

Oct. 24, 1967

G. D. OLSON ET AL

3,348,492

REVERSIBLE WEAR PLATE PUMP

Filed Dec. 5, 1966

5 Sheets-Sheet 1

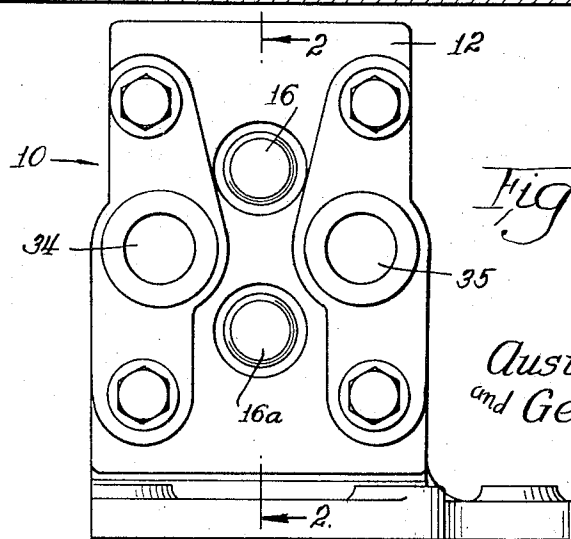
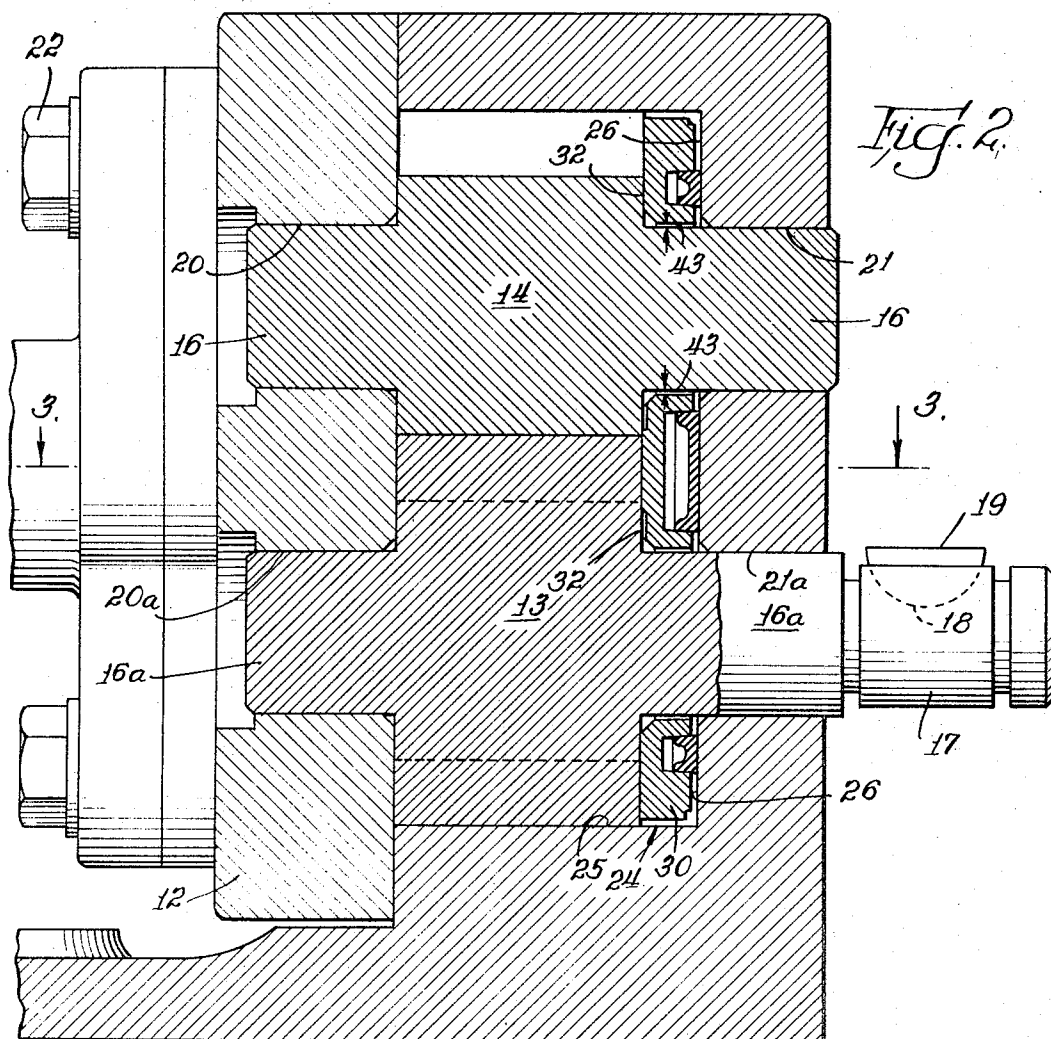


Fig. 1.

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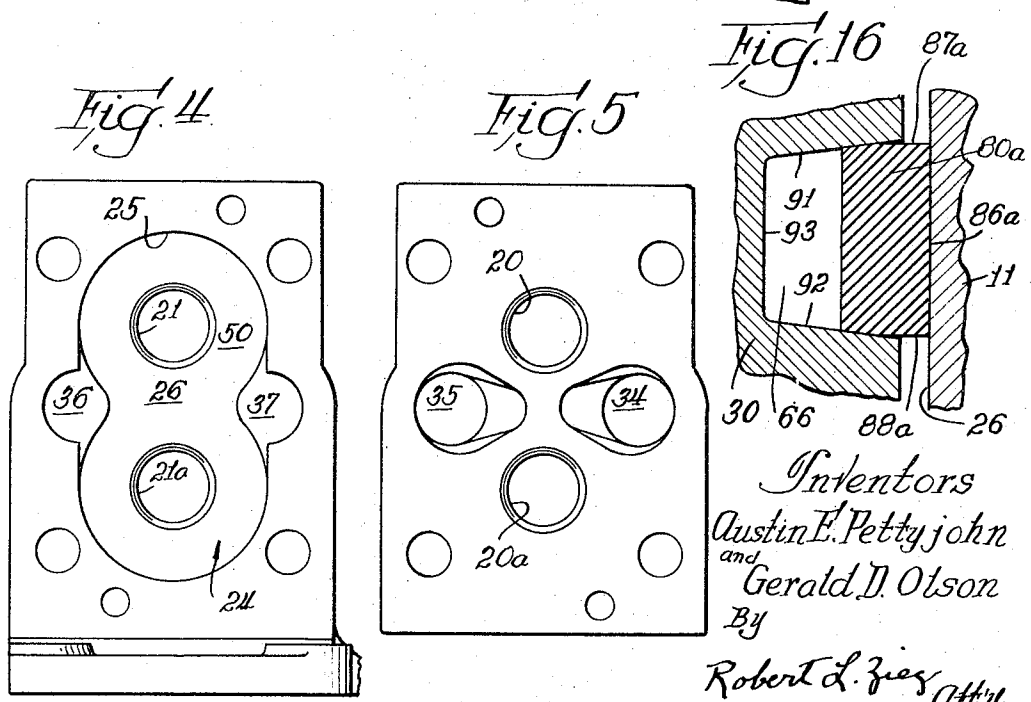
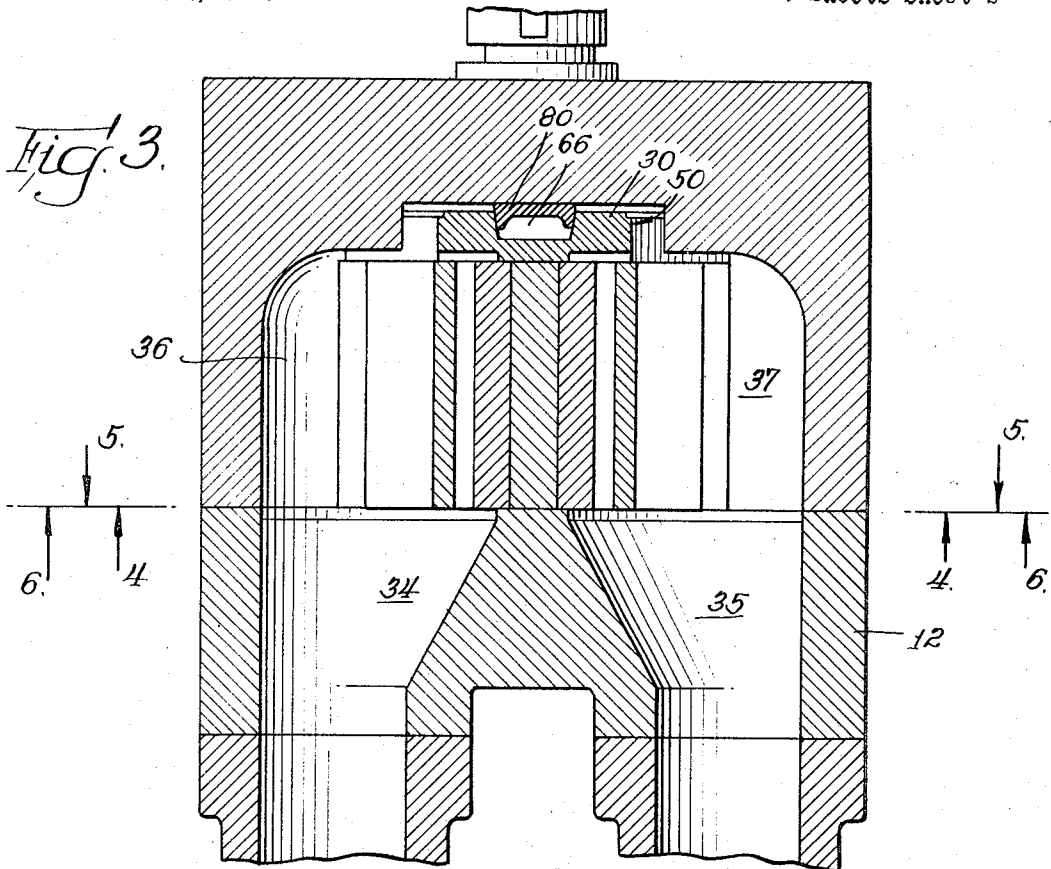
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Fig. 6

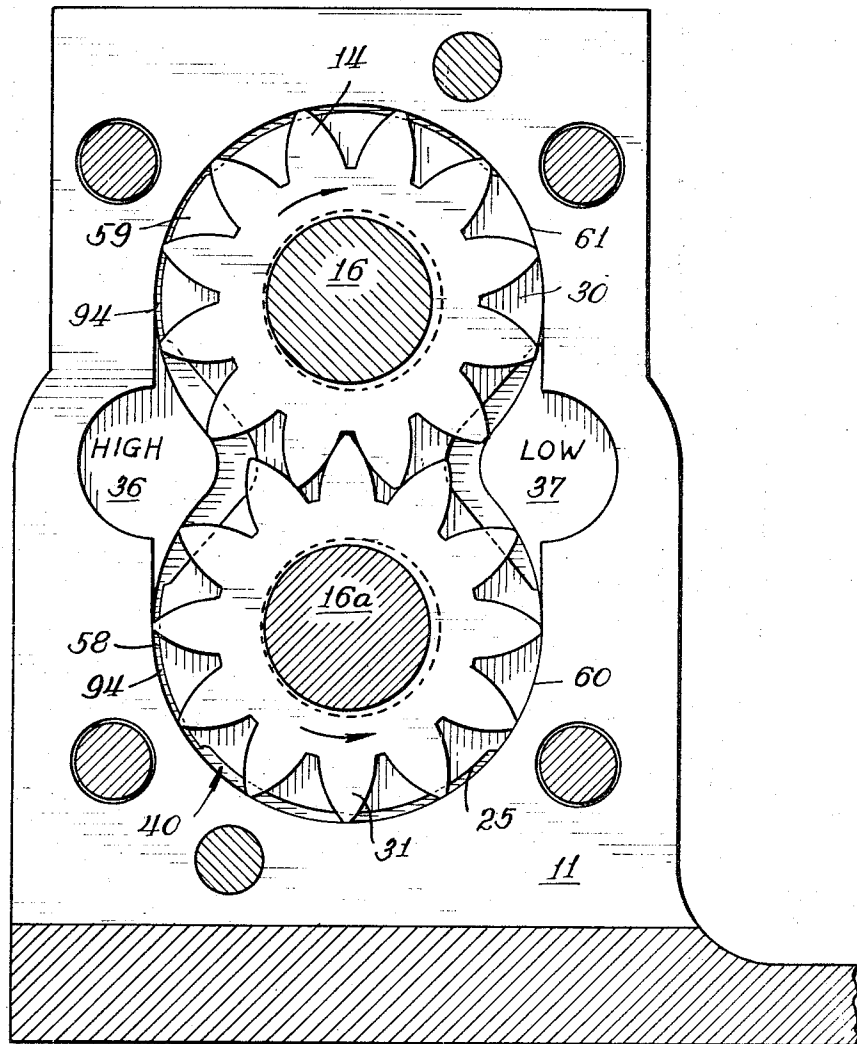


Fig. 14

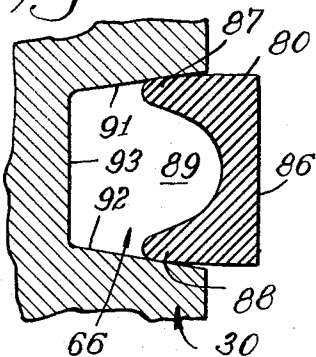


Fig. 15

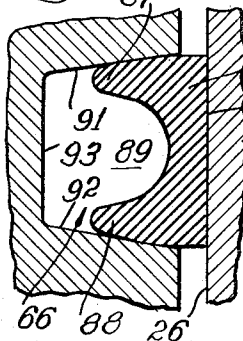
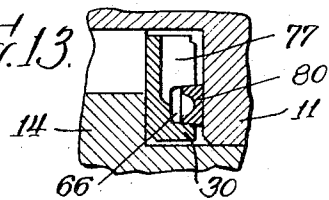


Fig. 13



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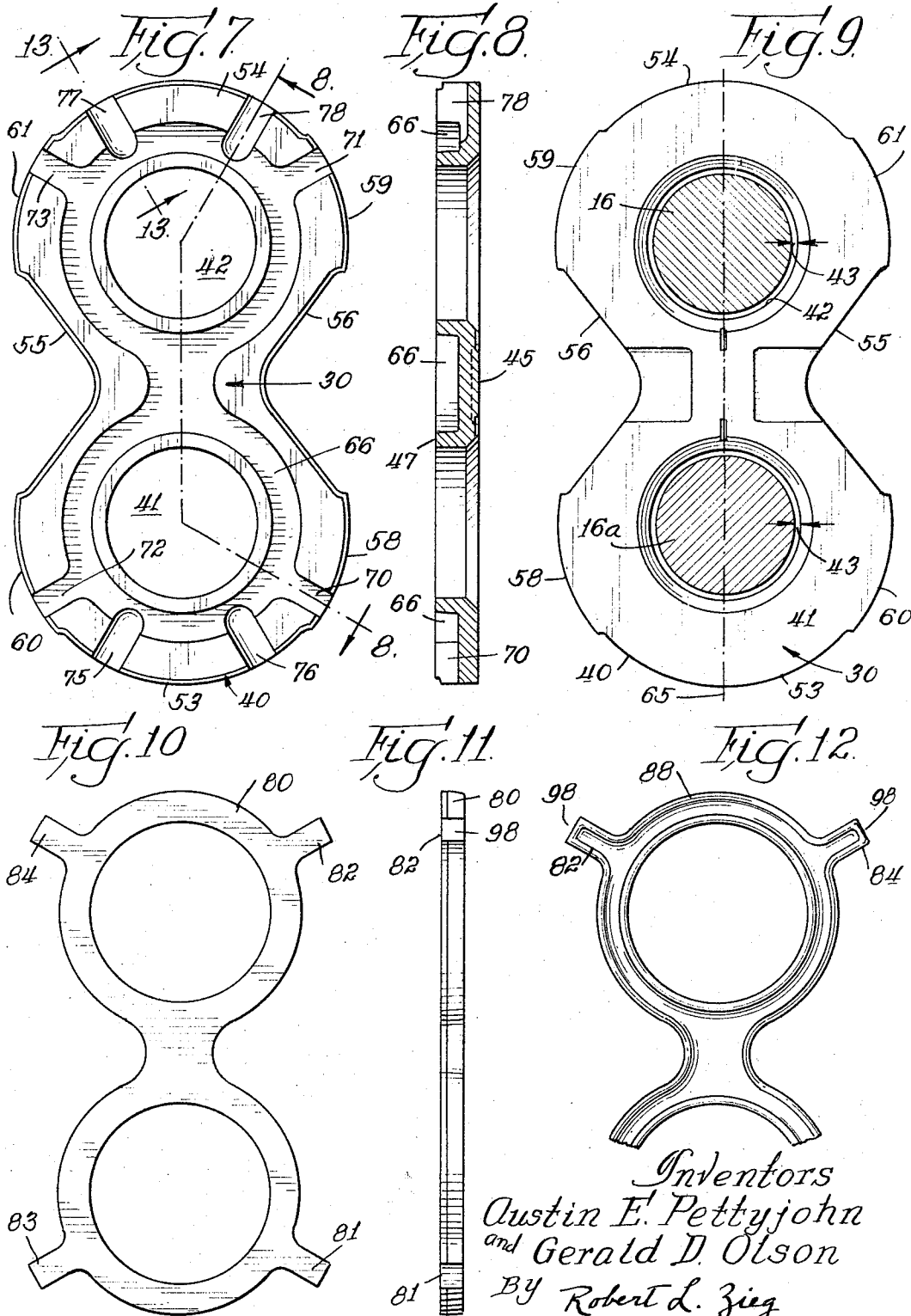
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Fig. 17

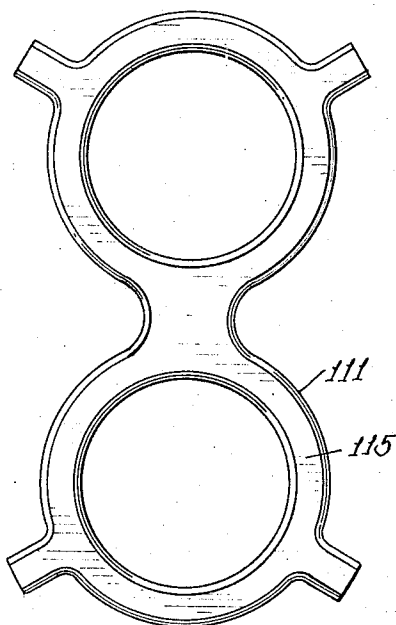


Fig. 18

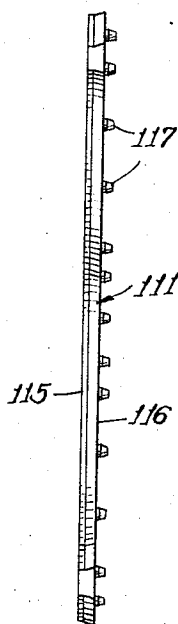


Fig. 19

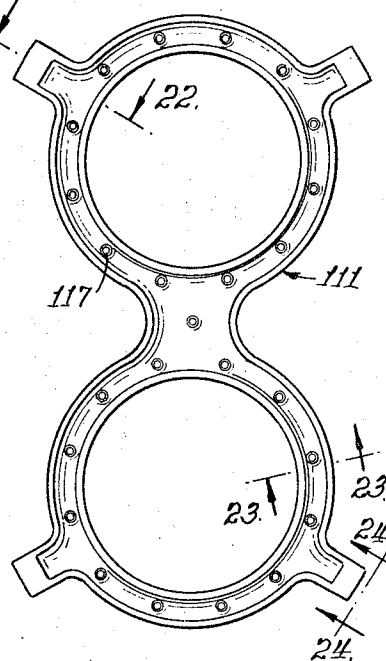


Fig. 20

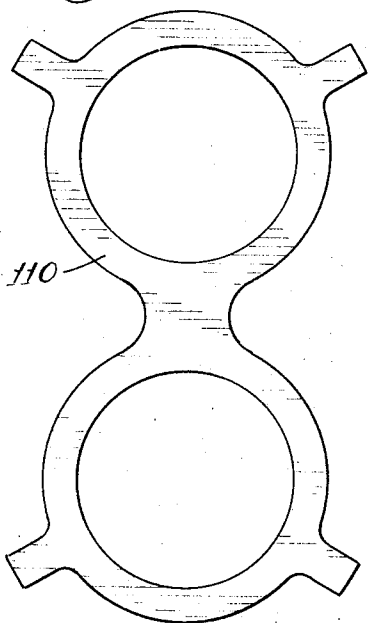


Fig. 21

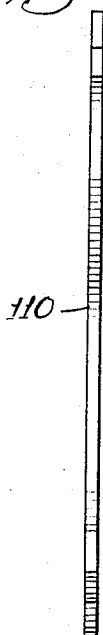


Fig. 23

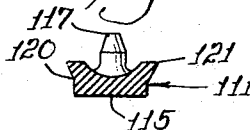


Fig. 22

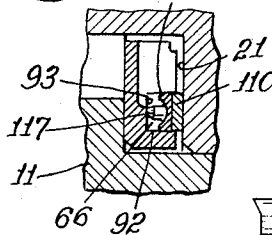
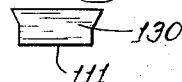


Fig. 24



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3,348,492

REVERSIBLE WEAR PLATE PUMP

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Filed Dec. 5, 1966, Ser. No. 599,237

12 Claims. (Cl. 103—126)

ABSTRACT OF THE DISCLOSURE

A pressure loaded pump or motor having a pair of intermeshing gears mounted within a housing having an inner-peripheral surface defining a cavity, the housing having low pressure and high pressure ports. A wear plate mounted between the gears and an end wall of the cavity, the wear plate having a pressure loading zone defined thereon on the side of the wear plate toward the end wall of the cavity, the zone being defined by a seal mounted in a groove of the wear plate. The seal is adapted to move outwardly in response to the fluid pressure underneath the seal. The wear plate is so constructed that it is movable axially to load the pump gears and provide an effective seal therebetween and is also movable radially to engage the inner peripheral surface of the cavity so that in either direction of rotation the wear plate will move radially to engage the inner peripheral surface of the cavity on the opposite side of the periphery of the wear plate from the high pressure port of the pump or motor to provide a fluid seal between the periphery of the wear plate and the inner peripheral surface of the cavity.

Summary of invention

This invention relates to a pressure loaded pump or motor of the wear plate type and more particularly to a pressure loaded pump or motor mechanism adapted to be reversible in operation.

This invention relates to an improved reversible pressure loaded pump or motor of the wear seal plate type, the wear plate being movable radially to engage the inner peripheral surface of the pump or motor cavity and movable axially to sealably pressure load the gears. The wear plate has a seal on the face thereof toward the end wall which is activated by fluid pressure underneath the seal to engage the end wall and define pressure loading zones on the wear plate. The wear plate moves radially to engage the peripheral surface of the pump or motor cavity on the opposite side of the periphery of the wear plate from which the high pressure is located depending upon the direction of rotation of the pump or motor.

Other features and advantages of the present invention will be apparent from the following description when read in connection with the accompanying drawings in which:

FIGURE 1 is an end view of the pump incorporating the features of the present invention;

FIGURE 2 is a sectional view along line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view along line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken along line 4—4 of FIGURE 3;

FIGURE 5 is a sectional view taken along the line 5—5 of FIGURE 3;

FIGURE 6 is a sectional view taken along the line 6—6 of FIGURE 3;

FIGURE 7 is a view of the wear plate of the present invention;

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FIGURE 8 is a sectional view taken along the line 8—8 of FIGURE 7;

FIGURE 9 is a view of the gear engaging side of the wear plate of the present invention;

FIGURE 10 is a representation of the seal in plan view;

FIGURE 11 is an end view of the seal of FIGURE 10;

FIGURE 12 is a view of the opposite side of the seal of FIGURE 10;

FIGURE 13 is a cross sectional view of the wear plate taken along the line 13—13 of FIGURE 7;

FIGURE 14 is an enlarged view of the seal assembled in the wear plate;

FIGURE 15 is a view similar to FIGURE 14 showing the compression of the seal after assembly in the pump;

FIGURE 16 is an enlarged view of an optional form of seal;

FIGURE 17 is a view of the resilient member to be utilized in a modified form of seal construction;

FIGURE 18 is an end view of the resilient member of FIGURE 17;

FIGURE 19 is a view of the opposite side of the resilient member of FIGURE 17;

FIGURE 20 is a view of the seal member used in the modified construction;

FIGURE 21 is an end view of the seal member of FIGURE 20;

FIGURE 22 is a view taken along the line 22—22 of FIGURE 19 showing a two-piece type seal in an assembly in a wear plate;

FIGURE 23 is an enlarged sectional view taken along line 23—23 of FIGURE 19; and

FIGURE 24 is an end view taken along the line 24—24 of FIGURE 19.

The device of the present invention is generally similar to that disclosed in co-pending application Ser. No. 609,686, filed Jan. 16, 1967 of common assignee, which is a continuation application of Ser. No. 572,494, filed Aug. 15, 1966, now abandoned, to which reference may be had for additional description of the details and operation of a uni-directional type of wear plate pressure loaded pump or motor.

Referring to FIGURES 1, 2 and 3, a pump or motor 10 is illustrated which may employ the present invention therein. The device 10 includes a body or housing 11 and an end cover 12. The device will generally be described as a reversible pump in the ensuing description; however, it will be obvious to those of ordinary skill in the art that by utilizing a separate source of pressure the device 10 will function as a reversible fluid motor.

Mounted within the pump are gears 13 and 14 which intermesh and when rotated are operative to pump fluid. Journals 16 are provided for the gears 13 and 14. One of the journals 16 for the gearing includes an extension 17 having a keyway 18 therein engageable by a key 19 to provide the driving connection to turn the gears when connected to a power source. The journals 16 for the gears 13 and 14 are mounted in a pair of bores 20 within the cover 12 and in a pair of bores 21 provided in the body 11. The cover member 12 may be secured to the body 11 by any known means as for example by bolts 22.

A cavity 24 is provided in body 11 in which gears 13 and 14 are mounted. The cavity 24 is defined by an inner peripheral surface 25 of generally a figure 8 cross-section, as will be clear from FIGURE 4, an inner face or end wall 26, and the cover 12. An improved wear plate 30 is provided which is mounted in the cavity 24 between the gears 13 and 14 and the face or wall 26 of body 11. The gears 13 and 14 have side faces 32 which are engaged by the wear plate 30.

Provided in the cover 12 is a pair of ports 34 and 35

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which are interchangeably high and low pressure ports depending upon the direction gears 13 and 14 are driven when the device is used as a pump or depending upon the port to be supplied from a source of pressure when the device 10 is used as a fluid motor. Mating with the ports 34 and 35 is a pair of recesses 36 and 37 respectively provided in the cavity 24. The recesses 36 and 37 provide for easy entrance and exit of fluid into and from the device 10 by means of the ports 34 and 35 in the cover 12.

Referring to FIGURES 7, 8 and 9, the wear plate 30 of the present invention is disclosed. The wear plate 30 is of a generally figure 8 configuration having an outer peripheral surface 40 and a pair of bores 41 and 42 adapted to receive the journals 16 and 16a. As seen in FIGURE 9, the bores 41 and 42 are larger in diameter than the journals 16 and 16a, preferably from .018 to .023 inch when the bores are .665 inch in diameter, to provide a clearance 43 between the wear plate 30 and the journals 16 so as to provide for a limited radial movement of wear plate 30 within cavity 24 as will be later described and also to prevent binding of the wear plate when it moves transversely as will be later described.

The wear plate 30 has a side face 45 adapted to engage the gear side faces 32. The wear plate 30 also has a face 47 on the opposite side thereof adapted to be in close association with the inner face or wall 26 of the pump body 11. A pocket 50 is provided in the pump body which is of generally complementary shape to the wear plate 30 which is adapted to receive the wear plate 30 as can be seen in FIGURE 3, for example. The inner peripheral surface 25 of the pump body is continuous and defines an inner peripheral surface in the area of the wear plate 30.

The outer peripheral surface 40 of wear plate 30 is relieved at the upper and lower ends as illustrated in FIGURE 7 and as indicated at 53 and 54. The outer peripheral surface 40 is further relieved on the sides thereof as indicated at 55 and 56. Relieving of the outer peripheral surface at areas 53, 54, 55 and 56 just described leaves a pair of arcuate sealing surfaces 58 and 59 on the right side thereof as viewed in FIGURE 7 and a pair of arcuate sealing surfaces 60 and 61 respectively on the left side thereof as viewed in FIGURE 7. The sealing surfaces 58, 59, 60 and 61 are adapted to engage the inner peripheral surface 25 of the pump body 11 to perform a sealing function as will later be described.

The wear plate 30 has a central axis 65 which intersects centers of the bores 41 and 42 therein. On the face 47 of the wear plate a continuous groove 66 is provided which is generally of a figure 8 shape surrounding each of the bores 41 and 42 in the wear plate 30. The groove 66 has four radially projecting sections extending from the circular or figure 8 parts of groove 66 to the peripheral arcuate sealing surfaces of the wear plate. Radial grooves 70, 71, 72 and 73 extend between the figure 8 sections of the grooves 66 and the outer peripheral sealing surfaces 58, 59, 60 and 61 respectively. The continuous groove 66 including its radial extensions above described is symmetrical about the axis 65 of the wear plate so as to provide for the reversible operation of the pressure loading wear plate 30.

In the recessed area 53 of the wear plate and on the face 47 is a pair of radially extending recesses 75 and 76. In the recessed area 54 of the wear plate is a pair of radially extending access recesses 77 and 78. As can be seen from FIGURE 8, the access recesses are of greater depth than the continuous groove 66 and serve to supply fluid pressure to the bottom portion of the groove 66 at each of the four access recesses so as to actuate a fluid pressure seal during operation of pump 10 as will be later described. The access recesses 75, 76, 77 and 78 extend radially from the continuous groove 66 to the recessed portions 53 and 54 of the outer peripheral surface of the wear plate. Also the access recesses are all interposed between a pair of the outer peripheral sealing surfaces. For example, access grooves 75 and 76

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are located between the outer peripheral sealing surfaces 58 and 60 and the access recesses 77 and 78 are located between the outer peripheral sealing surfaces 59 and 61.

A continuous seal 80 is illustrated in FIGURES 10, 11 and 12 which is complementary to and of identical shape to the continuous groove 66 of the wear plate and is adapted to be assembled therein. The continuous seal 80, therefore, similar to the continuous groove 66, has four radially projecting arms connected to the figure 8 sections thereof which are 81, 82, 83 and 84 and which are adapted to be received by the radial groove sections 70, 71, 72 and 73 respectively of continuous groove 66.

Illustrated in FIGURE 13 is a cross section showing the seal 80 assembled within the continuous groove 66. FIGURES 14 and 15 are enlarged views illustrating the seal member 80 assembled within the groove 66. From the enlarged view it can be seen that the seal member 80 has a generally flat surface 86 thereon adapted to engage the face 26 of the body 11 and also includes a pair of projecting lips 87 and 88 which define therebetween a fluid conducting channel 89. As seen in FIGURES 14 and 15, the groove 66 includes side walls 91 and 92 and a bottom wall 93. The lips 87 and 88 are adapted to engage side walls 91 and 92 when seal 80 is assembled in the groove 66. FIGURE 14 illustrates the seal just prior to final assembly in the pump, the seal being loosely placed within the groove 66 and the lips 87, 88 loosely engaging sides 91 and 92 of groove 66. After final assembly of the pump, the seal will assume the position illustrated in FIGURE 15 wherein the lips 87 and 88, due to the axial force moving seal 80 further into the groove 66 in assembly and deflecting the lips 87 and 88 inwardly toward the central passage 89 in the seal 80 as illustrated in FIGURE 15. Due to the deflection of the lips 87 and 88 and the resilient characteristic of the material used in seal 80, a resultant axial force will exist inherent in the seal 80 attempting to move the seal 80 out of the groove 66 and thereby into engagement with the surface or inner face 26 of the body 11. Thus, prior to pump operation a preload function is present in that the seal will be initially urged by the preloading into engagement with the surface or face 26 and further the wear plate 30 will be urged by the same force into engagement with the gears 13 and 14.

During operation of the pump fluid pressure will be admitted into the fluid passage in groove 66 in the wear plate as defined by side walls 91, 92 and bottom wall 93 and the passage 89 of seal 80. The fluid will thus be conducted underneath seal 80 and throughout the entire continuous extent of the groove 66 and during pump operation will urge the seal 80 further into engagement with face 26 to define a pressure loading zone or other face 47 of wear plate 30, as will be later described.

The function of the pump or motor 10 is thus that, as illustrated in FIGURE 6, if the device is used as a pump and the gears 13 and 14 are rotated from power source, and be it assumed that they are rotated in a direction such that recess 36 would be the high pressure recess and recess 37 would be the low pressure or inlet recess of the pump, high pressure acting on the outer peripheral surface 40 of the wear plate 30 will urge the wear plate 30 to the right as viewed in FIGURE 6 to engage arcuate sealing surfaces 60 and 61 of the outer periphery of the wear plate with the inner peripheral surface 25 of the pump cavity 24 and provide thereby a sealing engagement between surfaces 60, 61 and surface 25. When this sealing engagement takes place, fluid pressure can then flow from the high pressure recess 36 between the sealing surfaces 59, 58 and inner peripheral surface 25 of the pump cavity relieved areas 53 and 54 on the wear plate since a fluid passage as indicated at 94 is defined by the displacement of the surfaces 59 and 58 from the surface 25. High fluid pressure in the relieved areas 54, 53 will thus be conducted by means of the access recesses 75, 76, 77 and 78 under the seal 80 to move the seal into engagement with the

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face 26 to define high and low pressure zones in the face 47 of the wear plate. Thus at this time, looking at FIGURE 7, the high pressure zone will extend between the groove 66 and the outer peripheral surface 40 of the wear plate 30 on the face 47 from the radial groove section 72 counter-clockwise around the periphery of the wear plate 30 to the radial groove 73, thus defining a pressure loading high pressure area on the face of the wear plate which is offset with respect to the center of the gears 13 and 14 to compensate for the high pressure on the opposite side of the wear plate or on face 45 engaging the gears 13 and 14. The low pressure zone at this time is defined as the area between the groove 66 and the outer peripheral surface 40 of the wear plate 30 extending between groove 72 and clockwise along the outer peripheral surface to the groove 72 and generally in the area of recess 55 provided in the wear plate.

Referring again to FIGURE 6, if the direction of the gears would be reversed and recess 37 then being the high pressure recess and recess 36 the low pressure recess, the wear plate 30 would be moved to the left as viewed in FIGURE 6 and arcuate sealing surfaces 59 and 58 would thus be engaged with the peripheral surface 25 of the cavity 24 and a fluid passage would then be defined between sealing surfaces 60 and 61 and the peripheral surface 25 to the relieved areas 54 and 53 on the wear plate. Thus it will be seen that in either direction of rotation of the gears of the pump or the gears of the motor, the wear plate will shift radially within the pump cavity 24 to engage a pair of arcuate sealing surfaces as, for example 58 and 59 with the inner peripheral surfaces of pump cavity to therefore provide an essential seal to seal off the high and low pressure zones of pressure loading on the face of the wear plate 30. This radial movement is allowed because the clearance 43 between bores 41 and 42 and gear journals 16 and 16a, as shown in FIGURES 2 and 9, permits the wear plate 30 to shift radially to one side or the other of a vertical center line 43a, FIGURE 9, depending upon the direction of rotation of the gears.

The wear plate further moves in a transverse direction against the gear side faces 32 to provide the pressure loading function essential to efficient pump operation by providing a seal of the side faces 32 of the gears against the face 47 on the wear plate. The transverse movement of the wear plate into engagement with the gears is further aided by the fluid pressure which is conducted by the access recesses under the seal 80. In other words, a component of force is added to move the plate transversely due to engagement of seal 80 with face 26.

As previously pointed out, the groove 66 has a generally symmetrical shape with respect to axis 65 to make the reversible operation possible. The access recesses 75, 76, 77 and 78 are located between the pairs of arcuate sealing surfaces 58, 60, 59, 61 so that admission of high fluid pressure under seal 80 will take place regardless of the direction of rotation and regardless of which of the pairs of arcuate sealing surfaces is engaged with the inner peripheral surface 25 of the cavity 24.

The compound movement of the wear plate 30 in both a radial and a transverse direction is utilized in a novel manner to supply high fluid pressure to the access recesses 75, 76, 77 and 78 through the clearance provided between the pair of sealing surfaces which are not engaged with the inner peripheral surface of the pump cavity at a particular time. Thus the radial movement of the wear plate 30 has a dual purpose in that it provides for engagement between the peripheral sealing surfaces and the inner peripheral surface 25 of cavity 24 to provide an essential fluid seal and likewise opens fluid passages to conduct high pressure fluid to the desired locations on the wear plate.

The arms 81, 82, 83 and 84 on the seal 80 have an additional sealing function in that the end faces 98 which are provided thereon define a continuation of the lip 88 which is adapted to engage the inner peripheral surface 25 of the cavity 24 at the same time the arcuate peripheral

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sealing surface for the particular arm is engaging the peripheral surface 25 and thereby to aid in the sealing function of the arcuate sealing surfaces and ensure a good fluid seal.

It will be apparent that when the device 10 is utilized as a fluid motor the same action of the wear plate 30 takes place, the recesses 36 and 37 being interchangeably high and low pressure recesses depending upon the direction of rotation of the motor desired and therefore which of the recesses will be supplied with high fluid pressure.

It will thus be apparent that the present invention provides a novel and improved type of wear plate pressure loaded fluid pump or motor wherein, due to the symmetrical design of the wear plate and its particular structural differences over those known in the prior art, the pump or motor is reversible while at the same time maintaining efficient operation due to pressure loading zones on the wear plate effectively providing a seal between the side faces of the gears and the wear plate. Due to the fact that the wear plate may be made by casting methods, powdered metallurgy, or a stamping type of operation the reversible operation with pressure loading is provided at a very reasonable cost as compared to structures known in the prior art.

The seal member 80 has been conveniently designed as a one-piece fluid seal. Due to the shape of seal member 80 including lips 87 and 88, the seal member may be made of a semi-resilient material which may be of various combinations of rubber and synthetic materials having good sealing characteristics so that the sealing face 87 will provide an effective seal. Thus with the one-piece seal 80 the present invention has incorporated both the sealing function and the preloading function necessary with a wear plate type of pump eliminating the necessity of adding a separate preloading spring. As before stated, the seal member 80 may be made out of any known rubber or synthetic material to provide the inherent properties necessary for both the preloading function and the sealing function. However, the shape of the seal 80 in cross section is so designed that it may be of uniform material composition throughout, thereby eliminating the necessity for an expensive type of seal to be utilized in the wear plate type pump.

Illustrated in FIGURE 16 is an optional type of one-piece seal to be utilized in groove 66 comprising a generally rectangular cross section seal 80A having a sealing face 86A thereon adapted to engage face 26 of body 11. The seal 80A has side faces 87A and 88A adapted to engage the side walls 91 and 92 respectively of groove 66. Thus in assembly, due to the resilient nature of the seal 88, the sides 87A and 88A will be deflected toward the center of seal 80A as illustrated in FIGURE 16 and thus provide an axial force inherent in seal 80A tending to move seal 80A out of groove 66 and into engagement with face 26. Thus a seal 80A of simple shape is provided which can perform both the preloading function and the fluid pressure activated function in a similar manner to the seal described in FIGURES 14 and 15.

In FIGURES 17, 18, 19, 20, 21, 22, 23, and 24 a two piece type of seal construction is illustrated somewhat similar to that utilized in the above mentioned co-pending application of common assignee. In the two piece seal modification a sealing member 110 is utilized which is of complementary shape to the shape of the groove 66 in the wear plate. This member 110 would be constructed of a material having good anti-extrusion characteristics and assembled in the groove 66 above a resilient member 111. Resilient member 111 is also of complementary shape to the groove 66 provided in the wear plate 30. Resilient member 111 has an upper face 115 and a lower face 116. Provided on the lower face 116 is a series of projections 117. The projections 117 are provided equally spaced over the entire continuous extent of the resilient member 111. The face 115 is adapted to be engaged by the sealing member 110 when the sealing

member 110 and resilient member 111 are assembled in groove 66 as viewed in FIGURE 23. The resilient member 111 further includes a pair of lips 120 and 121 which are adapted to engage the sides 91 and 92 of the groove to provide a fluid seal. As viewed in FIGURE 23 the ends of the arms on the resilient member 111 are closed to form a surface 130 and to close the fluid chamber defined by groove 66 and the resilient member 111. Surfaces 130 are adapted to engage inner peripheral surface 25 in a like manner as surfaces 98 on seal 80.

Referring to FIGURE 22 resilient member 111 and seal 110 are shown in assembly in groove 66. Lips 120 and 121 on resilient member 111 engage the side walls 91 and 92 of groove 66 and together with the bottom 93 of the groove define the fluid channel underneath the resilient member 111 so that when fluid is conducted through the channel the resilient member 111 will be moved outwardly of groove 66 to move seal 110 into engagement with the face 26 on body 11. In assembly of the resilient member and the seal into the groove 66, the projections 117 engage the bottom 93 of groove 66 and are deformed in assembly so that the preloading function will be provided by an inherent axial force in member 111 tending to move resilient member 11 out of groove 66. The two-piece seal comprising the resilient member 111 and seal 110 works in a similar manner as the one-piece seal 80 to define pressure loading zones on the face of wear plate 30.

It will be apparent to those of ordinary skill in the art that the pump or motor 10 may be supplied with a second wear plate identical to wear plate 30 to be assembled between cover 12 and gears 13 and 14 which would function in a like manner to wear plate 30 and provide pressure loading of the gears on each side face thereof.

Various of the features of the invention have been particularly shown and described; however, it should be obvious to one skilled in the art that various modifications may be made therein without departing from the scope of the invention.

We claim:

1. A reversible fluid pump or motor device having a cavity therein being defined by an inner peripheral surface, rotatable means in said cavity, an end wall enclosing said cavity, a seal plate disposed between said rotatable means and said end wall, said plate having opposed faces, one of said faces of said plate having seal means therein engageable with said end wall to define high and low pressure zones on said plate to provide pressure loading of said rotatable means, means for communicating high pressure fluid to said high pressure zone, said plate being adapted to move radially in said cavity, said plate having a portion of the periphery thereof recessed to define the limits of a plurality of arcuate sealing surfaces on opposite sides of the periphery of said plate, said plate further being adapted for axial movement toward said rotatable means to provide a wear sealing engagement of the other face with said rotatable means whereby in one direction of rotation of said rotatable means the high pressure fluid will move said plate radially to engage said sealing surfaces along one side of the periphery thereof with said inner peripheral surface to provide a seal between the low and high pressure zones of said plate and when said rotatable means is rotated in the other direction the high pressure will move the plate radially to engage the sealing surfaces on the opposite sides of said plate with said inner peripheral surface to provide a fluid seal therebetween whereby pressure loading of said rotatable means is provided in either direction of rotation of said rotatable means.

2. A device as claimed in claim 1 wherein said means defining pressure zones on said plate comprises a groove, a sealing means in said groove and means to communicate fluid pressure to said groove to move said sealing means outwardly with respect to said wear plate to

engage said end wall and provide a fluid sealing between high and low pressure zones on said plate.

3. A device as claimed in claim 1 wherein when said plate has been moved radially to engage said inner peripheral surface, a fluid communicating channel is defined by the clearance between the arcuate sealing surfaces on the wear plate and the inner peripheral surface on the opposite side of said plate with respect to those arcuate sealing surfaces engaging said inner peripheral surface whereby high pressure communication to the sealing means is enhanced.

4. A device as claimed in claim 2 wherein a pair of arcuate sealing surfaces are provided on opposite sides of said plate, said means to communicate fluid pressure to said groove being located between the pairs of sealing surfaces on the opposite sides of the periphery of said plate whereby high pressure fluid will be conducted to said communicating means in either direction of rotation of said rotatable means.

5. A device as claimed in claim 2 wherein the groove on the face of said plate is symmetrical.

6. A device as claimed in claim 1 in which said plate has means defining bores therein, said rotatable means having journals, said journals extending through the bores in said plate, the bores in said plate being of larger diameter than said journals so as to provide for radial movement of said plate with respect to said rotatable means.

7. In a fluid pressure energy translating device including a pair of rotatable means and an end wall, a plate in said device between said end wall and said rotatable means, said plate being provided with means defining a pressure zone thereon by engagement of said means with said end wall, said means comprising a groove in the face of said plate adjacent said end wall, said groove having side walls, a one-piece seal in said groove adapted to engage said end wall, said seal defining a channel in said groove for communication of fluid pressure, said seal having a face adapted to engage said end wall and means adapted to engage the side walls of said groove whereby when said seal is assembled in said groove said means engaging the sides of said groove is deflected toward the center of said groove to provide an axial force urging said seal in said groove outwardly thereof toward said end wall whereby when said device is assembled said sealing means will provide a preload by urging said plate into engagement with said rotatable means prior to any fluid pressure being developed within said device.

8. A device as claimed in claim 7 wherein said seal has a generally U-shaped cross-section, the sides of said U being engageable with the side walls of said groove.

9. A device as claimed in claim 7 wherein said seal has a generally rectangular cross section.

10. In a fluid pressure device an assembly including a fixed surface and a member adjacent said fixed surface, said member being adapted to move toward and away from said fixed surface, a seal surface on said member generally parallel to and adjacent said fixed surface, a source of fluid pressure, means defining a groove in said seal surface, said groove having side walls, a one-piece seal in said groove, means connecting said groove to the source of fluid pressure whereby fluid pressure in said groove will move said seal outward of said groove to engage said fixed surface and thereby define zones of differing pressures on said seal surface, said one-piece seal having means thereon engaging said side walls, whereby when said device is assembled said means on said seal will be deflected toward the center of said groove by said side walls to provide an inherent axial force in said seal attempting to move said seal out of said groove to thereby provide a preloaded engagement of said seal with said fixed surface prior to operation of said device.

11. A fluid pressure device as claimed in claim 10 wherein said seal has a general U-shaped cross-section and said means on said seal comprising lips engageable with said side walls.

12. A fluid pressure device as claimed in claim 10

wherein said seal has a generally rectangular cross section.

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