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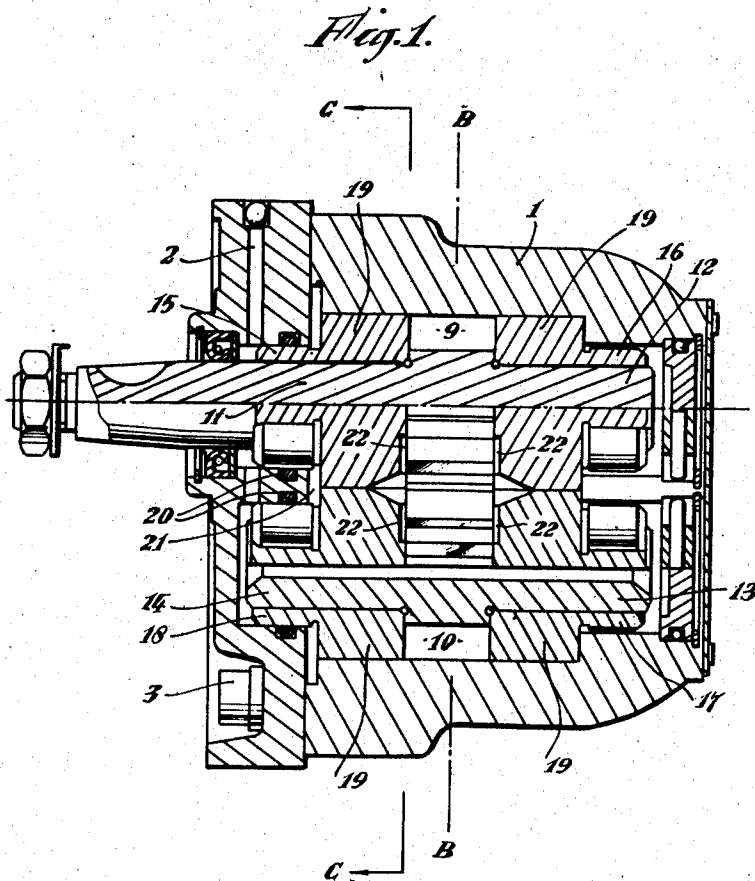
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ROTARY FLUID DISPLACEMENT PUMP

Filed Aug. 10, 1954

2 Sheets-Sheet 1



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Fig. 2.

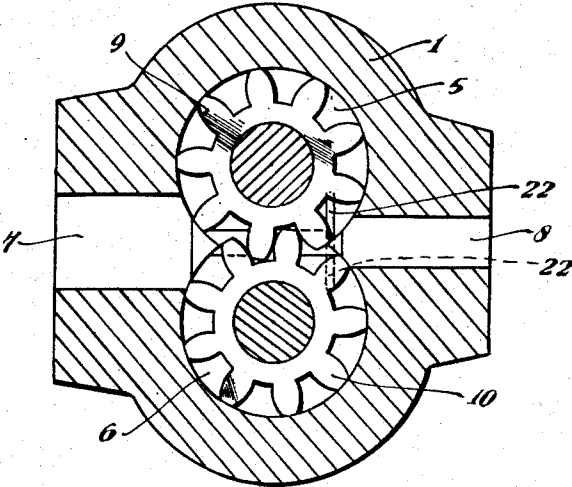
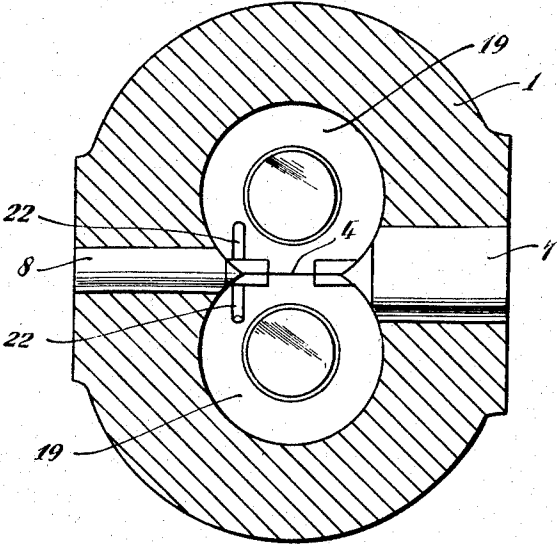


Fig. 3.



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## ROTARY FLUID DISPLACEMENT PUMP

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Claims priority, application Great Britain  
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4 Claims. (Cl. 103—126)

This invention relates to rotary fluid displacement pumps, particularly but not exclusively, to pumps rotating at high speeds for handling volatile liquids at high pressure.

In high pressure gear pumps it is known that corrosion or destruction similar to corrosion in appearance is liable to be encountered at the side faces of the casing or of side members effecting the seal with the side faces of the gears, in the vicinity of the zone of intermesh. With a view to reducing this destruction, it has been a wide-spread practice to recess the side faces of the casing or the like by forming a groove extending from a point in the zone of intermesh near the plane containing the axes of the two intermeshing gears to a point freely communicating with the pump delivery. While this known expedient necessarily removes the sealing effect of the gear intermesh up to approximately the middle of the zone of intermesh, the present invention has for an object to provide improved means for combating the tendency to gradual destruction of the side walls or the like facing the gears without the need of reducing in this manner the effectiveness of the seal due to the intermesh of the gears. Another object is to provide improved destruction-reducing means which are suitable for the incorporation in a pump having pressure loaded end plates or bushes.

I have discovered with rotary displacement pumps generally there is a tendency for the separation of air and/or vapour from the liquid at points of relatively low pressure in the vicinity of the inlet side of the pump. This vapour or air passes through the pump and is separated from the liquid by centrifugal effects so that it accumulates in the spaces at the root of the rotors. When these spaces reach the high pressure zone, there is a sudden application of pressure to the liquid causing the bubbles to collapse and the liquid impinge against the side faces of the casing or bushings with the result that these faces become pitted or erosion occurs to such an extent that the damage affects the performance of the pump. In the case of high speed pumps having bushings of relatively soft material the damage is very prominent and the life of the pump is considerably reduced.

An object of this invention is to overcome this defect and thereby improve the overall efficiency and life of the pump.

According to this invention means are provided for enabling the air and/or vapour trapped in the spaces at the root of the rotors to be dispersed to an intermediate position transversely between the sides of the rotors as each space approaches the pressure zone, whereby the air and vapour accumulated is removed from attacking the side faces of the casing or bushings when the said spaces reach the pressure zone.

The means for eliminating the erosion may consist of a channel or the like which communicates with the high pressure zone in such a manner that the spaces at the root end of the rotors are brought into communication

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with the high pressure zone before they reach the high pressure side.

The invention will now be described with reference to the accompanying drawing in which—

Fig. 1 is a side view in section and partly in elevation of a gear pump incorporating the improvement.

Fig. 2 is a section on B—B of Fig. 1 and

Fig. 3 is a section on C—C of Fig. 1.

Referring to the drawing—

The gear pump comprises a pump housing 1 having a removable cover plate 2 at one end, the cover plate being secured in position by a ring of screws 3 which are screwed into tapped holes in the end of the pump housing 1.

The pump housing 1 is bored to provide parallel cylindrical intersecting bores 5, 6, with an inlet port 7 and an outlet port 8 at the juncture of the bores 5, 6.

Gear wheels 9, 10 with oppositely extending journals 11, 12, 13, 14 are provided with four bearing bushes 15, 16, 17, 18, interposed between the housing 1 and gear wheels 9, 10, so that when assembled into the housing 1 two opposite pump chambers are formed in the overlapping cylindrical bores. Each of the bearing bushes 15, 16, 17, 18 is formed with an outwardly extending flange denoted generally by the numeral 19, and the abutting surfaces of the flanges 19 are flat as indicated at 4 in Fig. 3. Fluid from the delivery side of the pump is supplied to chamber 21 and a rubber sealing ring 20 is provided for each bushing which serves to prevent leakage of pressure fluid from the chamber 21.

In accordance with the invention a groove 22 is cut in the face of the flanges 19 in the vicinity of the outlet port or pressure zone 8, said grooves 22 are so disposed that they extend beyond the pressure zone 8 to a point at the root of each of the gears 9, 10, at which the periphery of the tooth gaps is still sealed by the walls of the bores 5 and 6. As a result of this during rotation the spaces at the root of the teeth of said gears 9, 10 successively communicate with the grooves leading to the pressure zone before the spaces reach or connect with the delivery port 8. By this means any vapour accumulated in the root of the tooth space is flushed away from the vicinity of the side faces of the flanges 19, thereby obviating the disadvantages and defects as hereinbefore set forth.

The invention has been described with reference to the drawing as applied to a pressure loaded type of pump, but it is to be understood the invention is in no way limited to this type of pump. It is applicable generally to gear types of pumps.

I claim:

1. In a gear pump comprising a pair of intermeshing gear wheels mounted for rotation in a pumping chamber defined by peripheral walls in sealing contact with the circumference of the gear wheels except for an inlet chamber and a delivery chamber respectively formed at the two sides of the zone of intermesh and side wall members in sealing contact respectively with the side faces of the gear teeth at the two sides of the gear wheels, the provision, in the surface of each side member, of a groove extending from a first point facing said delivery chamber to a second point facing the root zone only of one of said gear wheels in the vicinity of the radial plane defining the limit of sealing contact between the gear teeth of said gear wheel and the peripheral wall of the gear housing, said second point being so selected that when the root zone of a tooth gap reaches said second point, such tooth gap is completely sealed from the delivery chamber by the contact of the gear teeth defining said gap with the peripheral wall and the side wall members, said groove being substantially clear of the zone

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in which the tooth gaps of the gear wheel are sealed by intermeshing contact of the gear teeth of said gear with those of the other gear.

2. In a gear-type positive-displacement pump having a pair of intermeshing gear rotors rotatable in a pumping chamber having a peripheral wall in sealing co-operation with the circumference of the gear rotors except for an inlet chamber at one side and an outlet chamber at the other side of the zone of intermesh, and has side walls in contact respectively with the two side faces of each gear, the feature that each side wall is provided with a groove extending from the delivery chamber to a point which faces the root zone only of each gear rotor adjacent the outlet port in a sector in which the outer parts of the teeth of said gear are still in sealing co-operation with the peripheral and side walls, the cross section of said groove being sufficient for producing a flushing effect scavenging air or vapour bubbles away from the end of the tooth gap.

3. A gear pump including a housing having a pair of parallel overlapping cylindrical bores, gear rotors in said bores having teeth meshing in the area of said overlapping bores, said gears having pairs of oppositely extending journals, bearing bushes associated with said gear rotors and having side faces engaging adjacent gear side faces, said housing being provided with an inlet port and an outlet port, wherein a groove is formed in the side faces of the bearing bushes, said groove extending from the outlet port to a point passed by the roots only of the tooth gaps of each gear wheel while the outer part of such tooth gaps is still sealed from the outlet port, said groove being substantially clear of the zone of sealing intermesh between the teeth of the gear wheel.

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4. A gear type positive displacement pump including a housing having a pair of parallel overlapping cylindrical bores, gear rotors in said bores having teeth meshing in the area of said overlapping bores, said gear rotors having a pair of oppositely extending journals, bearing bushes associated with said gear rotors and having side faces engaging adjacent gear side faces, said housing being provided with an inlet port and an outlet port, wherein grooves are formed in the side faces of the bearing bushes, said grooves extending from the outlet port to points facing the roots only of the tooth gaps of each gear rotor while the outer part of such tooth gaps is still sealed from the outlet port, said grooves being arranged parallel to the plane containing the axes of the two rotors and at such a distance from said plane as to be substantially clear of the zone in which the tooth gaps of such rotors are mutually sealed by intermeshing.

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