Aug. 6, 1940. N. E. SACHA 2,210,152

GEAR PUMP

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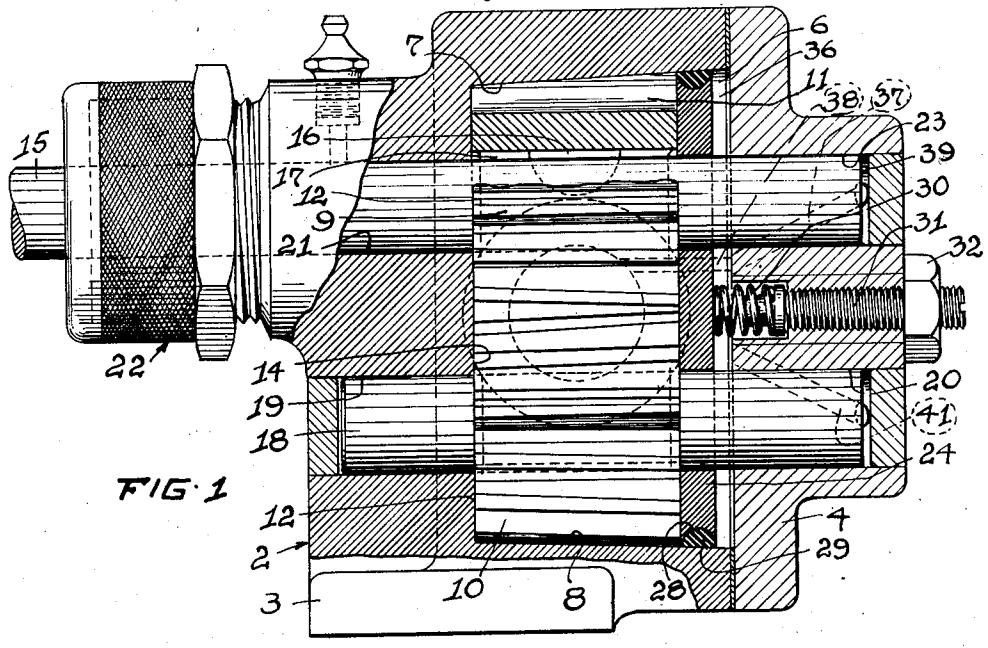

FIG. 1

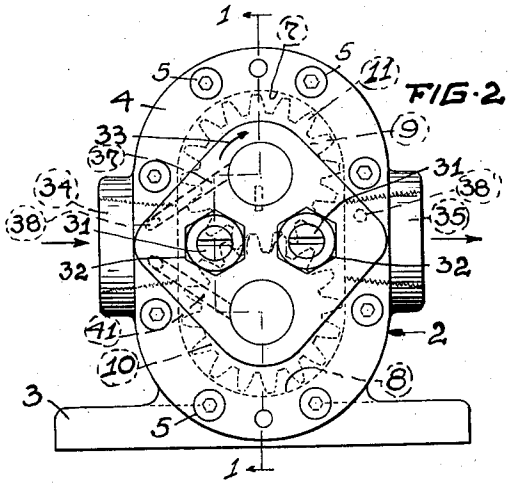

FIG. 2

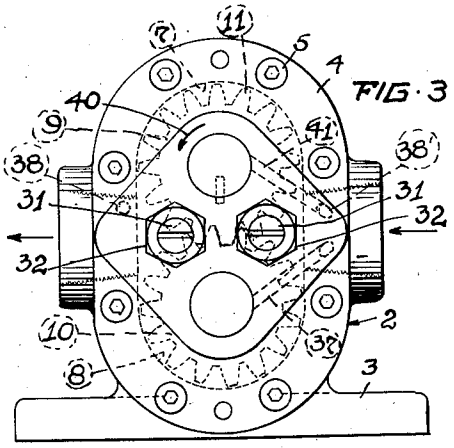

FIG. 3

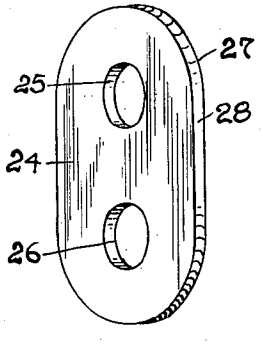

FIG. 4

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GEAR PUMP

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2 Claims. (Cl. 103—126)

This invention relates in general to gear pumps and more particularly to gear pumps designed for automatically compensating wear and deterioration. Pumps of this type are described in Patent No. 2,134,153 and embody a working chamber with inclined wall portions having arranged therein rotatably mounted intermeshing spur gears with teeth machined to conical or tapered form for close contact with the inclined wall portions of the working chamber. The opposite faces of the gears in these pumps contact with one end wall of the working chamber and with an end plate yieldingly forced against the larger radial surfaces of the gears.

Gear pumps of this type vary greatly in efficiency, particularly, when run at different speeds and different pressures. This is due to excessive leakage between the end plate and the gears, the end plate being yieldingly pushed back at increased speed and pressure and permitting substantial leakage, thus materially effecting the efficiency of these pumps. It is the primary object of the present invention to overcome such deficiencies in self-compensating gear pumps by providing a gear pump of the type referred to with gears of less width than the depth of the working chamber and an end plate within the working chamber spaced from its cover plate to permit of lateral shifting of said end plate by pressure increase and therewith increase of the pressure in the rear portion of the working chamber, all for the purpose of forcing the end plate against the gears with substantially equal pressure at low and high speeds of the pump gears.

Another object of the invention is the provision of a gear pump of the type referred to with an end plate forced toward the gears with a plurality of yielding means symmetrically arranged with respect to said end plate to effect parallel shifting of such plate in either direction by pressure variations and by said yielding means.

A further object of the invention is the provision of a gear pump of the type referred to with a drive shaft for one of the gears extended into the pump and mounted in spaced bearings therein and means for releasing undesired pressure on the inner end face of such drive shaft.

Still another object of the invention is the provision of a gear pump of the type referred to with a pump housing including a symmetrically constructed cover member, a drive shaft for one of the gears extended into the pump housing and mounted in the housing and cover member, and means in housing and cover member for releasing undesired pressure on the inner end face of said drive shaft, the releasing means in the cover member being symmetrically arranged to permit mounting of said cover member in two distinct positions for rotation of said pump in opposite directions.

With these and incidental objects in view, the invention consists in certain novel features of construction and combination of parts, the essential elements of which are set forth in the appended claims; and a preferred form of embodiment of the invention is hereinafter shown with reference to the drawing accompanying and forming part of this application.

In the drawing:

Fig. 1 shows a longitudinal sectional view partly in elevation through a gear pump made in accordance with the invention, the section being taken on line 1—1 of Fig. 2.

Fig. 2 is a rear view of the pump shown in Fig. 1 and

Fig. 3 a view similar to Fig. 2 with the cover plate rotated 180° to permit of the pump being rotated in an opposite direction.

Fig. 4 is a perspective view of the end plate arranged within the working chamber of the pump.

Referring now more particularly to the drawing, which shows a gear pump made in accordance with this invention, reference numeral 2 designates a chambered housing open at one end and supported on base 3. Housing 2, which has its open end fluid-tightly closed by a cover member 4, secured to said housing by means of screws 5, forms a working chamber 6 with outwardly inclined curved wall portions 7 and 8, and this working chamber has arranged therein two gears 9 and 10 in such a fashion, that the teeth of the gears closely contact the outwardly inclined curved wall portions 7 and 8 of chamber 6 and that the inner faces 12 of said gears contact the inner wall 14 of said chamber. For such purpose gears 9 and 10, preferably common spur gears, have the outer portions of their teeth 11 cut on angles to the angles of the inclined curved wall portions 7 and 8 of chamber 6. The upper gear 9 is secured to a drive shaft 15 by means of a Woodruff key 16, engaging a key way 17 in gear 9 and the lower gear 10 is slidably and rotatably mounted upon a stud shaft 18, press-fitted in a bore 19 in housing 2 and extended into a bore 20 in cover member 4. The front end of drive shaft 15 extends outside of the housing through a bore 21 and is fluid-tightly sealed to said housing by a packing gland and nut arrangement 22, and the rear end of said drive shaft is sup-

ported by and pivotally mounted in a bore 23 in cover member 4.

As can clearly be seen from the drawing, the width of gears 9 and 10 is substantially less than the depth of the working chamber 6, so as to permit of an end plate 24 being readily extended into said chamber for facial contact with the larger radial faces of said gears. This end plate, which in form is similar to the cross section of the working chamber but smaller in size than the largest cross section of said chamber, embodies two circular openings 25 and 26 for drive shaft 15 and stud 18 and has its circumferential edge 27 grooved to form a circumferential recess 28 for an endless, yielding packing ring 29. End plate 24 is yieldingly forced into contact with the end faces of gears 9 and 10 by means of two symmetrically arranged short, adjustable compression springs 30, compressed by means of adjusting screws 31, in turn threadedly extended through cover 4 and held in proper position by lock nuts 32.

The described gear pump structure, when rotated in the direction of arrow 33, see Fig. 2, draws liquid into chamber 6 through inlet 34 and discharges such liquid from said chamber under pressure through outlet 35. During operation of the pump sudden increase of pressure effects lateral shifting of end plate 24 and permits by-passing of liquid, so as to eliminate undesired shocks in the pipe system. In addition, lateral shifting of the end plate effects escape of liquid around the edge of the end plate 24 into the small chamber 36 behind plate 24 for quick adjustment of the pressure in small chamber 36 when the pressure in the pump increases. Such quick adjustment of the pressure in chamber 36 materially improves running of the pump under adverse conditions and insures proper contact of end plate 24 with gears 9 and 10, the main controlling factor for such contact being pre-setting of the two springs 30.

The two symmetrically arranged springs 30 prohibit any tilting of end plate 24 and permit of adjustment of the springs, so as to practically eliminate the danger of tilting of such plate.

When a pump of the type described is running at high pressure, there is seepage of liquid under pressure into bore 23 of cover member 4. Such seepage materially interferes with proper operation of the pump as drive shaft 15 is forcibly shifted toward the left and gear 9 is forced toward the inner wall 14 of chamber 6. To overcome this action by pressure in bore 23, there is provided a bore 37 which extends from bore 23 and openly communicates through a bore 38 with the intake 34 of the pump for full release of the pressure at the inner end face 39 of shaft 15, except, when the pump is rotated in an opposite direction, see arrow 40 in Fig. 3, indicating the rotation of the pump in this figure. In this case, bore 23 would be connected with the pressure side of the pump, however, such undesired connection is overcome by turning cover member 4 180°, so that bore 20 of said cover member aligns with drive shaft 15 and bore 23 with stud shaft 18. Bore 20 of cover member 4 communicates through a bore 41, which bore is symmetrically arranged with respect to bore 37 in the Fig. 3 position of cover member 4, with a bore 38', communicating with outlet 35. Therefore, when the pump rotates in a direction opposite to the rotation shown in Fig. 2, intake 34 becomes the outlet and outlet 35 becomes the intake, so that bore 20 communicates with the intake and prohibits building up of pressure in said bore 20 and against the end face 39 of shaft 15.

Having thus described my invention:

What I claim is:

1. A reversible gear pump comprising a chambered housing open at one end and provided with inclined circular wall portions, a cover member for said housing adapted to be attached thereto in either of two definite positions, axially parallel shafts mounted in said housing and extended into bores of said cover member, spur gears on said shafts having less width than the depth of the chamber in said housing and inclined teeth surfaces fitting the inclined circular wall portions of said housing, an end plate with a yielding, circumferential packing ring within the chamber of said housing yieldingly forced into face contact with the larger radial surfaces of said gears and in sealing contact with the inclined side walls of said chamber, and passage means in said cover member and said housing for communication of one of said bores in said cover member in either of its two positions with the intake side of the pump.

2. A reversible gear pump comprising a chambered housing with intake and outlet passages open at one end and provided with inclined circular wall portions, a cover member for said housing adapted to be attached thereto in either of two definite positions, a drive shaft extended through said housing into a bore of said cover member, a stud shaft mounted in said housing and extended into another bore of said cover member in axial parallel relationship with respect to said drive shaft, spur gears on said shafts having less width than the depth of the chamber in said housing and inclined teeth surfaces fitting the inclined circular wall portions of said housing, an end plate within the chamber of said housing yieldingly forced into face contact with the larger radial surfaces of said gears and in sealing contact with the inclined side walls of said chamber, passage means in the opposite walls of said housing extending from the open end thereof to the intake and outlet passages, and passage means in said cover member extending from the bores in said cover member to the inner face thereof, said passage means in the wall of said housing and in said cover member being located to effect in either position of the cover member communication of the bore mounting the drive shaft with the intake of the pump to permit of release of pressure at the inner end face of the drive shaft when rotated in either direction.

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