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(54) **Oil pumps.**

(57) A gear pump has a variable output which is relatively ripple free by using a single common gear rotor meshed with a pair of individual annuli each mounted in a corresponding eccentric so that they can be turned in opposite directions. This not only reduces the output from each rotor part, by reducing the eccentricity, but puts the parts out of phase with one another. According to the invention the rings are journalled by needle roller bearings which avoids them jamming due to the forces involved within the pump.

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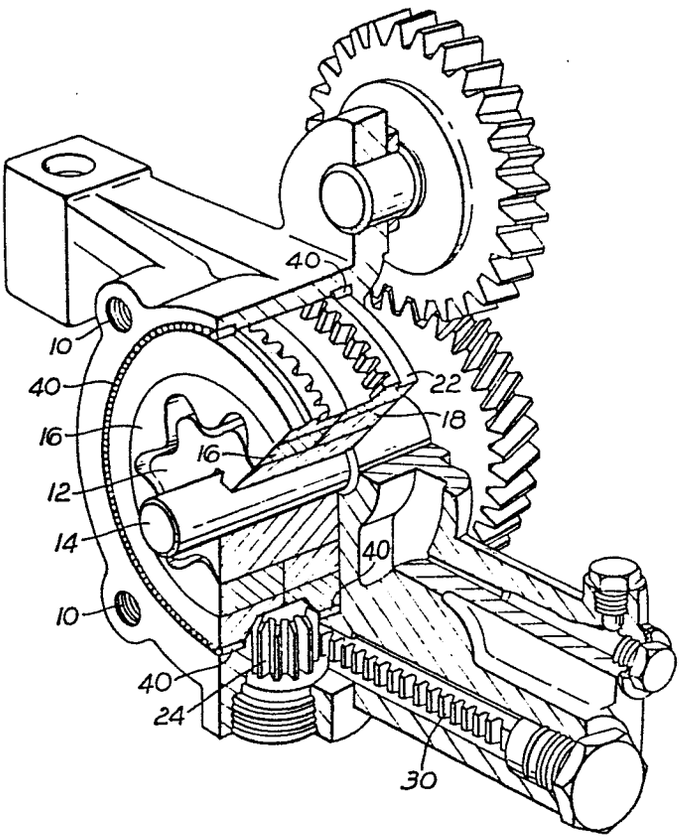
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OIL PUMPS

This invention relates to oil pumps. Figures 1 and 2 of DAS 1231563 show a known non-adjustable internally meshing gear pump in which a toothed rotor rotates in and with an internally toothed annulus having one more tooth.

BP 1426223 shows a similar pump with the toothed annulus mounted in an eccentric ring arranged to be driven by a rack and pinion, with the intention of displacing the axis of the annulus about that of the rotor. When said axes and the axis of the outer surface of the annulus lie in a common plane, the pump output is at a maximum. Hence turning the annulus from that position reduces the output.

The output volume of the pump depends, among other factors, on the axial length of the rotating parts. Smoothness of operation, in particular the (usually undesirable) pulsating effect or lack of it, depend upon the number of teeth or lobes on the rotor and in the annulus.

EP 0076033A proposes dividing the annulus into two axially spaced portions each with its own gear set driven from a common pinion so that the annuli can be turned in opposite directions simultaneously. This has the advantage of giving adjustment of output in the same way as in the mentioned BP but allows a smoother more ripple-free output because the respective lobes can be out of phase. However it is found in practice that the device of said BP is impractical.

The object of the present invention is to provide a variable output pump of this kind which

is practical.

According to the invention an internally meshing gear pump comprises a pair of axially spaced internally toothed annulus portions each located in a corresponding eccentric ring and both encompassing a common rotor, said rings being provided with gear teeth meshed with a common pinion whereby the rings can be turned in opposite direction to vary the eccentricity of the annuli likewise and hence vary the output of the pump, and characterised in that each ring is journalled by a set of roller bearings.

Preferably needle roller bearings are used.

The invention is based on the discovery that the impracticability of the design of said BP 0076033A is due to it jamming, and recognition that the jamming is due to the ec centric rings being subject to forces which wedge them against the housing bore.

Pumps of this kind are sometimes operated completely immersed in oil and it is to be expected that all of the surfaces of the parts of the pump are well lubricated and jamming was therefore not only impossible to predict or anticipate, but also difficult to recognize.

One presently preferred embodiment of the invention is now more particularly described with reference to the accompanying drawing in which the sole figure is a part sectionak perspective view of a pump embodying the invention.

In the drawing, the cover plate (not shown)

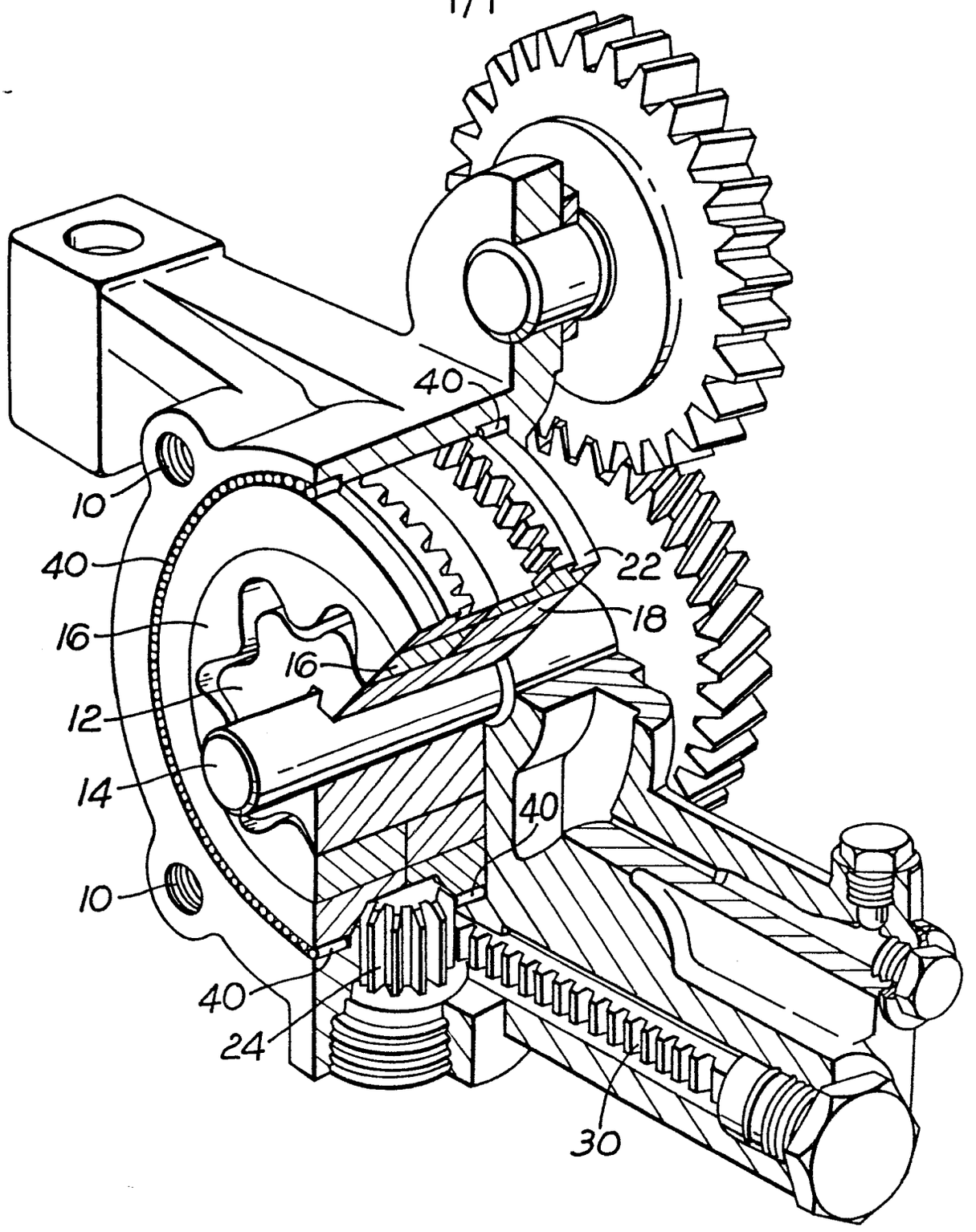
normally held in place by screws engaging with the tapped apertures 10, has been removed to reveal the internal parts. The inner rotor 12 has n lobes, for example six lobes and meshes with the internally toothed or lobed annulus 16 which has n + 1, in this instance seven, lobes. A single rotor 12 is provided driven by shaft 14, but two annuli 16,18 (both alike) are provided axially spaced on the rotor 12. The annuli lie within corresponding rings 20, 22 which are provided with peripheral gear teeth meshed with a common pinion 24. The latter can be driven by a rack 30 to turn the rings 20,22 in opposite direction and vary the eccentricity of the axes of the annuli 16, 18 with respect to the axis of the rotor 12.

A ring of needle roller bearings 40 is provided between the ring 20 and the body and a comparable set between the body and the ring 22. One set is held in place axially by the body, and the other similarly by the cover plate. In cases where the installation space permits the rollers may be retained axially within the axial length of the eccentric rings by providing lips or flanges at the ends adjacent to the body and cover faces.

1. An internally meshing gear pump comprising a pair of axially spaced internally toothed annulus portions each located in a corresponding eccentric ring and both encompassing a common rotor, said rings being provided with gear teeth meshed with a common pinion whereby the rings can be turned in opposite direction to vary the eccentricity of the annuli likewise and hence vary the output of the pump, and characterised in that each ring is, journalled by a set of roller bearings.

2. A pump as claimed in Claim 1 wherein the roller bearings are needle roller bearings.

3. An internally meshing gear pump substantially as described with reference to the accompanying drawing.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