(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 361 716 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89309135.5**

(51) Int. Cl.5: **F04C 2/10 , F04C 15/00**

(22) Date of filing: **08.09.89**

(30) Priority: **28.09.88 GB 8822696**
09.06.89 GB 8913368

(43) Date of publication of application:
04.04.90 Bulletin 90/14

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

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(54) Improvements relating to gerotor pumps.

(57) A gerotor pump can have a particularly short axial length by fixing the main shaft in the body (instead of journalling it in the body) and journalling the rotor on the shaft (instead of making the rotor fast with the shaft). Figure 3 shows an arrangement in which gear 24 transmits drive to the pump and has an axial extension 38 journalled on the fixed shaft 18 and keyed or splined at 46 to the rotor which surrounds the extension and hence is only indirectly supported and journalled on the shaft. 14 represents the usual annulus with which the rotor engages in conventional gerotor pump fashion.

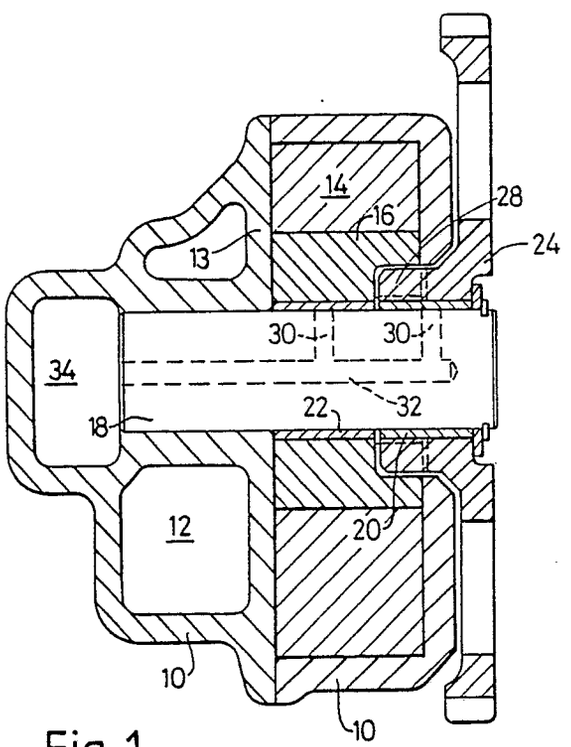

Fig. 1

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IMPROVEMENTS RELATING TO GEROTOR PUMPS

This invention relates to gerotor pumps comprising a male lobed rotor meshed internally of a female lobed annulus. The annulus has more lobes - usually one more -than the rotor, and their axes are eccentric. On one side of a plane containing the axes, the chambers bounded by the respective lobes open to an inlet, and on the other side of that plane they open to an outlet. Relative rotation causes said chambers to process about the axes and so vary in size thus inducing flow into the chambers on the inlet side and expelling it out on the outlet side. Such pumps are herein called "of the kind referred to".

Known pumps of this kind have the male rotor fast, for example keyed to a drive shaft which is essentially journalled over an axially extending zone, for example in the pump casing wall, possibly even at two axial locations, one on either side of the meshed parts. The shaft is also fast with a drive pulley, sprocket or gear (collectively called "gear") at a further location. These factors dictate a certain axial length to the shaft apart from that necessary for the required volumetric displacement.

The object of the invention is to provide improvements and particularly to enable shorter axial length to be provided.

According to the invention, a pump of the kind referred to is characterised by a shaft fast with the pump body and in that the rotor is journalled directly or indirectly on the shaft.

If the shaft is for example a force-fit in the body, the length of shaft necessary for body engagement is substantially less than what is necessary for spaced bearings carrying a cantilevered shaft, or less than what is necessary for two axially spaced sets of bearings in other designs. However, it might also be possible to make the shaft and body as a common one piece article for example as a casting when the notional length necessary to connect the shaft and body is even less.

Where drive is taken from the gear to the rotor directly, the gear may be journalled directly on the shaft and the rotor carried by the gear. Where drive is taken direct to the annulus, the gear may be journalled on the body and the rotor journalled directly on the shaft.

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

Figure 1 is a sectional elevation of a first embodiment;

Figure 2 is a fragmentary end elevation of the same; and

Figures 3-6 are views similar to Figure 1 showing second-fifth embodiments.

Turning first to Figures 1 and 2, a pump body 10 is provided with one or more inlet passages 12 opening through the side wall (not shown) to the cavity housing the annulus 14 and rotor 16. The outlet passage opens from that cavity. It will be appreciated that both inlet and outlet may open generally radially or tangentially from the cavity or through one or other side wall, or a combination of these according to requirements.

Shaft 18 is fast in the body, for example being a press-fit. In Figure 1 it is bushed at 20-22 to journal the rotor 16 and the drive gear 24 respectively. A passage system 30-32 shown in dotted line communicates with port 34 to allow lubrication of the bushes.

The drive gear (or sprocket 24) is provided with axially extending dogs 28 (see Figure 2) which mesh with like dogs 26 in the rotor 16 so that the gear and rotor are directly dogged together for drive between them. Hence the gear drives the rotor which drives the annulus at a different speed for the usual gerotor pumping action.

Turning now to Figure 3, the arrangement is generally similar except that here the gear 24 has a hub portion 38 extending over the full axial dimension of the rotor 16, so that the rotor may be considered to be indirectly journalled on the shaft. The hub and rotor are keyed or splined together at 46 for direct drive between them.

Turning now to Figure 4 (in which, as in Figures 3, 5 and 6, like references are used for like parts) shaft 18 carries bushes 20, 22 journalling rotor 16. Annulus 14 fits directly in a cylindrical body part 10, and on the exterior of that body part is a further bush 50 which is concentric with the axis of shaft 18 and which journals drive pinion 52. The pinion is connected by a spider 54 meshed at its outer periphery with the pinion 52 and splined at 56 on to an axial extension 58 integral with the rotor 16. Hence pinion 52 drives the rotor 16 which in turn drives the annulus 14. In the case of Figure 4, the section is taken on a line non-diametric of the engaged rotor and annulus.

Turning now to Figure 5, pinion 52 is in this case splined at 60 to an axial extension 62 on the annulus 14. Rotor 16 is lined by bush 20 on the shaft 10, which as in Figure 4, is fast in the pump body.

Turning now to Figure 6, in this case pinion 52 is splined at 56 to the axial extension 58 of the rotor 16 which is bushed 20, 22 to the shaft 18. The pinion is bushed at 50 onto the cylindrical part of the body 10.

It will be seen that the arrangements in Figures

4 and 6 are generally similar except that in Figure 6 the body of the gear 24 (pinion 52) between the outer periphery provided with the pinion and the inner periphery splined at 56 forms a side cheek or axial end face for the pumping cavities, that is in the vicinity of the arrow 64 in Figure 6, whereas in Figure 6 an annular washer-like part 66 fulfills the same action and is held in place by the spider. In Figure 5 a body plate 70 is held in place by bolts 72 to fulfill the same function of completing the body cavity.

Claims

1. A pump comprising a male lobed rotor (16) provided on a shaft (18) and rotatable about the shaft axis and meshed with an internally lobed annulus (14) rotatable in a pump body (10) on a second and parallel axis, said annulus having more lobes than the rotor, and a gear (24) for driving the rotatable parts, characterised in that said shaft is fast with the pump body, and in that said rotor is journalled directly or indirectly on said shaft.

2. A pump as claimed in Claim 1 wherein the shaft is a force fit in the body.

3. A pump as claimed in Claim 1 wherein the shaft is unitary with the body.

4. A pump as claimed in Claim 1 wherein the rotor is driven by the gear, said gear is journalled on said shaft, and the rotor and gear are dogged together.

5. A pump as claimed in Claim 4 wherein the rotor and gear are axially adjacent and are both supported on the shaft via interposed bearings which are also axially adjacent.

6. A pump as claimed in Claim 4 wherein the gear has an axially projecting hub which is supported on the shaft via an interposed bearing, the rotor surrounds the said hub, and the hub and rotor are keyed or splined together.

7. A pump as claimed in Claim 1 wherein the gear is journalled on the body with an interposed bearing and drives the rotor via a radially extending part.

8. A pump as claimed in Claim 7 wherein the rotor has a drive extension projecting axially through the pump body for engagement with said radially extending part.

9. A pump as claimed in Claim 7 wherein the said radially extending part forms an end wall for the pump.

10. A pump as claimed in Claim 1 wherein the gear is journalled on the body and drives the annulus via a spline or like connection.

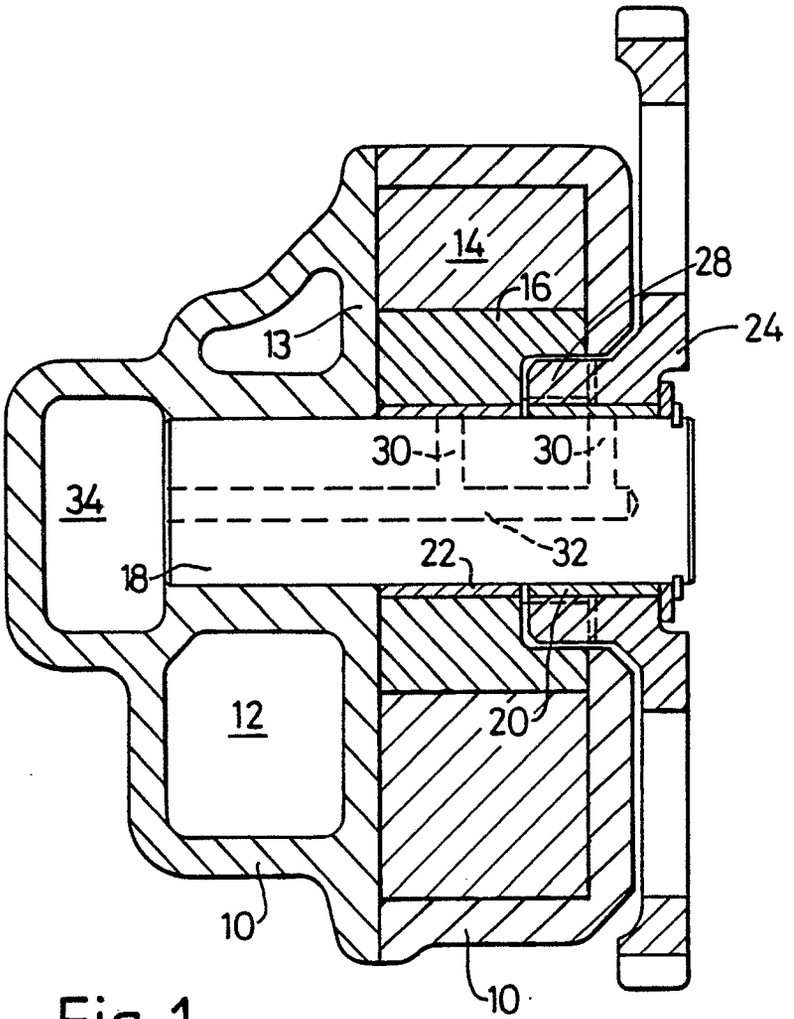


Fig. 1

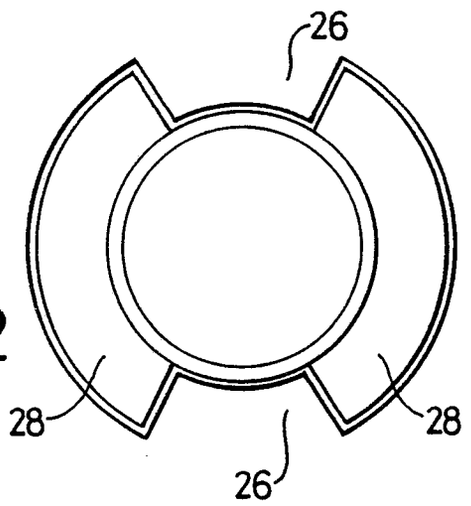


Fig. 2

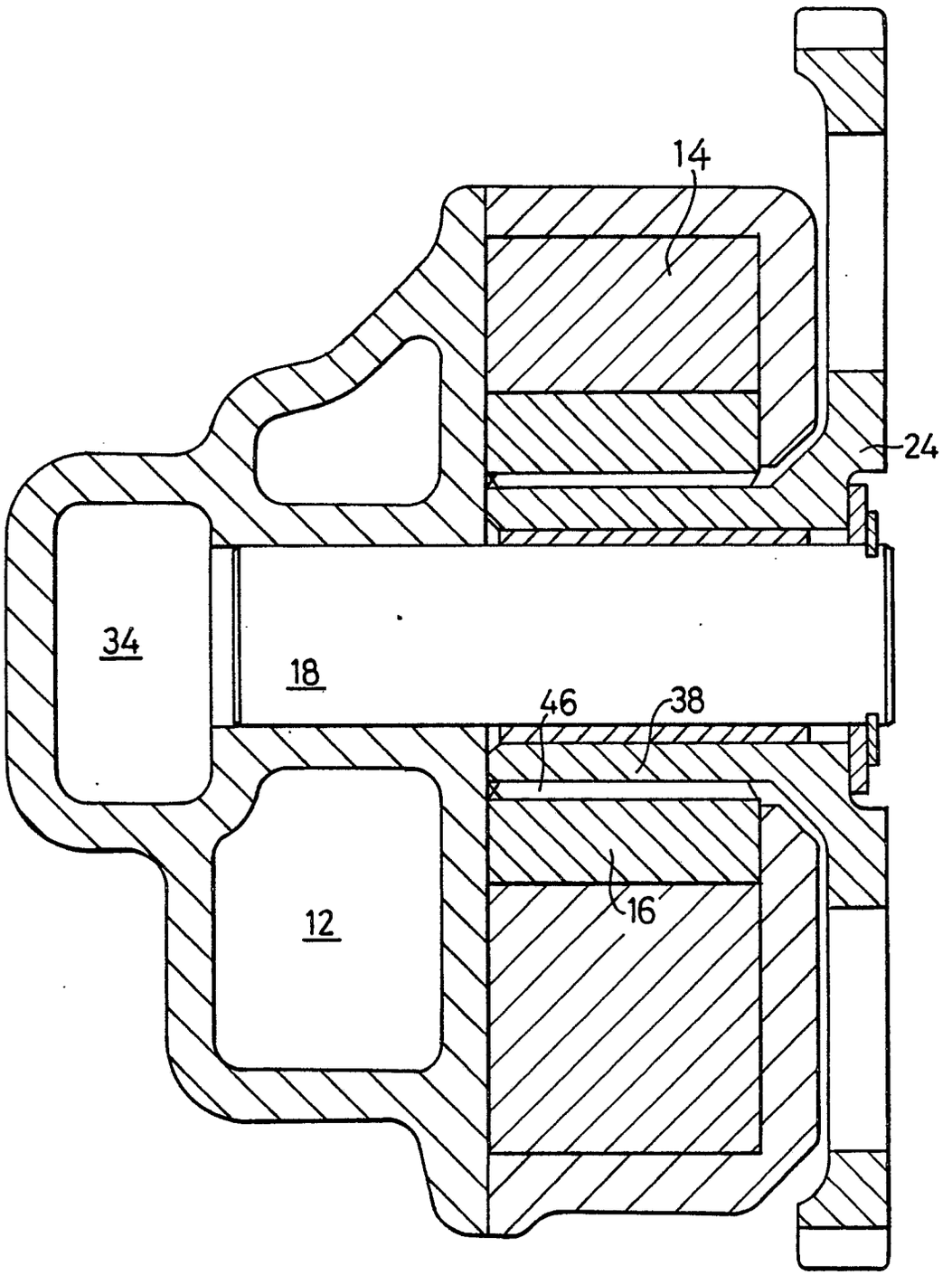


Fig. 3

Fig. 5

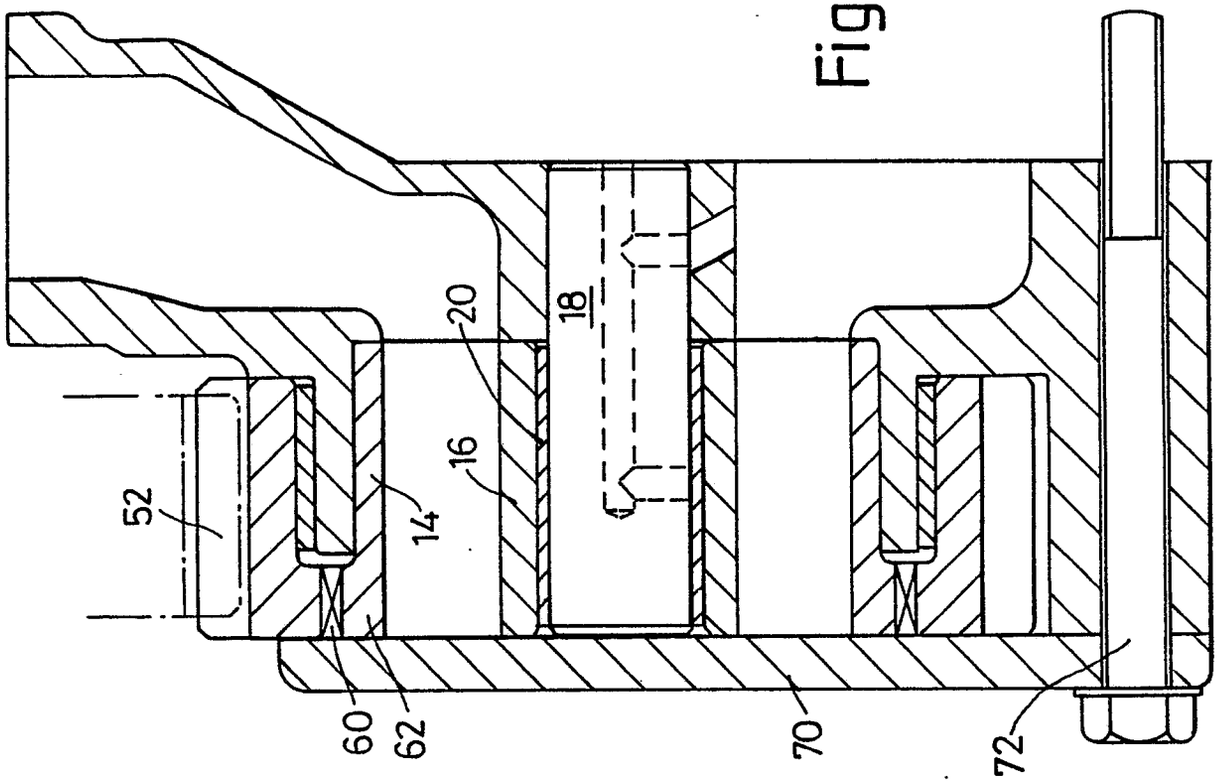
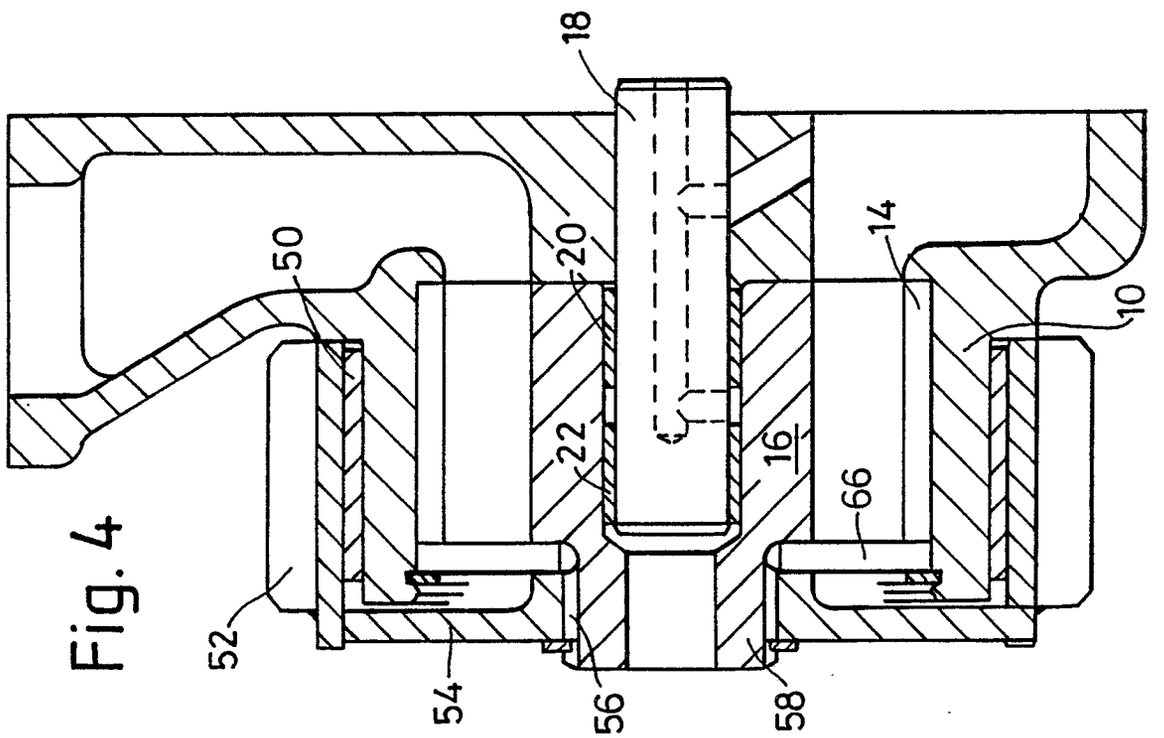


Fig. 4



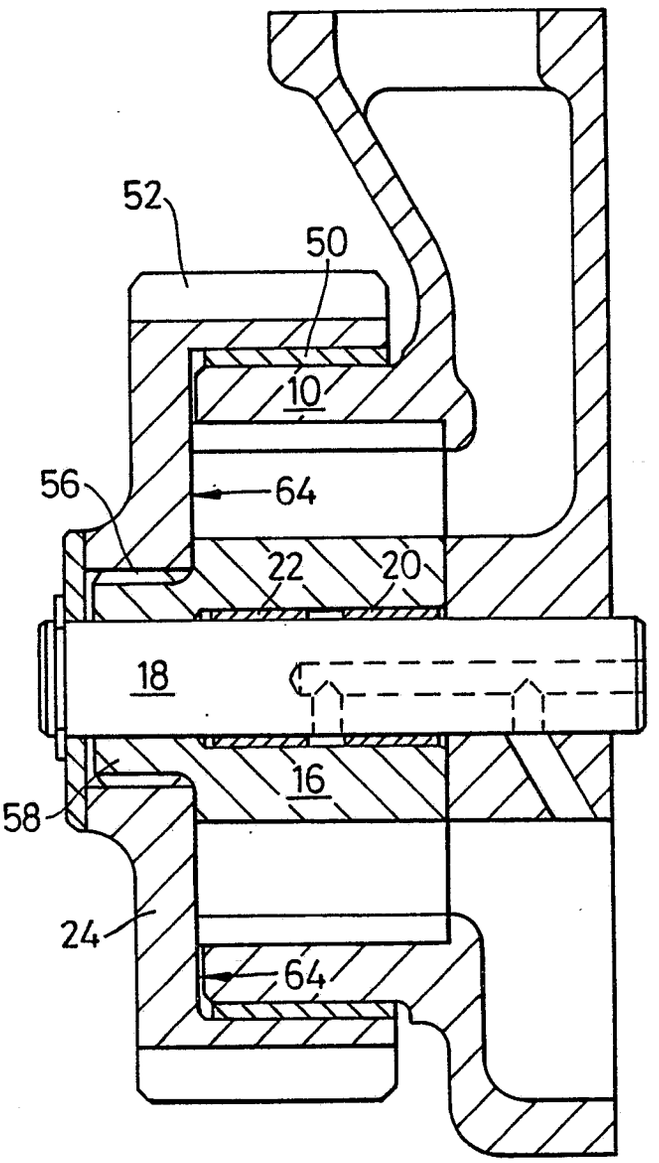


Fig. 6