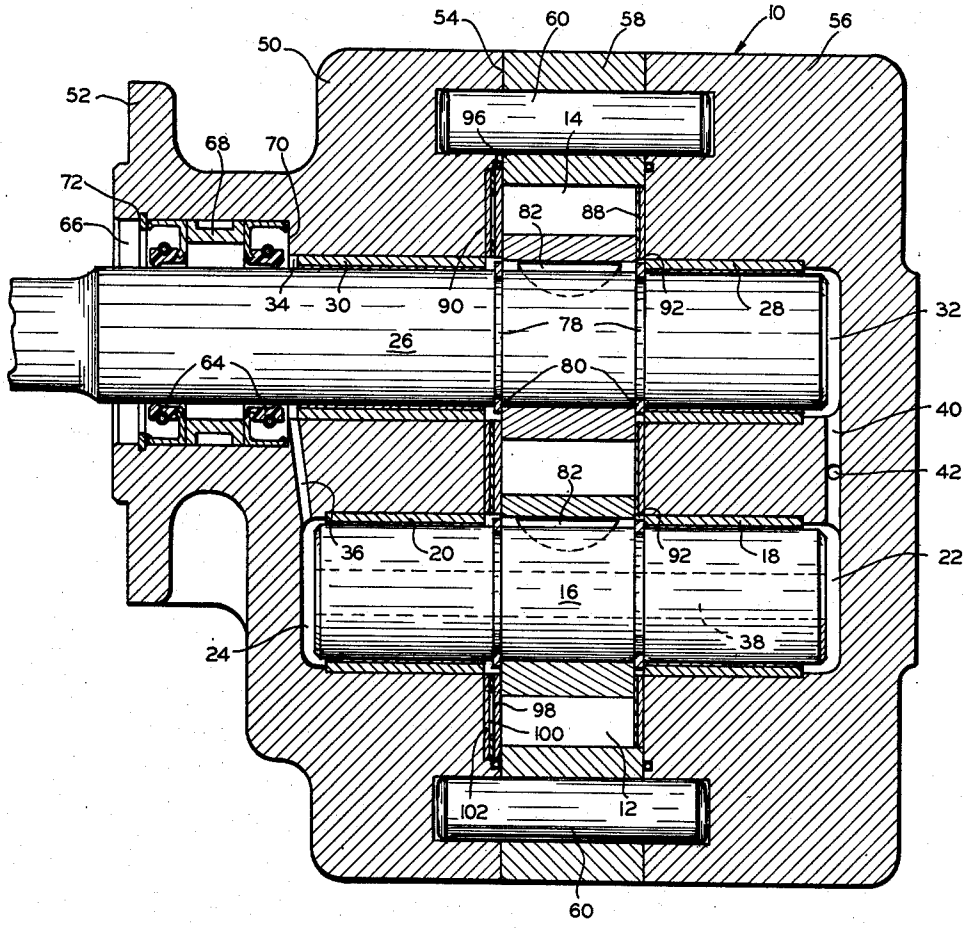
March 23, 1965 R. L. SISSON ETAL 3,174,435

PUMP OR MOTOR

Filed Aug. 16, 1962 3 Sheets-Sheet 1

FIG. 1



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FIG. 2

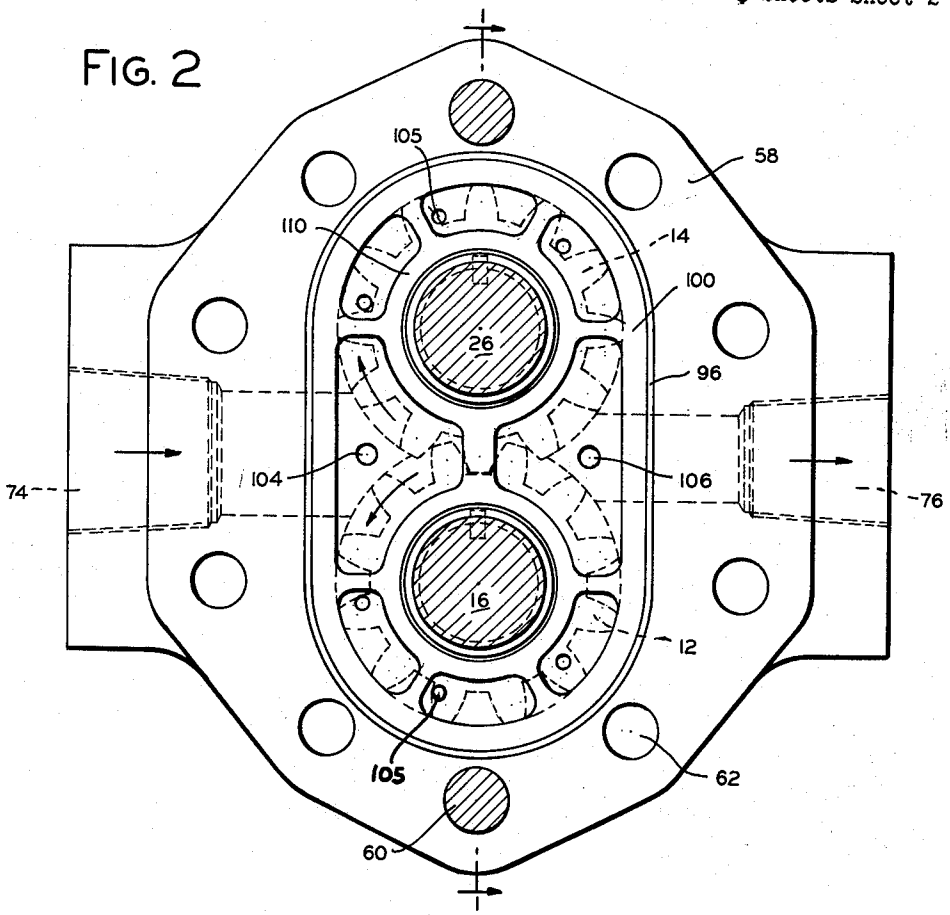
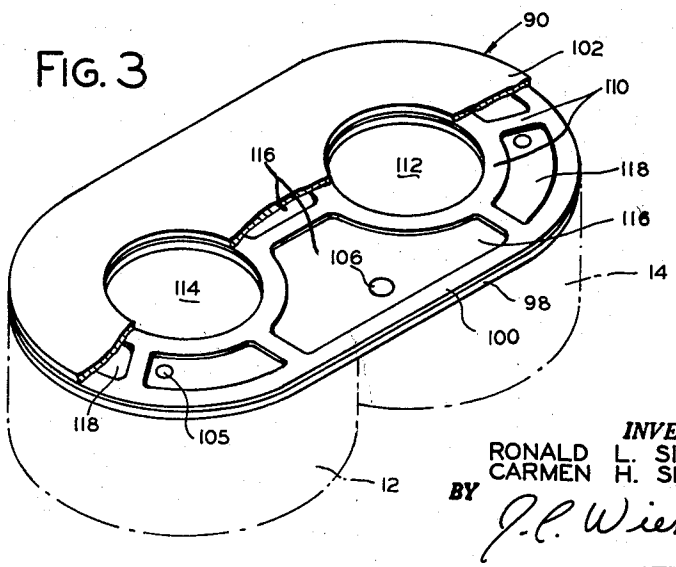


FIG. 3



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FIG. 4

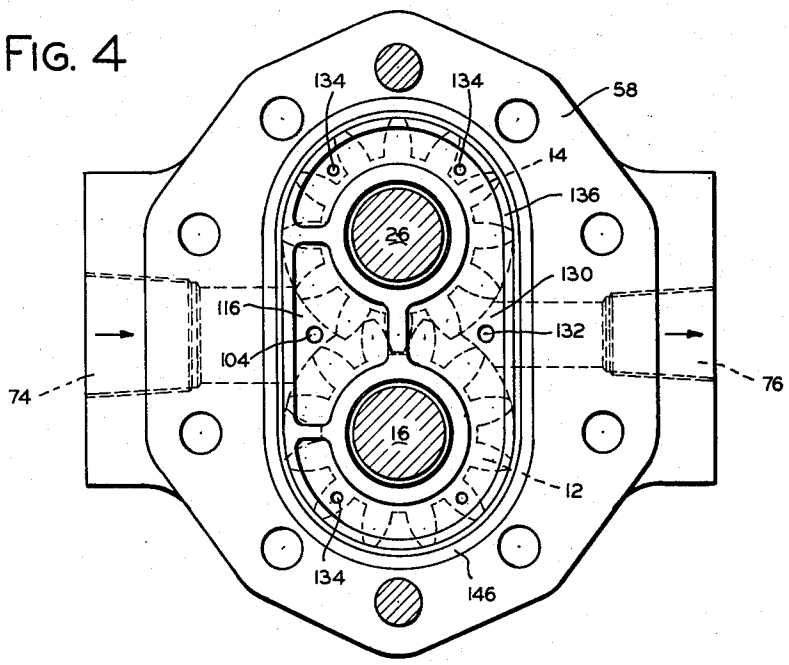
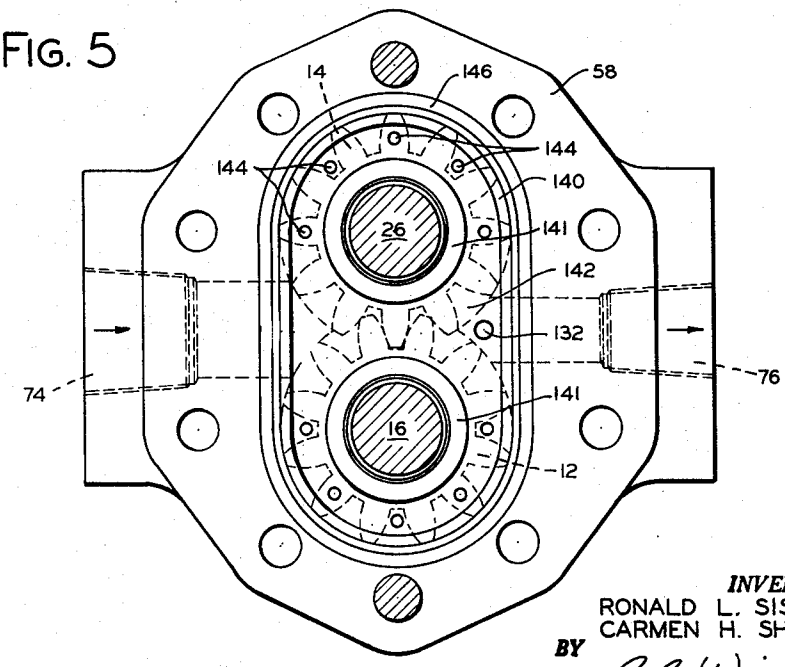


FIG. 5



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3,174,435

PUMP OR MOTOR

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Filed Aug. 16, 1962, Ser. No. 217,376
18 Claims. (Cl. 103—126)

This invention relates to fluid displacement pumps and motors, and more particularly to pressure loaded pumps and motors.

It has long been a problem in the art to which this invention pertains to design a pressure loaded gear pump, for example, capable of generating relatively high discharge pressures, operable at high mechanical and volumetric efficiencies, and capable of high performance operation for relatively long periods of time with minimum maintenance requirements. One of the major problems in this art for which various solutions have been proposed results from the pressure gradient encountered in operation of such pumps which tends to cause the pump and pump pressure sealing means to operate in an unbalanced condition with resulting short pump life, high maintenance cost and reduced efficiency. The most promising solution to the problem to date of which we are aware is described in detail in copending application Serial No. 158,362, filed December 11, 1961, in the name of Richard O. Gordon (common assignee), now Patent No. 3,137,238. Other approaches to a solution of this problem are disclosed in U.S. Patent Nos. 2,809,592, issued in the names of Miller et al., and 2,853,952, issued in the name of Aspelin.

Our present invention comprises a significant improvement over these prior patents in that it effects a similar functional result in a simpler, and more economical construction which lends itself to low-cost, high production techniques in providing a pressure gradient compensated pressure loaded pump or motor requiring minimum maintenance. We have devised a pump or motor construction which is capable of utilizing simple production stampings for thrust plate elements in a pressure balanced unit while eliminating the need for rubber or other flexible fluid pressure seals in association with the thrust plate construction.

In carrying out our invention in one embodiment thereof a "sandwich" type thrust plate is utilized wherein a relatively rigid metal plate is stamped or otherwise formed to provide openings for receiving the driving and driven shafts of a gear pump, for example, and having fluid pressure chambers of various configurations formed peripherally of said openings and adapted to communicate with adjacent pressure fluid in the pump through a passage formed in each of the various chambers, and a relatively flexible plate bonded in any suitable manner to the relatively rigid plate in order to form a closed unitary thrust plate construction having the required pressure compensated chambers formed between the bonded plates.

It is an object of the present invention, therefore, to provide an improved pressure loaded gear pump or motor.

Another object of the present invention is to provide in pumps or motors of the type contemplated a "sandwich" type thrust plate construction.

Yet another object of the present invention is to provide an improved thrust plate of relatively simple and economical construction.

A further object of this invention is to provide a compartmentalized thrust plate construction adapted to communicate with various fluid generated pressures during operation of a pump or motor of the types contemplated wherein said thrust plate is of a closed unitary construction adapted to trap pressure fluid within itself.

Another object of the invention is to provide a closed, two-sided thrust plate adapted to communicate between the sides thereof with a plurality of fluid pressure sources.

Other objects, features and advantages of this invention will become apparent to persons killed in the art in view of the following detailed description taken in conjunction with the drawings, wherein:

FIGURE 1 is a sectional view of a pressure loaded type, intermeshing gear pump or motor taken along line 1—1 of FIGURE 2 in accordance with one embodiment of the present invention;

FIGURE 2 is an elevational view of the pump taken from the left end of FIGURE 1 with the cover body of the unit and the cover plate of the thrust plate both removed;

FIGURE 3 is a perspective view showing the thrust plate of the present invention abutting the side faces of the gears and the top plate thereof broken away;

FIGURE 4 is a view similar to FIGURE 2 showing a modified version of the trust plate construction; and

FIGURE 5 is also a view similar to FIGURE 2 which shows another modification of the thrust plate construction.

Referring now in detail to FIGURES 1–3, numeral **10** denotes a suitably chambered gear pump or motor **10** (hereinafter denoted as "pump") in which are rotatably mounted a driven gear **12** and an intermeshing driving gear **14**. Driven gear **12** is supported on a shaft **16** journaled on opposite sides of the gear in sleeve bearings **18** and **20** which are pressed in enlarged portions of chambers **22** and **24**, respectively. Driving gear **14** is mounted for rotation upon a drive shaft **26** journaled on opposite sides of the gear in sleeve bearings **28** and **30** which are pressed in position in chambers **32** and **34**, respectively, in a manner similar to the mounting of bearing **18** and **20**. Chamber **34** vents pressure fluid which leaks leftwardly along shaft **26** from the chamber in which gear **14** is mounted to chamber **24** by way of a passageway **36**, chamber **24** communicating with chamber **22** for venting fluid received from chamber **34** and the chamber of gear **12** by way of a conduit **38** in shaft **16**. Chambers **22** and **32** vent such leakage fluid as is collected therein to the inlet of the pump by passages **40** and **42**.

A cover body **50** having an adaptor flange **52** and a mating surface **54** is secured to a pump body **56** and an annular center body **58** by a pair of dowel pins **60** and a ring of bolts **62**. Shaft sealing means **64** is located in an enlarged chamber **66** of the cover body which also houses a seal retainer member **68**. A snap ring **72** locates seal retainer **68** in chamber **66**. As shown in FIG. 2, the pump housing has an inlet conduit **74** and a discharge conduit **76**, both of which open into the gear chambers for conducting fluid to and from the gears. A pair of annular grooves **78** is formed in each of shaft members **16** and **26** for receiving a pair of snap rings **80** which are spaced to locate gears **12** and **14** in predetermined axial location within the gear chambers when the pump is assembled. One or more keyways **82** may be provided for mounting each gear in driving relation to the respective shaft.

The side faces of gears **12** and **14** are adapted to be substantially sealed from leakage fluid which tends to migrate back from high pressure discharge conduit **76** to low pressure inlet conduit **74** past said side faces by a pair of thrust plates **88** and **90**. Thrust plate **88** may be denoted a "fixed" thrust plate which comprises merely a smooth, flat, generally oval plate having openings **92** therethrough for receiving the shaft members, the inner side of said oval plate abutting the one side of gears **12** and **14** for sealing same against leakage in operation in known manner. Thrust plate **90** preferably comprises a generally oval plate assembly which, as shown in FIGS.

1–3, is of somewhat larger dimension than the combined diameter of intermeshing gears 12 and 14 so that the plate construction is held in a chamber 96 which is formed in cover body 50 by clamping the peripheral edge of the plate construction between the cover body and body member 58. When the pump is assembled the left side faces of the gears is preferably aligned with mating surface 54 between housing parts 50 and 58 so that thrust plate 90 may seal fully and most efficiently the entire left side faces of the gears.

The construction and operation of the sealing thrust plate comprises the essence of the present invention. The thrust plate construction 90 comprises one form of such plate and consists of three generally oval shaped plate members 98, 100 and 102, although, if desired, plates 98 and 100 may be formed as a single plate member, and the form of the thrust plate may be varied as desired, as, for example, assuming the form of a figure eight to conform more closely to the outer periphery of the intermeshing gears. As illustrated in FIGS. 1–3, innermost plate 98 comprises a flat, smooth plate which is adapted to seal against the adjacent sides of gears 12 and 14; it includes a plurality of circumferentially spaced openings 104, 105 and 106 for a purpose to be described. The center plate 100 may be readily stamped out in production; it comprises an outer generally oval strip member having formed integral therewith and inwardly thereof a latticework 110 which, as shown in FIGS. 2 and 3, forms a pair of spaced circular openings 112 and 114 which are adapted to receive gear shifts 16 and 26, and a plurality of circumferentially spaced openings 116 and 118 having varying configurations and, as shown, disposed in symmetrical relationship around openings 112 and 114. Outer plate member 102 is a flat, smooth unbroken plate member except for openings provided therein which register with openings 112 and 114 for receiving shafts 16 and 26. Plate member 98 is preferably constructed of a material which is relatively rigid in comparison with the material of plate member 102. Plate members 98 and 102 are sealingly secured to opposite sides of plate 100 as by brazing thereto along the boundaries of plate 100 comprising the outer peripheral strip and the latticework 110 thereof so that when assembled a plurality of compartments are formed between plate members 98 and 102 and within the various portions of latticework 110. These compartments are completely sealed from communication with any portion of the pump except as is provided by openings 104, 105 and 106. The compartments formed between plate members 98 and 102 by openings 116 and 118 in plate 100 function in the assembled thrust plate 90 as motive pressure chambers when they are subjected to fluid pressure through openings 104, 105 and 106 which communicate with respective pressures generated in and peripherally of the pump adjacent the various compartments. The pressure force which is applied in each of these compartments is, of course, active against the interior surfaces of both compartmentalized plates 98 and 102, and since plate 102 is of a relatively flexible material the various portions thereof which form one side of chambers 116 and 118 tend to expand or bulge slightly outwardly of each such chambers which, in the assembled pump, applies a force against the facing surface of housing 50 causing each corresponding relatively rigid compartmentalized portion of plate 98 to be forced into sealing relationship with a corresponding portion of the side faces of the gears and with a force which is proportional to the fluid pressure in the corresponding chamber 116 or 118.

As is discussed more fully in the aforementioned copending application, in any given gear pump design the pressure gradient which is encountered in operation and which tends to cause the pump and the pump pressure sealing means or thrust plate to operate in an unbalanced condition with resulting short pump life, high maintenance costs and reduced efficiency, will vary widely under different conditions of operation, depending upon such things as variations in viscosity of the fluid pumped, the volume of air which may be entrained in the fluid, pump speed and the level of discharge pressure. If, therefore, a pump design takes into account less than all of these variables, the pump in operation will be subjected to some degree of unbalance as operating conditions vary from any given assumed constant design condition. Our pump design inherently takes into account all such variables in operation inasmuch as each peripheral portion of the intermeshing gears of the pump communicates with a corresponding portion of the thrust plate construction through pressure gradient openings 104, 105 and 106, whereby the pressure force which acts in each of compartments 116 and 118 for sealing a corresponding area on the side face of the gear is continuously compensated by any changes in the pressure level existent in the adajcent pockets of the gear teeth.

In operation, drive shaft 26 rotates gears 12 and 14 in the directions indicated by the arrows to transport and pressurize fluid from inlet conduit 74 to discharge conduit 76. The relatively large compartments 116 formed within the thrust plate 90 define areas adjacent the inlet and discharge sections of the pump which are normally subjected to pressures substantially equal to inlet and discharge pressures, respectively, such that those areas of plate member 98 defined by said compartments are continuously actuated into sealing relationship with adjacent portions of the side faces of the gears with a force proportional to the existing pressures in said inlet and discharge pump sections as a result of the reactive effect of such pressures acting through flexible plate 102 as described above. Likewise, each of the peripheral compartments 118 communicates with the respective pressures existent in each adjacent portion of the gears, which may vary widely during operation under varying conditions and which has a similar reactive effect through flexible plate member 102 for actuating the corresponding area of plate member 98 in each compartment 116 into sealing relationship with the corresponding side face portion of each gear. The thrust plate assembly 90 tends, therefore, to operate continuously in a balanced condition such that the sealing force between the sealing side of plate 98 and the gears is proportional to the existing pressure in any given section of the gears from the inlet to the outlet.

From the foregoing it will be appreciated that we have provided a relatively simple, economical and highly efficient thrust plate construction which is usable in gear and vane type pressure loaded pumps and motors and which provides pressure gradient compensation during operation so that the thrust plate operates in a substantially balanced condition irrespective of pressure level variations in any given portion of the unit. The "sandwich" type thrust plate construction described above eliminates previous sealing problems between the pressure chamber behind the thrust plate and the gear chambers by providing a mechanical seal not subject to extrusion and the like, such as brazing, between the various plate portions of the construction, and likewise it eliminates sealing problems between the various pressure gradient compensated compartments formed peripherally of the plate construction. The various parts of the thrust plate construction may be readily manufactured with a minimum amount of machining and other specialized operations which have heretofore been required in pressure loaded pumps and motors of the types contemplated. Each of the plate members 98, 100 and 102 forming the thrust plate construction may be readily formed by a simple stamping operation, and when assembled provides a simple unitary construction which is essentially independent of other parts of the pump.

The overlapping peripheral edge portion (FIG. 1) which is clamped between housing portions 50 and 58 retains the thrust plate in position and provides a thrust plate of the non-full floating type. A full-floating thrust plate may, of course, be readily provided by using a plate construction of the same circumference as the gears and supporting the same upon shafts 16 and 26 in bearing relationship. The full-floating type of thrust plate has one advantage over that described above in detail in that it is not necessary that the side faces of the gears be substantially aligned in assembly with mating surface 54, such as is shown in FIG. 1. On the other hand, it is important with the full-floating type that the periphery thereof be accurately formed to conform to the circles of rotation of the tips of the gear teeth.

Referring now to FIGURE 4, wherein a modification of the thrust plate construction is illustrated, like parts have been numbered the same as in FIGURE 2. The only structural difference of significance between the construction of FIGURE 4 and that of FIGURE 2 is that center plate 100 is formed to provide only two compartments, viz, compartment 116 adjacent the inlet side of the pump and a compartment 130 which extends throughout the remaining operative portion of the thrust plate. In this embodiment chamber 116 communicates with the inlet section of the pump through opening 104, the same as in FIGURE 2. However, the remaining operative surface of plate 98 communicates with discharge pressure fluid through an opening 132 which communicates with a plurality of pressure gradient openings 134 spaced circumferentially of chamber 130 at preselected locations which are vented to portions of the gears in which the pressure tends to vary significantly from discharge pressure.

Under any given pressure gradient condition existent around the gears during operation, the pressure in any localized area on the sealing side of the thrust plate remains substantially constant as the gear is rotated at a given speed, thus effecting a smooth flow of pressure fluid from discharge vented opening 132 throughout chamber 130 to and through the various gradient openings 134. If the pump is run under conditions which result in little or no pressure gradient on the pump side of chamber 130, such as during pumping of solid fluid at low r.p.m., a substantially uniform distribution of fluid at or near discharge pressure will exist throughout the area of chamber 130 on both sides of the thrust plate and little or no flow of pressure fluid will occur between openings 132 and the plurality of openings 134. Pulsations in pressure resulting from the gear teeth rotating past the gradient openings are not readily measurable and have no measurable effect on the accuracy in pressure balance of the plates. As pump operating conditions vary, the pressure gradient condition on the pump side of chamber 130 will vary from the above-assumed condition. Streamlines of dynamic pressure fluid will therefore flow from the discharge of the pump through opening 132 and pressure chamber 130 to each gradient opening 134, and a different pressure drop will occur across each gradient opening depending upon the pressure condition in the area of said opening on the sealing side of the thrust plate. Localized pressure areas around each gradient opening in chamber 130 will therefore approach the pressure in the area surrounding the opposite side of each said opening, whereby a pressure gradient proportional to but somewhat greater than the gradient on the sealing side of each thrust plate is established in chamber 130 and the thrust plate remains in balance irrespective of changes in the pressure gradient for any reason on the sealing side thereof.

By proper selection of the size of openings 132 and 134 it will be understood that the net sealing force acting on the thrust plates may be varied as desired. For instance, as the area of openings 132 becomes greater in relation to the area of openings 134 the net sealing force acting to react on plate member 98 through plate member

102 will increase. As the pressure under any gradient opening decreases, the quantity of oil flowing to that opening in chamber 130 increases proportionately. The average pressure in chamber 130 is reduced below the outlet pressure of conduit 76 by an amount which varies in proportion to the quantity of oil flowing through gradient openings 134, or, in other words, the average pressure in chamber 130 varies in proportion to changes in pressure gradient on the sealing side of the thrust plate. We have obtained very satisfactory results in utilizing only four gradient openings 134 located as illustrated in FIG. 4, taken in conjunction with the other features of the thrust plate construction as shown in FIG. 4. Compartment 116 which communicates with the inlet side of the pump through opening 104 tends to remain at a substantially constant zero gage pressure, as is normal adjacent the inlet of such pumps. Thrust plate unbalance which would otherwise occur in the area of chamber 116 is therefore prevented by sealing off discharge pressure fluid from chamber 116 by means of the brazing or other sealing connection between the latticework of plate 100 and plates 98 and 102.

The embodiment of our invention as disclosed in FIG. 4 is similar to the main embodiment of the above-mentioned copending application Serial No. 158,362 to the extent of the basic concept of compartmentation and provision for supplying discharge pressure fluid to chamber 130 in which is located a plurality of pressure gradient openings 134. A more complete discussion of the principles employed in distributing the pressure gradient across the motive surface side of the thrust plate is provided in said prior application. It will be noted in respect of the embodiment shown in FIG. 4 that the thrust plate construction is of the full-floating type wherein the outer peripheral edge of the plate assembly is coincident with the outer circles of rotation of gears 12 and 14. Thus, the plate construction is not held between housing members 50 and 58 as in FIG. 1 hereof.

In FIGURE 5 we disclose one other exemplary embodiment of the present invention wherein like parts are numbered the same as in the foregoing embodiments. In this embodiment the inner and outer plates may be the same as plates 98 and 102 of the previous embodiments. The intermediate plate comprises three separate parts, viz, generally oval member 140 and a pair of circular members 141. Members 140 and 141 are the same as corresponding portions of plate member 136 in FIG. 4, but are not interconnected by a compartment forming latticework as in the previous embodiment. Thus, a single chamber 142 is formed between plates 98 and 102 which are secured the same as previously to members 140 and 141 to provide a sandwich-type thrust plate construction. Discharge vented opening 132 is provided in plate 98 the same as opening 132 in FIG. 4. In the present embodiment, however, it will be noted that no opening 104 at the inlet of the pump is provided since, without pressure compartmentation around the inlet area as is provided in FIG. 4, an excessive loss of pressure fluid flowing from discharge opening 132 would otherwise result. Additional circumferentially spaced pressure gradient openings 144 have been provided, all of which are supplied with pressure fluid from discharge conduit 76 through opening 132. All of the gradient openings 144 extend through plate 98 radially outwardly of the root diameter of gears 12 and 14, the same as in the previous embodiments, so that these openings communicate continuously during pump operation with the gear teeth pockets. The gradient openings nearest the inlet section of the pump are preferably located just beyond the portion of the pump on the inlet side which normally operates at inlet pressure. That is, just beyond the location of the upper and lower ribs of the latticework which forms compartment 116 in FIG. 4, for example. Depending upon the particular characteristics and design of any given gear pump, the pressure gradient openings 144

may be varied in number and area to suit requirements. With a plurality of gradient openings as are provided in plate **98** it will be appreciated that the complete pressure gradient pattern which may be generally found on the sealing side of the thrust plates is reflected in pressure chamber **142** as a result of the flow pattern between discharge opening **132** and the various gradient openings **144**. It may be found desirable, for example, to vary the area of the gradient openings with respect to each other to provide a more accurate gradient control. For instance, the area of the gradient openings **144** may be increased progressively from the opening nearest the discharge of the pump to the opening nearest the inlet thereof, discharge opening **132** being always larger than the largest such gradient opening. In this manner, the section of the pump which is subjected to the lowest pressures in the gradient, i.e., near the inlet section, is provided with the largest gradient openings for maximum flow from the chamber **142** to the gear pockets so as to more rapidly transmit these lower pressures to chamber **142**. If desired, and as shown in FIGS. 4 and 5, an oval groove may be provided in each mating surface of housing member **58** for receiving an oval O-ring **146** to prevent pressure fluid from leaking between the mating surfaces of the housing sections.

From the foregoing, it is believed that those familiar with the art will readily recognize and appreciate the novel concepts and features of the present invention. Although the invention has been described in relation to only a few embodiments, numerous variations, changes, and substitutions of equivalents will present themselves to persons skilled in the art, and may be made without necessarily departing from the scope of the invention. Also, it will be appreciated that although the invention has been disclosed herein with particular emphasis on its application to intermeshng gear type pumps, the principles of the invention are as readily applicable to intermeshing gear type motors and to vane type pumps and motors. As a result, it is not our intention to be limited to any particular form of the invention herein illustrated and described except as may appear in the claims appended.

We claim:

1. In a pump or motor including a housing and a housing chamber containing rotary fluid energy translating means and high and low pressure areas in said housing chamber, a unitary one piece thrust plate in the housing having opposed side plate portions, one of said plate portions having a sealing surface movable into sealing relationship with one side of said rotary means, the other side plate portion of said thrust plate being held in axially spaced relation to said one side plate portion to form intermediate of said side plate portions motive pressure chamber means, means fixedly and sealingly secured to and intermediate of said side plate portions for holding the latter in said spaced relation and forming therewith said pressure chamber means, and a plurality of spaced openings in said one side portion communicating said pressure chamber means with fluid pressure in different circumferential areas of said rotary means for causing said one plate portion to move into sealing relation with said one side of said rotary means.

2. A pump or motor of the type including a housing having high and low pressure areas and a rotary element for moving pressure fluid from one to the other of said areas comprising circumferentially spaced projections around the periphery of said rotary element forming fluid containing pockets therebetween, a unitary one piece thrust plate assembly in the housing having a sealing side plate for abutting one side of said rotary element, a raised latticework sealingly and fixedly secured to said side plate, a back side plate sealingly and fixedly secured to said latticework and forming therewith and with said sealing side plate at least two sealingly separated motive pressure chambers, and a plurality of spaced openings communicating said pressure chambers with different ones of said pockets, said rotary element producing under different conditions of operation different fluid pressures in said pockets adjacent each said spaced openings, the pressure fluid in said chambers causing said sealing side plate to be actuated into sealing relationship with the said one side of said rotary element.

3. In a pump or motor of the type including a housing containing intermeshing gears and having an inlet leading to and an outlet leading from said housing, a unitary one piece thrust plate construction in the housing having a sealing side plate, a back side plate and means intermediate said sides and secured fixedly and sealingly to each thereof for retaining said sides in spaced relation to one another and forming therebetween self-contained motive pressure chamber means, and a plurality of spaced openings in said sealing side plate in communication with pressure fluid in different ones of the pockets of said gears for producing in said chamber means under certain operating conditions a plurality of fluid pressures which react on said back side plate to effect a movement of said sealing side plate into sealing relationship with one side face of said gears.

4. A pump or motor as claimed in claim 3 wherein said chamber means comprises a plurality of individual pressure chambers within a latticework formed by said intermediate means, one of said openings communicating with each of said individual chambers.

5. A pump or motor as claimed in claim 3 wherein said chamber means comprises a plurality of individual pressure chambers formed within an intermediate latticework of said intermediate means, various ones of said openings being located to communicate each such chamber with adjacent pressure fluid in the gear pockets, the portion of said sealing side plate which forms one side of each such chamber being actuated into sealing relation with one side face of said gears with a force proportional to the fluid pressure in the respective chambers.

6. A one piece thrust plate assembly for sealing pressure loaded pumps and motors of the types specified comprising a sealing side plate having a plurality of circumferentially spaced openings and a shaft receiving opening, intermediate projecting means sealingly and fixedly secured circumferentially of said side plate and of said shaft receiving opening and forming therewith at least one compartment, and a back side plate substantially coextensive with said sealing side plate and sealingly and fixedly secured to said projecting means for forming with said latter means and said sealing side plate at least one self-contained compartment, said thrust plate assembly being insertable as an independent and integral unit in the housing of such pumps and motors.

7. A thrust plate construction as claimed in claim 6 wherein said projecting means comprises a continuous latticework forming with said sealing and back side plates a plurality of independent chambers.

8. A thrust plate construction as claimed in claim 6 wherein said projecting means is secured by suitable means such as brazing to both said sealing and back side plates.

9. A thrust plate construction as claimed in claim 6 wherein said back side plate is of relatively flexible material and said sealing side plate is of relatively rigid material, said back side plate being adapted to flex outwardly under pressure in said chambers.

10. In a pump or motor of the type including a housing containing intermeshing gears and having an inlet leading to and an outlet leading from said housing, a chamber formed in said housing between one side surface of said gears and an adjacent surface of said housing for receiving a thrust plate assembly of unitary one piece construction, said thrust plate assembly including a sealing side plate having spaced openings adapted to communicate with different pressure levels present in said gears during operation, an intermediate member sealingly and fixedly secured to said sealing side plate circumferen-

tially thereof and a back side plate sealingly and fixedly secured to said intermediate member and forming therewith and with said sealing side plate at least one self-contained pressure chamber independent of other portions of the pump or motor and insertable as an integral unit in said housing chamber.

11. A unitary one piece thrust plate construction for pumps and motors of the type specified comprising one or more members formed by stamping operations including a front side plate having a plurality of spaced openings formed therein, a back side plate having a continuous inner surface facing said front side plate, and intermediate means separating and sealingly and fixedly secured to both said front and back side plates defining at least one closed pressure chamber therebetween which is adapted to communicate with the surrounding environment by way of said openings only.

12. A thrust plate construction as claimed in claim 11 wherein said intermediate means comprises an interconnected latticework defining a plurality of circumferentially spaced and independent pressure chambers between said front and back side plates which are out of communication with each other and with the environment surrounding the thrust plate construction except by way of said openings, at least one of said openings being located in each of said chambers.

13. In a pump or motor of the type including a housing containing intermeshing gears having an inlet leading to and an outlet leading from said housing, a thrust plate chamber formed between one of the side faces of said gears and the adjacent inner surface of said housing, a one-piece thrust plate assembly mounted in said chamber for sealing said one side face of said gears, said thrust plate comprising front side, intermediate and back side plate portions, said front plate portion having spaced openings therethrough for communicating with different circumferential portions of said gears, said back plate portion abutting said adjacent inner surface of said housing and defining with said intermediate and front plate portions self-contained chamber means formed independently of any portion of said pump housing, said intermediate portion being sealingly and fixedly secured to both said front and back side plate portions.

14. As an article of manufacture, a compartmentalized one piece sealing thrust plate assembly for pressure loaded fluid pumps and motors comprising front and back side plate members, said front plate member having spaced openings therethrough, and an intermediate latticework secured fixedly and sealingly to said front and back plate members and defining therebetween compartments adapted to communicate with the surrounding environment through said openings.

15. As an article of manufacture, a unitary one piece sealing thrust plate construction for pressure loaded fluid pumps and motors comprising front and back side plate members having axially aligned openings therethrough, additional openings in said front side member spaced

radially outwardly of said aligned openings, and intermediate means sealingly and fixedly secured to said front and back side plate members and defining therebetween one or more compartments adapted to communicate with the environment surrounding the thrust plate construction through said radially outwardly located openings only.

16. As an article of manufacture, a unitary one piece sandwich-type thrust plate construction for use in pressure loaded fluid pumps and motors comprising front and back generally oval plate members, an intermediate latticework sealingly and fixedly secured to both said front and black plate members circumferentially thereof and radially inwardly thereof defining a plurality of independent fluid sealed compartments between said front and back plate members, and openings formed in the front plate member connecting each of said compartments to the environment surrounding the thrust plate.

17. An article of manufacture as claimed in claim 16 wherein said front plate member is relatively rigid and said back plate member is relatively flexible.

18. A gear pump or motor of the pressure loaded type including a housing having inlet and outlet conduits, a gear chamber in said housing and a pair of intermeshing gears mounted in said chamber for conveying pressure fluid from the inlet to the outlet conduit, a one piece thrust plate assembly mounted in the housing chamber between the housing and one side of said gears having a sealing side plate for abutting one side of said gears, a raised latticework sealingly and fixedly secured to said side plate, a back side plate sealingly and fixedly secured to said latticework and forming therewith and with said sealing side plate at least two sealingly separated motive pressure chambers, and a plurality of spaced openings in said sealing side plate for communicating said motive pressure chambers with different peripheral portions of the gears, said gears producing under different conditions of operation different fluid pressures adjacent each of the spaced openings, said sealing side plate being relatively rigid and said back side plate being relatively flexible such that said back side plate tends to flex outwardly against the adjacent housing surface under pressure in said motive pressure chambers and while said sealing side plate moves into sealing relationship with the one side face of said gears.

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