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Bereit

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[54] **DEVICE FOR THE HYDROSTATIC SUPPORTING OF MACHINE PARTS**

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[51] **Int. Cl.** **F16c 1/24**

[58] **Field of Search** 184/5, 100; 308/9, 5

[56] **References Cited**

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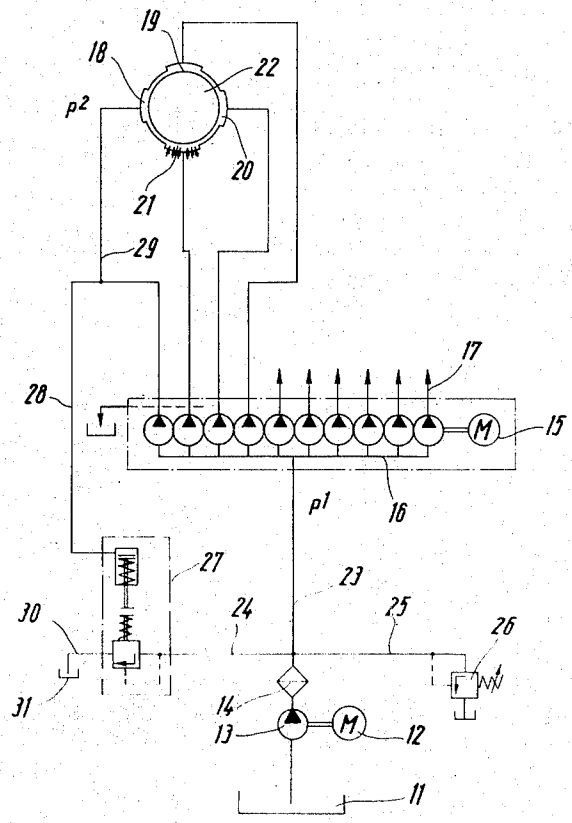
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[57] **ABSTRACT**

A device or system for hydrostatically supporting machine parts wherein the pressure fluid is conducted to several points from a supply pressure pump through a multi-circuit distributor pump. A differential pressure valve is connected to the output of the supply pump and to at least one of the circuits from the distributor pump. The differential pressure valve has a first valve member to control flow from the supply pump to an overflow in a first pressure range and in a second pressure range by a second valve member, the second valve member having a spring means which determines the differential pressure.

8 Claims, 2 Drawing Figures



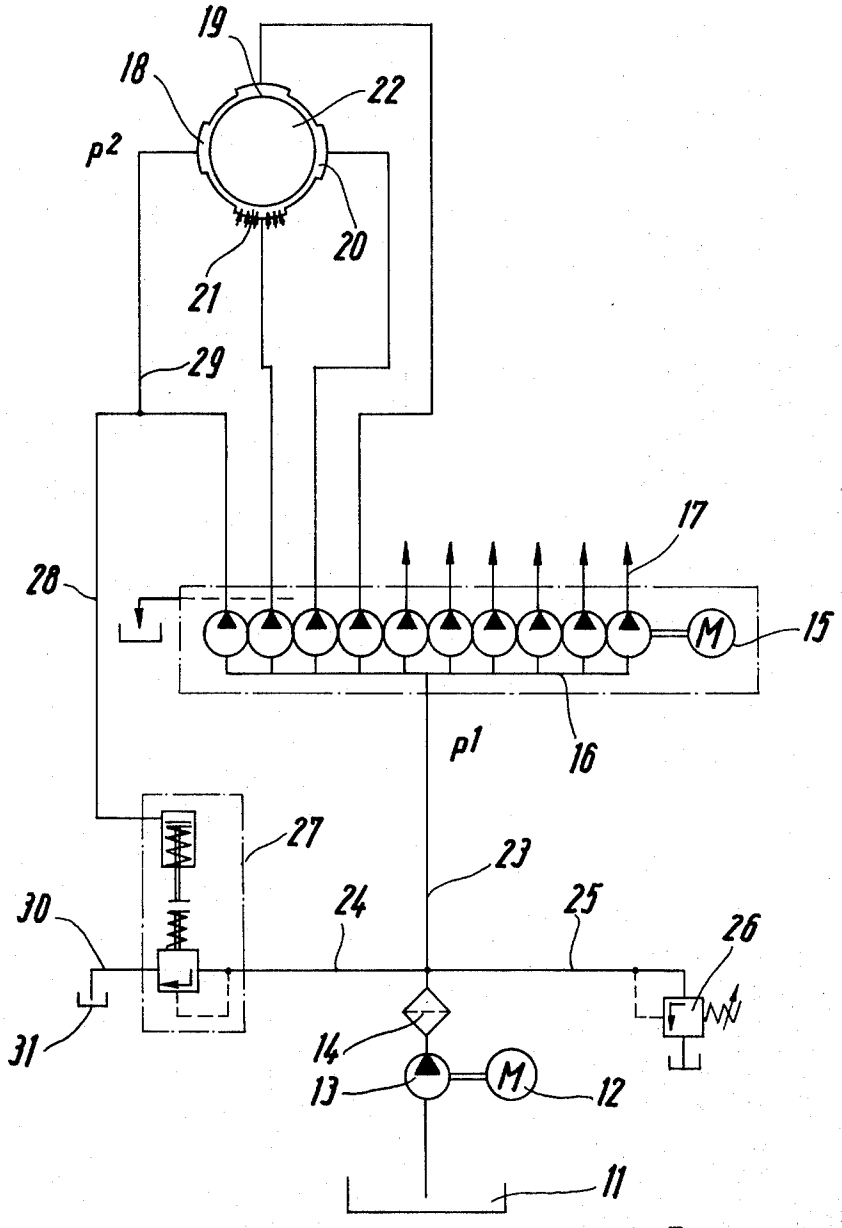


Fig.1

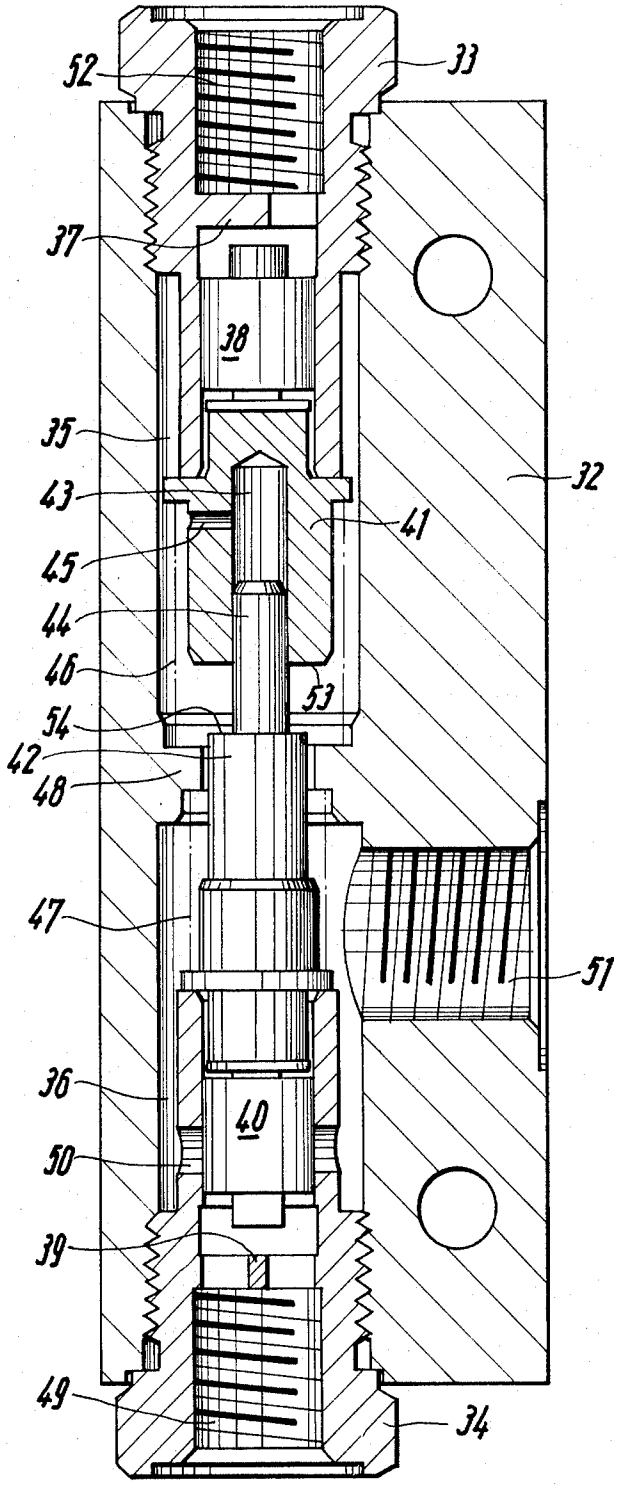


Fig. 2

DEVICE FOR THE HYDROSTATIC SUPPORTING OF MACHINE PARTS

The present invention relates to a device for the hydrostatic support of machine parts in which the pressure of the pressure fluid which is conveyed to various points of support can be controlled as a function of the value of the bearing forces which occur.

There is known a device for the aforementioned type in which a movable body which is exposed to varying forces is held in position by means of counteracting forces which are produced by the adjustable pressure of a fluid in one or more bearing zones and the value of which is determined by a bearing correction member which is formed of an annular gap of constant size and a control slide arranged in the fluid feed.

These known devices are of comparatively complicated construction and are too expensive, and are subject to failure, for numerous purposes.

One of the objects of the present invention is to provide a device of the aforementioned type which is characterized by utmost simplicity and makes it possible to provide at correspondingly little expense a large number of supporting points uniformly with a pressure fluid.

The foregoing object is achieved according to the present invention by using a device for supplying pressure fluid to the points of support comprising a supply pressure pump and a multi-circuit distributor pump located downstream or behind the latter. In at least one circuit of the multi-circuit distributor pump and parallel thereto, there is provided a differential pressure valve one end of which is connected with the outlet side of the supply pressure pump and the other end of which is connected with the outlet side of the multi-circuit distributor pump. The valve member of the differential pressure valve which controls the quantity of pressure fluid flowing from the supply pressure pump to an overflow can be displaced in a first pressure range against a first spring and in a second pressure range against the force of a second valve member acted upon by pressure fluid from the multi-circuit distributor pump, said second valve member being under the action of a second spring which determines the differential pressure.

The device of the invention makes it possible in simple fashion to bring equal quantities of pressure fluid to a large number of points and to maintain uniformity at the individual points even under varying conditions. In numerous cases, the use of only a single differential pressure valve which is associated with the point of consumption and which is regularly subjected to the heaviest load can be used. This, for instance, in the case of a rotary machine, would be the pressure pocket of the main bearing which receives the principal-section force.

One embodiment of the invention is shown in detail in the accompanying drawing in which:

FIG. 1 is the diagram of a device in accordance with the invention; and

FIG. 2 is a section through the differential pressure valve used in the device shown in FIG. 1.

In FIG. 1, 11 is an oil tank from which oil is pumped with a pressure p_1 by a supply pressure pump 13 driven by a motor 12 via a filter 14 to a multi-circuit distributor pump 16 driven by a motor 15. The multi-circuit distributor pump 16 is preferably formed of a gear pump having a sun wheel and a plurality of planet wheels. The supply pressure pump 13 is also a gear pump.

The individual outlets 17 of the multi-circuit distributor pump 16 are connected with pressure pockets 18-21 of bearings for shafts 22 or slides, not shown in the drawing.

The oil pumped by the multi-circuit distributor pump 16 has a pressure p_2. This pressure is necessary in order properly to support the parts which are to be supported even if varying loads act upon them.

From the line 23 connecting the supply pressure pump 13 with the multi-circuit distributor pump 16 there extend two branch lines 24 and 25. The branch line 25 is connected with a pressure-limiting valve 26, while the branch line 24 leads to a differential pressure valve 27. The construction of the differential pressure valve 27 can be noted from FIG. 2.

The differential pressure valve 27 is furthermore connected via a line 28 with a line 29 which leads from the multi-circuit distributor pump 16 to the pressure pocket 18. Finally, the differential pressure valve 27 is connected via a line 30 with an overflow 31.

The differential pressure valve 27 has a housing 32 into which two inserts 33 and 34 are screwed. The insert 33 extends into a chamber 35 and the insert 34 extends into a chamber 26. The insert 33 forms a cylindrical guide provided with an end stop 37 for a valve member 38, while the insert 34 forms a guide, also provided with an end stop 39, for a second valve member 40. Pressure pieces 41 and 42 are connected with the valve members 38 and 40. The pressure piece 41 has a guide bore 43 for a pin 44 of the pressure piece 42. A transverse bore 45 permits the entrance and emergence of oil under pressure from and into the guide bore 43 respectively. The pressure pieces 41 and 42 are pressed by springs 46 and 47 against stops formed by the end surfaces of the inserts 33 and 34. The springs rest on the opposite sides of a circumferential ledge 48 arranged in the region of the connection between the two chambers 35 and 36.

The object of the spring 47 is to maintain the pressure p_1 at a given value, for instance, 2.5 atm.ga. For this purpose the inlet 49 is connected with the branch line 24. If the pressure p_1 rises above the stipulated value, the valve member 40 moves upward, as seen in FIG. 2, and oil can flow via the overflow openings 50 through the chamber 36 and outlet 51 into the line 30 and from there to the overflow if a prescribed pressure difference $p_1 - p_2$ is not exceeded.

The amount of the pressure difference $p_2 - p_1$ depends on the spring 46. This spring is therefore, in other words, responsible for the building up of the pressure p_2. The differential pressure can amount, for instance, to 5 atm.ga. If p_2 increases in such a manner in pressure pocket 18 connected via the line 28 with the inlet 52 that the prescribed pressure difference is exceeded, the valve member 38 moves downward, as seen in FIG. 2, and contact takes place between the stop surfaces 53 and 54 of the pressure pieces 41 and 42. This contact has the result that the valve member 40 is moved downward by a greater force than the force of the spring 47. The overflow openings 50 therefore start to close and the supply pressure p_1 increases.

The difference between the pressures p_1 and p_2 can be maintained constant over large ranges in the manner described. In practice it has been found that with a pressure p_1 of 2.5 atm.ga., the pressure difference between p_2 and p_1 can be maintained constant within 5–7 atm.ga. up to a value of 100 atm.ga. The device of the invention therefore makes it possible to adapt the pressure in the pressure pockets of bearing points to varying circumstances in a simple manner.

What is claimed is:

1. In the hydrostatic supporting of machine parts in which the pressure of pressure fluid conducted to several bearing points can be controlled as a function of the value of the bearing forces which occur, the combination including a supply pressure pump, a multi-circuit distributor pump connected thereto, means connecting circuits of said distributor pump to several of said bearing points, differential pressure valve means connected in parallel with at least one of said means connecting said distributor pump to a bearing point, said differential valve means being connected on one side to the output side of said supply pressure pump and at the other side with the output side of the multi-circuit distributor pump, said differential pressure valve having a first valve member which controls the quantity of pressure fluid flowing from the supply pressure pump to an overflow, said first valve being displaceable in a first pressure range against a first spring and in a second pressure range against the force of a second valve means being acted upon by pressure fluid from the multi-circuit distributor pump, said second valve member being under the action of a second spring which determines the differential pressure.

2. In the hydrostatic supporting of machine parts as claimed in claim 1 wherein the differential pressure valve means has a housing with intercommunicating chambers, said housing being provided in the region of the transition from the first chamber to the second chamber with a support for said two springs.

3. In the hydrostatic supporting of machine parts as claimed in claim 2 wherein the support is a circumferential ledge.

4. In the hydrostatic supporting of machine parts as claimed in claim 2 wherein two inserts are screwed flush into the housing of the differential pressure valve means, one of said inserts forming a cylindrical guide for said first valve chamber which extends into a first chamber, said first chamber being provided with overflow openings, the other insert forming a cylindrical guide for said second valve member.

5. In the hydrostatic supporting of machine parts as claimed in claim 4 wherein the end surfaces of said inserts which are directed toward the inside of the chambers, form stops against which pressure pieces cooperating with said valve members can be pressed by said spring members.

6. In the hydrostatic supporting of machine parts as claimed in claim 1 wherein the valve members are piston shaped.

7. In the hydrostatic supporting of machine parts as claimed in claim 5 wherein the pressure pieces are provided with stop surfaces which can act upon each other.

8 In the hydrostatic supporting of machine parts as claimed in claim 1 wherein said multi-circuit distributor pump is a gear pump having a sun wheel and a plurality of planet wheels.

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