it has bearings and collector channels characterised by having a rotating housing relative to the neck which is favourably immobile. The rotating housing is set on bearings directly or indirectly through the front manifold on the neck. The bearings are set on a part of the neck or the front manifold from the side of and close to the port fixing the positive displacement machine. The favourably rotating housing has a permanently embedded curvature. The neck has at least one longitudinal channel that is connected to at least one radial channel distributing liquid in the manifold permanently embedded circumferentially on it. The manifold has adjustable dislocation along the neck axis which is limited by a nut with a ring, a lock pin and a lock ring. The radial channel is connected to the compensation pockets via the compensation pocket channel. The number of compensation chambers is not greater than the number of compensation channels connecting liquid distribution channels with the working chambers. The compensation pocket area is at the height of the working chamber. As least one inflow/outflow channel is connected to the compensation pockets in the neck or in the front manifold.

[0008] The invention finds application in drives of e.g. hoists, belt conveyors, road wheels of vehicles. It finds application in the drives of a positive displacement machine with a rotating hydraulic motor casing with a rotating casing and it will help design such drives without additional couplers, coupling gears and bearing assemblies. The invention may have the features of a winch drum, a conveyor belt roller or a vehicle drive wheel. The invention simplifies the design of the device in which it is used.

According to the invention the positive displacement machine has compensation pockets, the task of which is to limit the axial clearance of elements of the working mechanism (curvature and satellites) when the machine is under load, which will result in reducing leaks in the working mechanism and enhance the machine's performance.

[0009] The subject of the invention is shown in the figures where Fig. 1 shows an axial section of the positive displacement machine with a front manifold; Fig. 2 shows an axial section of the positive displacement machine without a front manifold; Fig. 3 shows the cross section A-A from Fig. 1 with separated compensation pockets; Fig. 4 shows the cross section B-B and C-C from Fig. 1; Fig. 5 shows the cross-sections B-B and C-C from Fig. 1 with the circumferential compensation pocket.

Embodiment Example I

[0010] In this Embodiment Example, the hydraulic displacement machine with reverse kinematics consists of rotating housing 1 relative to neck 2 which is set on bearings 9. Bearings 9 are set on a part of neck 2 on the side of and close to manifold 23 fixing the positive displacement machine. Rotating housing 1 has permanently embedded curvature 4. Neck 2 has at least one longitudinal channel 17 that is connected to at least one radial channel 19 distributing liquid in manifold 6 permanently embedded circumferentially on neck 2. Manifold 3 has adjustable dislocation along the axis of neck 2 which is limited by nut 10 with ring 11 and lock pin 12 and lock ring 13. Radial channel 19 which distributes liquid is connected to compensation pocket 21 by pocket compensation channel 20. Compensation pocket field 21 is at the height of working chamber 25. In neck 2 it has one inflow/outflow channel 18 connected to compensation pockets 21.

Embodiment Example II

[0011] In this Embodiment Example, the hydraulic displacement machine with reverse kinematics consists of rotating housing 1 relative to immobile neck 2 which is set on bearings 9. Bearings 9 are set on a part of front manifold 24 from the side of and close to port 23 fixing the positive displacement machine. Rotating housing 1 has permanently embedded curvature 4. Neck 2 has at least two longitudinal channels 17 that are connected to two radial channels 19 distributing liquid in manifold 6 permanently embedded circumferentially on neck 2. Manifold 6 has adjustable dislocation along the axis of neck 2 which is limited by nut 10 with ring 11 and lock pin 12 and lock ring 13. Radial channel 19 which distributes liquid is connected to compensation pocket 21 via compensation pocket channel 20. The number of compensation pockets 21 is equal to the number of compensation channels 20 connecting liquid distribution channels 19 with working chambers 25. Compensation pocket field 21 is at the height of working chamber 25. In front manifold 24 it has one inflow/outflow channel 18 connect-

ed to compensation pockets 21.

Claims

1. A hydraulic positive displacement machine with reverse kinematics consisting of a housing with a neck and a working mechanism comprising a planet set on the neck, a curvature with satellites placed between the planet and the curvature and it has bearings, a collector and channels, **characterized in that** it has rotating housing /1/ relative to neck /2/.
2. According to Claim 1, the machine is **characterized in that** rotating housing /1/ is set rotationally respective to neck /2/.
3. According to Claim 1 the machine is **characterized in that** rotating housing /1/ is set on bearings /9/ directly or indirectly through front manifold /24/ on neck /2/.
4. According to Claim 3 the machine is **characterized in that** bearings /9/ are set on a part of neck /2/ or front manifold /24/ from the side and close to port /23/ fixing the positive displacement machine.
5. According to Claim 1, the machine is **characterized in that** rotating housing /1/ has permanently embedded curvature /4/.
6. According to Claim 1, the machine is **characterized in that** neck /2/ has at least one longitudinal channel /17/.
7. According to Claim 6 the machine is **characterized in that** longitudinal channel /17/ is connected to at least one radial channel /19/ distributing liquid in manifold /6/ permanently circumferentially embedded on neck /2/.
8. According to Claim 7 the machine is **characterized in that** manifold /6/ has adjustable dislocation along the axis of neck /2/ which is limited by nut /10/ with ring /11/ and lock pin /12/ and lock ring /13/.
9. According to Claim 7 the machine is **characterized in that** radial channel /19/ which distributes liquid is connected to compensation pockets /21/ via compensation pocket channel /20/.
10. According to Claim 9 the machine is **characterized in that** the number of compensation pockets /21/ is not greater than the number of compensation pocket channels /20/ connecting liquid distribution channels /19/ to working chambers /25/.
11. According to Claim 10 distributing compensation

pocket field /21/ is at the height of working chamber /25/.

12. According to Claim 1 the machine is **characterized in that** in neck /2/ or in front manifold /24/ it has at least one inflow/outflow channel /18/ connected to compensation pockets /21/. 5

Amended claims in accordance with Rule 137(2) EPC. 10

1. A hydraulic positive displacement machine consisting of a housing with a neck and a working mechanism comprising a planet set on the neck, a curvature with satellites placed between the planet and the curvature and it has bearings, a collector and channels and has rotating housing /1/ relative to neck /2/, , **characterized in that** rotating housing /1/ is set on bearings /9/ directly or indirectly through front manifold /24/ on neck /2/ from the side and close to port /23/ fixing the positive displacement machine wherein in neck /2/ or in front manifold /24/ it has at least one inflow/outflow channel /18/ connected to compensation pockets /21/. 15 20 25
2. The machine according to claim 1, **characterized in that** neck /2/ has at least one longitudinal channel /17/ and longitudinal channel /17/ is connected to at least one radial channel /19/ distributing liquid in manifold /6/ permanently circumferentially embedded on neck /2/. 30
3. The machine according to claim 1, **characterized in that** manifold /6/ has adjustable dislocation along the axis of neck /2/ which is limited by nut /10/ with ring /11/ and lock pin /12/ and lock ring /13/. 35
4. The machine according to claim 1, **characterized in that** radial channel /19/ which distributes liquid is connected to compensation pockets /21/ via compensation pocket channel /20/, the number of compensation pockets /21/ is not greater than the number of compensation pocket channels /20/ connecting liquid distribution channels /19/ to working chambers /25/. 40 45

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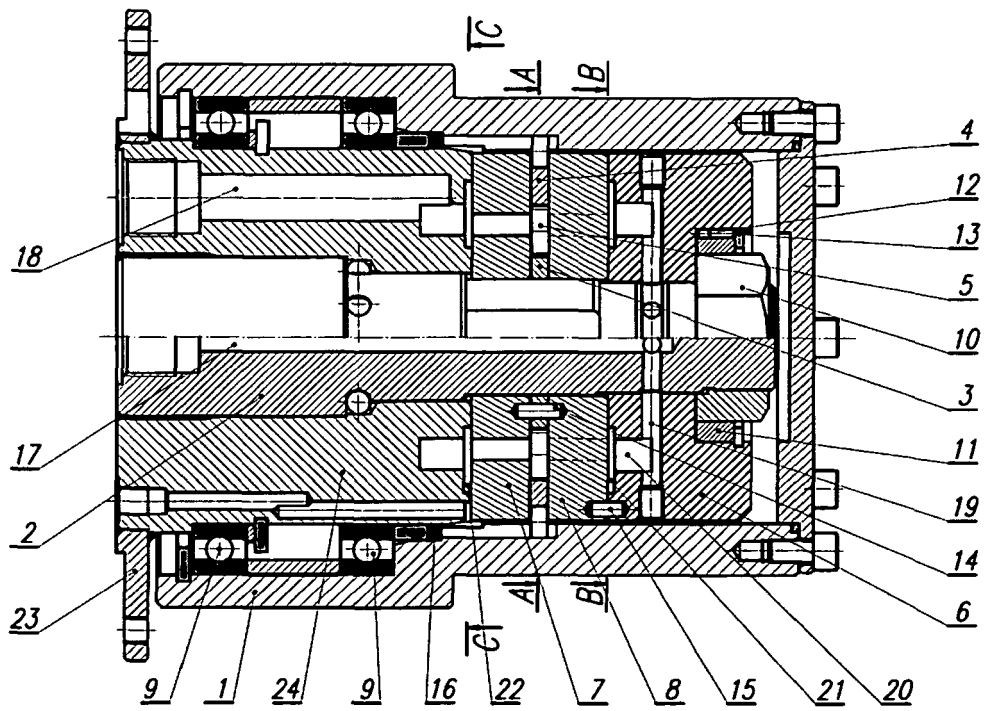


Fig. 1.

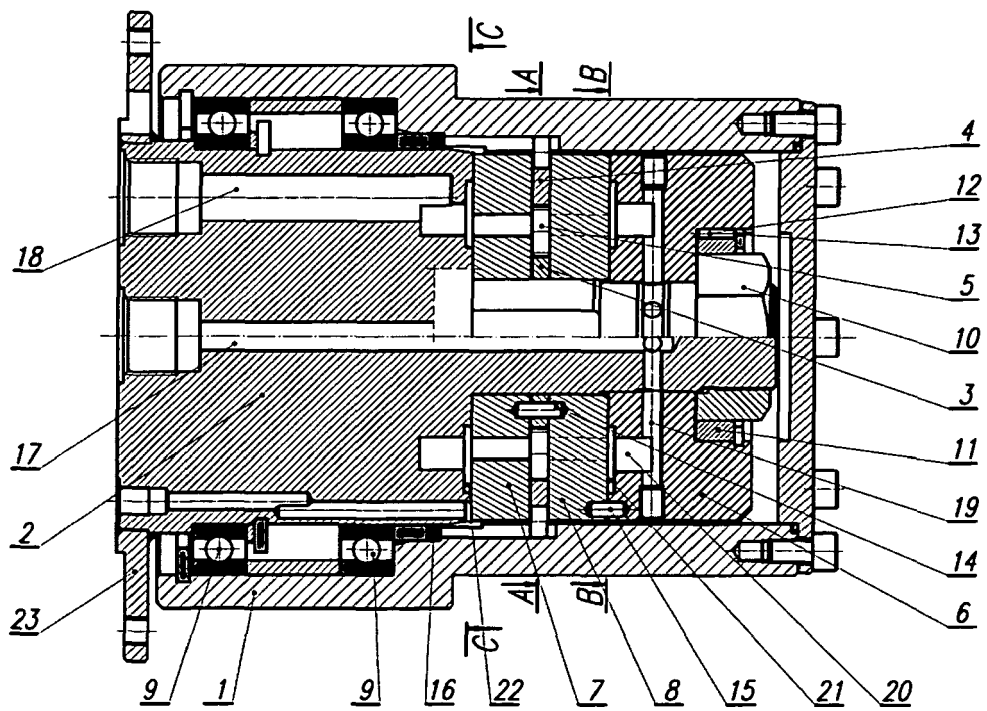


Fig. 2.

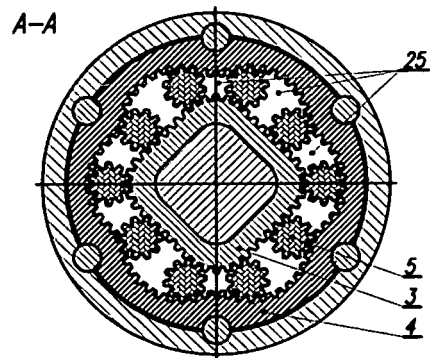


Fig. 3.

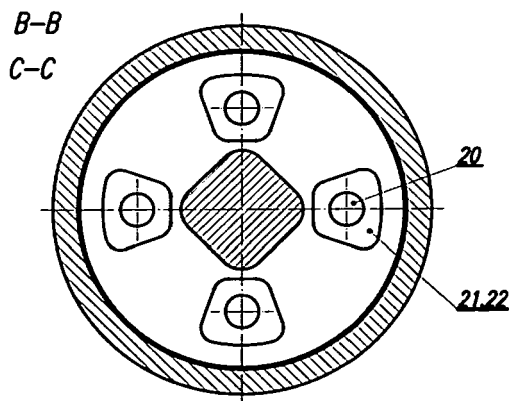


Fig. 4.

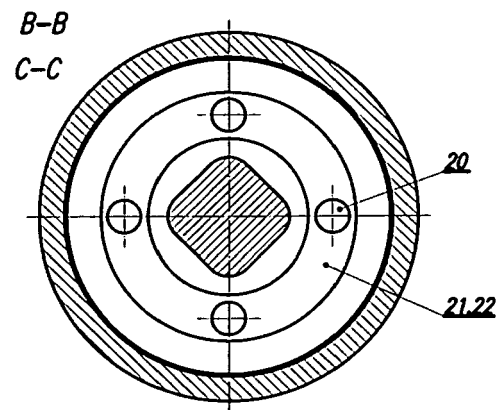


Fig. 5.



EUROPEAN SEARCH REPORT

Application Number
EP 15 00 3680

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 June 2016	Examiner Papastefanou, M
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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29-06-2016

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- PL 381396 [0003]
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