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(54) **Improvements in gerotor pumps.**

(57) A gerotor pump has the internal leakage paths reduced by making the female lobed annulus 12 (Figure 1) as a cup shaped part receiving the male lobed rotor 10.

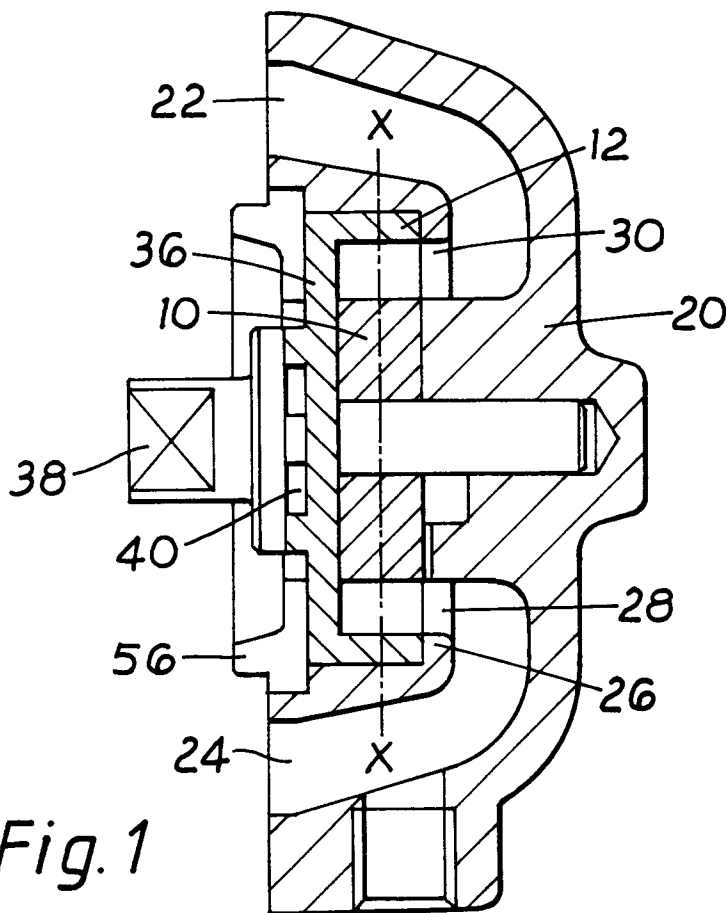


Fig. 1

This invention relates to gerotor pumps which, as well known, comprise a male lobed rotor with n lobes and a female lobed rotor or annulus with $n+1$ lobes in which the male rotor is located and meshed. Both are contained in a pump body. This creates a series of chambers between the two rotors, and when the two rotors turn about their parallel axes the chambers vary in volume between a minimum and a maximum on the inlet side thus inducing fluid flow into the chambers through an inlet port and vice versa on the outlet side thus expelling fluid from the pump through an outlet port.

One of the matters to be taken into account in pump design is leakage of fluid from the high pressure chambers through the working clearances of the pump which at the least may lead to loss of pumping efficiency. The object of the invention is to provide improvements in this area.

According to the invention, the female rotor (annulus) is cup-shaped and the male rotor is wholly located in said cup. This can substantially reduce leakage at one axial end of the chambers, that is at the base of the cup since fluid can no longer flow across one axial end face of the annulus to reach the cavity in the pump body in which the annulus is journaled.

Various embodiments of the invention are now more particularly described with reference to the accompanying drawings wherein:-

Figure 1 is a sectional elevation of a first embodiment;

Figure 2 is a similar view of a second embodiment;

Figure 3 is a section on the line X-X of Figure 2 or Figure 3 to show a typical layout.

Turning first to Figure 1 and 3, the gerotor pump comprises a male lobed rotor 10 which, in this illustrated embodiment has six lobes, although the precise number is unimportant to the present invention.

The rotor is received in an annulus 12 which essentially has one (or theoretically more than one) extra lobe. This creates a series of working chambers such as 14 Figure 3 each defined between the rotor lobes and the annulus lobes. In rotation of the parts, the rotor turns about the axis 16 and the annulus about the, axis 18, drive being imparted to one of these parts by the other of them, and the rotation being at different speeds. As a consequence, the working chambers rotate or precess about the axes varying in volume from a minimum to a maximum as the chambers pass over the inlet port and varying in volume from a maximum to a minimum as the chambers pass over the outlet port.

Each chamber extends axially, i.e. in the Figure 1 position, over the axial length of the meshed lobes.

Figure 1 shows the pump body 20 provided with inlet and outlet passages 22 24, and with a generally cylindrical cavity having an end wall 26 upon which the parts 10 and 12 seat. That end wall is apertured

at 28 and 30 to communicate between the working chambers and the inlet and outlet passages 22 24.

According to the invention, the annulus 12 is made as a cup-shaped component with a base wall 36 which is generally planar and parallel to the wall 26. Hence the male lobed rotor 10 is received wholly within that cup.

In this particular embodiment of the invention, the annulus is driven by drive means 38 which may be a tang, and the drive means 38 may either be integral with the annulus 12 36, or may have dogs 40 engaged between the drive means 38 and the annulus for the purpose of transmitting drive.

It will be appreciated that one of the possible leakage paths in the pump is across the end faces of the annulus and rotor adjacent the planar wall 26, and this could be generally radially outwardly, e.g. under the influence of centrifugal force, but effectively lead to a reduction of outlet pressure. In the conventional pump, such a leakage path is present at each axial end of the gerotor set, i.e. the meshed parts 10 12, but making the annulus cup-shaped so as to wholly accommodate the rotor, and without aperture in the base of the cup, one of those leakage paths is entirely eliminated. As a result, the internal leakage in the pump is substantially reduced.

The annulus may be held in position by a retaining ring 56 which may be secured in the body of the pump around the drive means.

Turning now to Figure 2 and 3, there is the same arrangement of rotor and annulus providing working chambers connecting with inlet and outlet passages, here indicated by the references 40 42. The pump in Figure 2 differs from that in Figure 1 in having a driven rotor instead of a driven annulus, and this is accomplished by means of drive shaft 44 journaled in the body 46 and fast with the rotor 10, for example by being an interference fit with the same. The end of shaft 44 is spaced from the base 36 of the annulus by a clearance 48.

The annulus may be held axially in the body 46 by means of a washer 50 and a circlip 52 as illustrated in the lower half of Figure 2; alternatively a more massive retaining ring 54 may be pressed into the cylindrical cavity which receives the gerotor set as an interference fit therein, and used to retain the parts in the required axial positions. However, the same reduction in available paths and increased efficiency is available from the Figure 2 version as from the Figure 1 version.

Claims

1. A gerotor pump comprising a male lobed rotor with n lobes and a female lobed rotor with $n+1$ lobes in which the male rotor is located and meshed, both parts being contained in a cylindri-

cal cavity in a pump body, and characterised in that the female rotor or annulus is cup shaped and wholly contains the male rotor so as to reduce leakage paths.

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2. A pump as claimed in Claim 1 wherein the annulus is driven and transfers drive to the rotor.

3. A pump as claimed in Claim 1 wherein the rotor is driven and transfers drive to the annulus.

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4. A pump as claimed in any of Claims 1 to 3 wherein the annulus is fixed in position in the body cavity by a retaining ring.

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5. A pump substantially as described with reference to Figures 1 and 3 or 2 and 3 of the accompany drawing.

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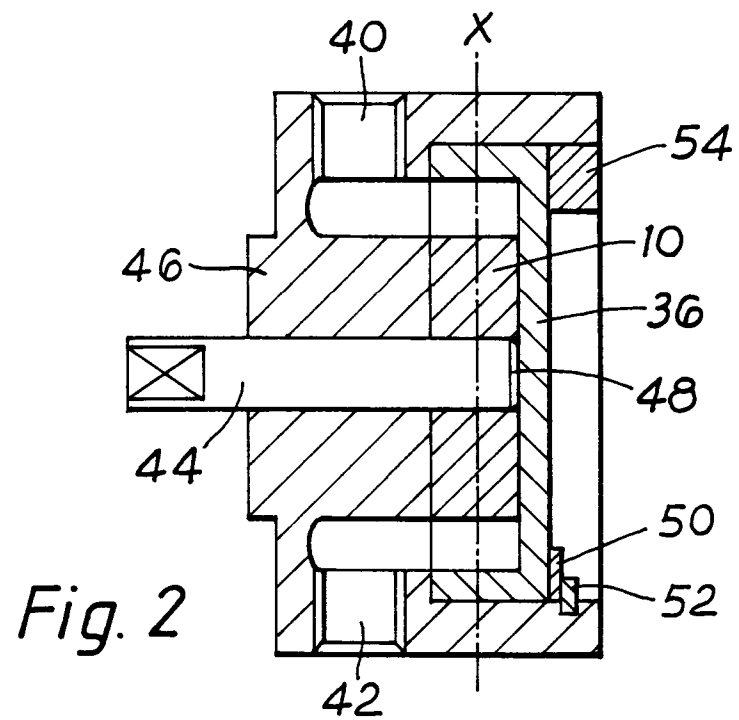
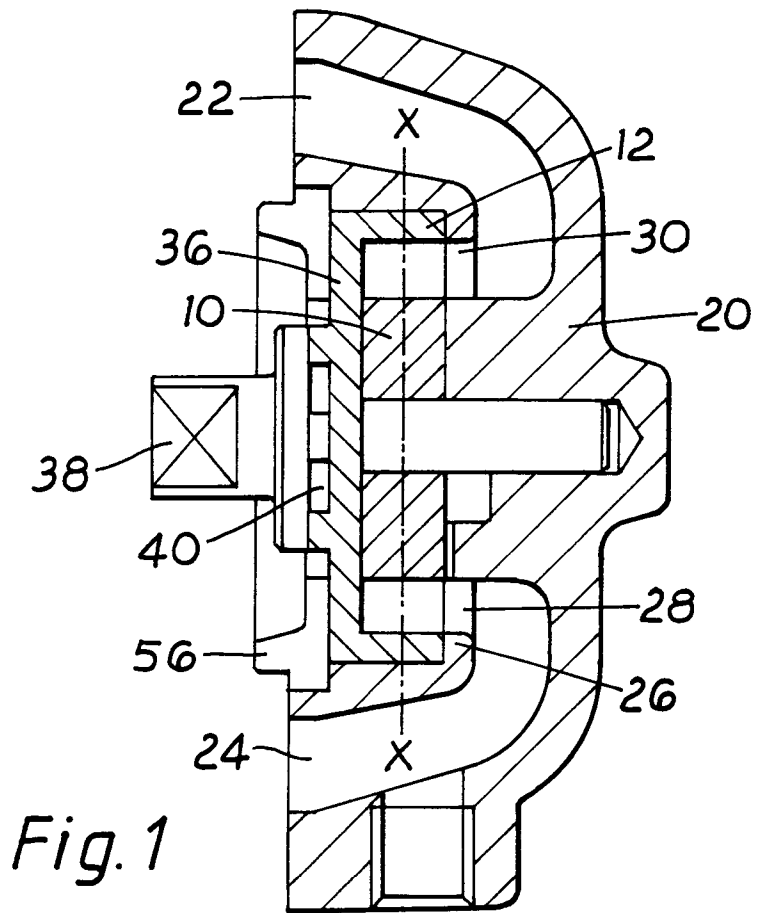
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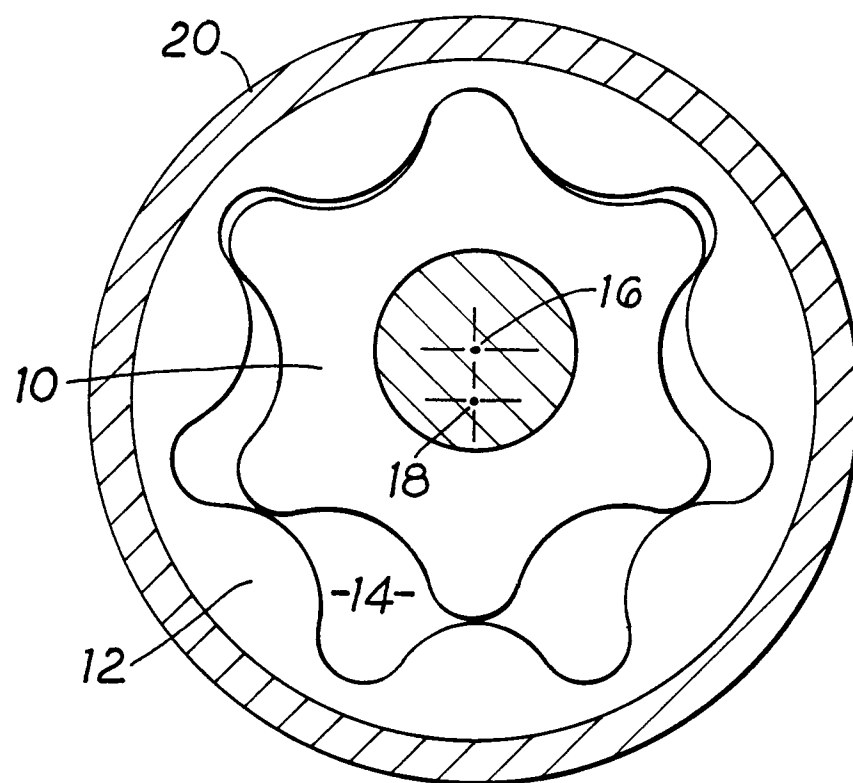


Fig. 3



European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 6147

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	GB-A-2 100 354 (FUJI JUKOGOYO) * Page 1, lines 80-106; figures 3,4 * ---	1,2	F 04 C 2/10
X	US-A-1 486 836 (HILL) * Page 1, lines 67-90; figures 1,2 * ---	1,2	
X	FR-A- 566 247 (HILL ENGINEERING) * Page 1, lines 1-14; page 1, line 40 - page 2, line 20; figures 1-3 * ---	1,3	
A	DE-A-3 603 773 (SCHWÄBISCHE HÜTTENWERKE) * Column 3, lines 21-30; column 4, lines 6-24; column 5, lines 24-62; figures 1,2 * -----	1,2,4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F 04 C F 01 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25-10-1991	Examiner KAPOULAS T.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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