

May 28, 1957

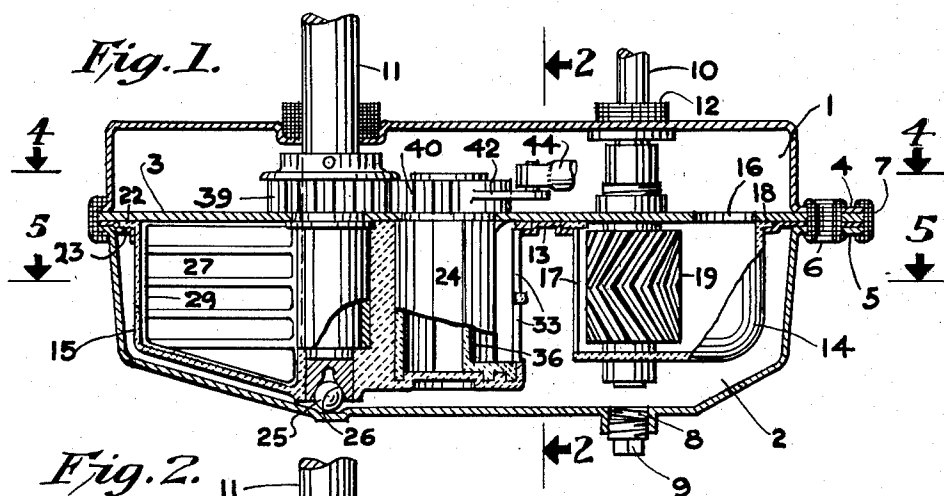
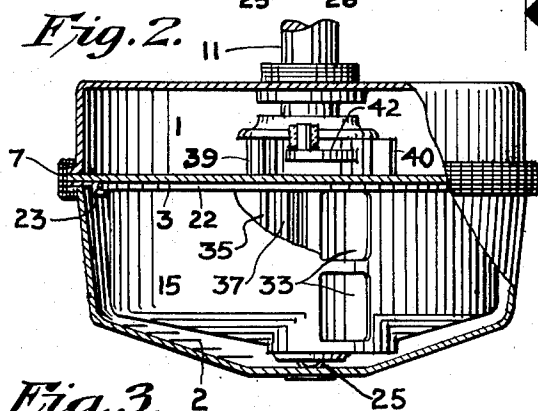
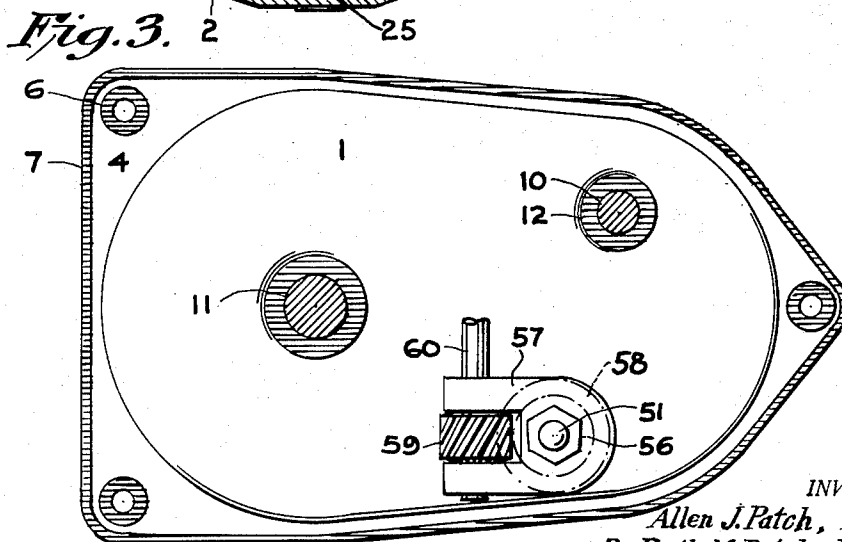
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2,793,499

HYDRAULIC DRIVE MEANS FOR WASHING MACHINES AND THE LIKE

Filed Sept. 18, 1953

4 Sheets-Sheet 1



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Fig. 5.

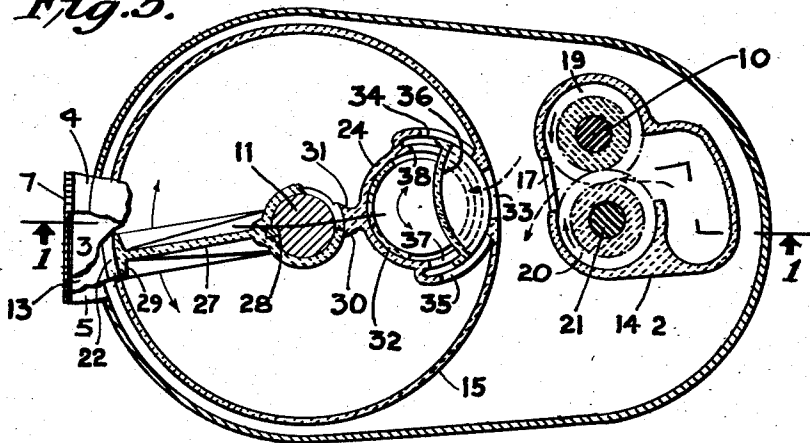
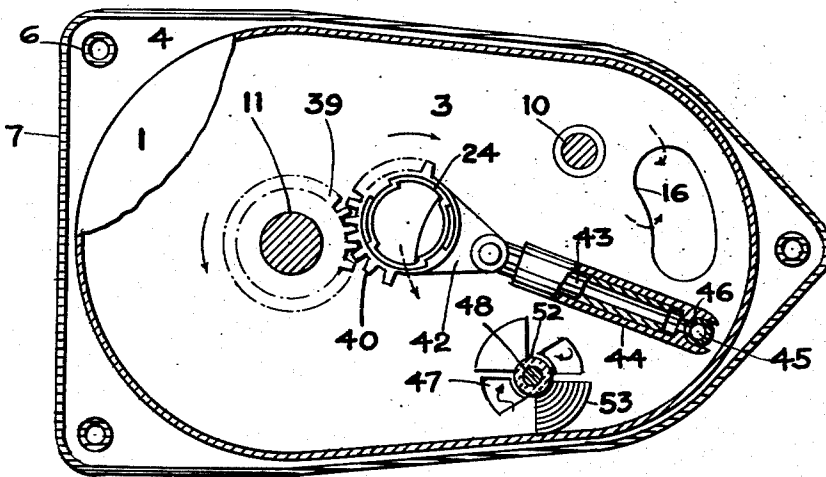


Fig. 4.



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Fig. 6.

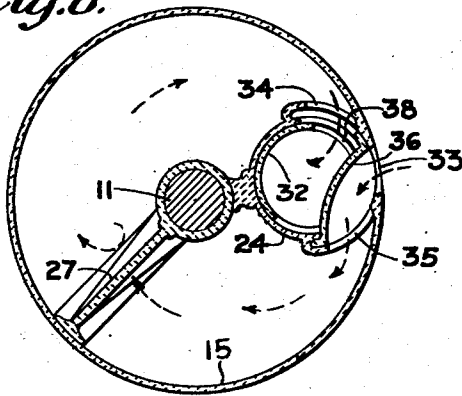


Fig. 7.

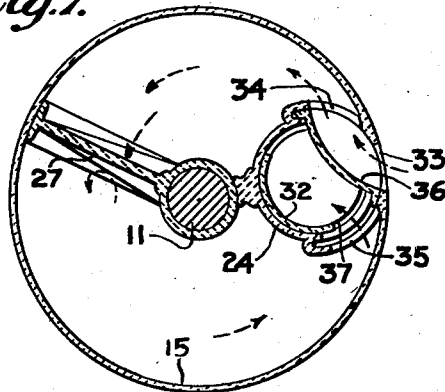
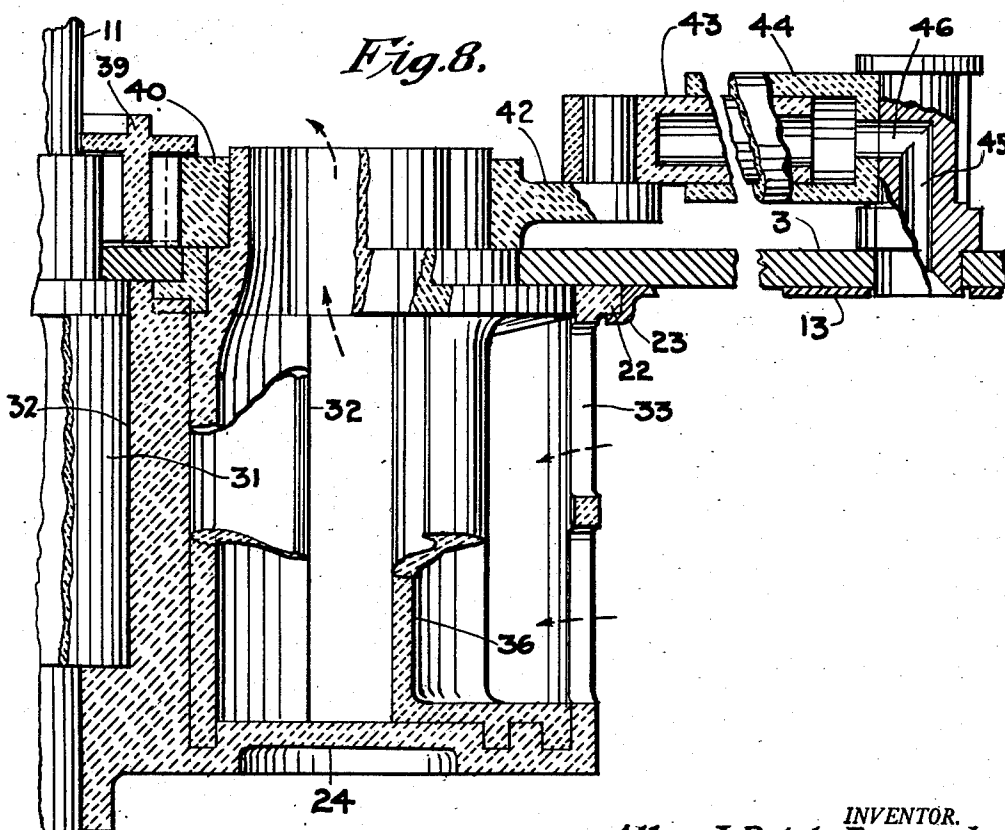


Fig. 8.



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Fig. 10.

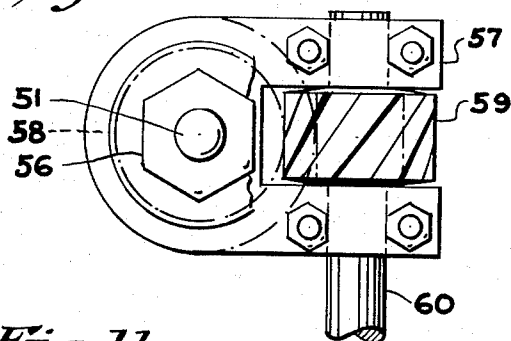


Fig. 11.

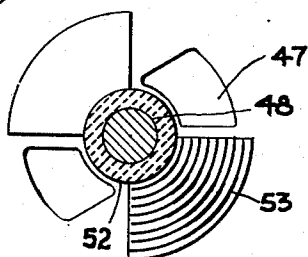


Fig. 12.

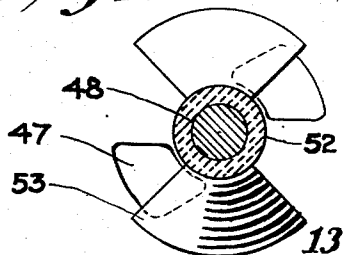


Fig. 13.

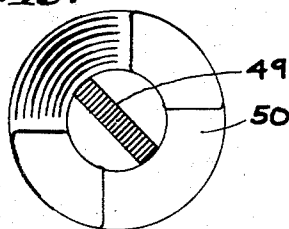
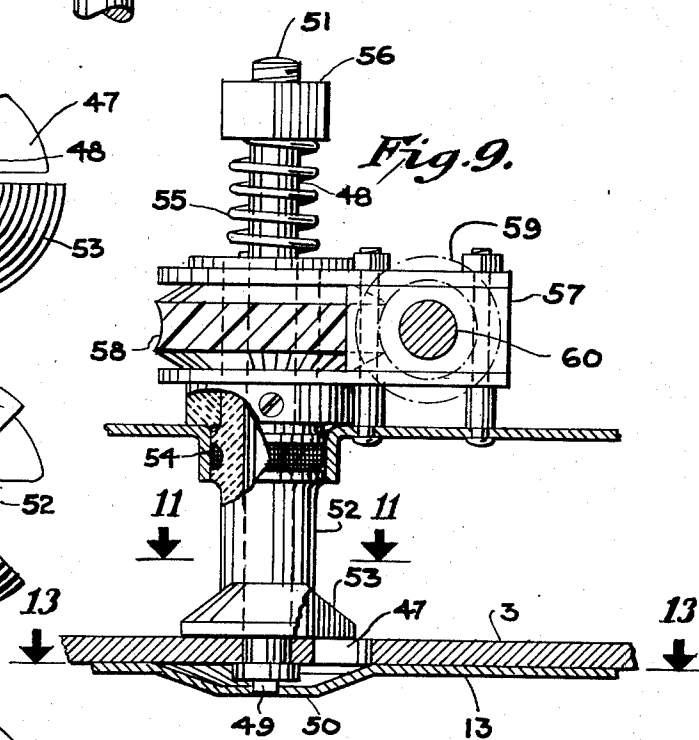


Fig. 9.



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HYDRAULIC DRIVE MEANS FOR WASHING MACHINES AND THE LIKE

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Application September 18, 1953, Serial No. 381,028

9 Claims. (Cl. 60—52)

This invention relates to hydraulic drive means for washing machines and the like, and particularly to drive means of this character in which a constantly operated fluid pump provides hydraulic fluid under pressure which can be used to accomplish oscillating impulses on an agitator shaft or the like.

An object is to provide a mechanism of this character in which many of the operating parts can be cast of more or less rigid or hard "nylon" or other suitable plastic, thus providing parts which can be fitted in place and used without machining or other finishing operations, and with which fitted operating parts will yield to compensate for wear or changes in temperature and the like.

Another object is to provide means so that the supply of liquid under pressure to the operating parts can be controlled to stop and vary the control and operation of the agitator shaft.

Still another purpose is to provide a supporting casing and structure of metal or other stampings which can be inexpensively produced and can be fitted in place and assembled without special knowledge or skill.

Another purpose is to provide control or operating means by which the oscillating movement of the oscillator shaft becomes substantially automatic when the mechanism is set for operation.

A further object is to provide means by which the fluid control is prevented from going on dead center or locking when in operation.

Still another purpose is to provide mechanism that can be made and assembled as a sealed unit so that this power mechanism can be manufactured and sold as a complete power transmission unit to be fitted to individual washers and the like by the machine manufacturers.

Yet another purpose is to provide a mechanism which is simple and inexpensive in construction and assembly, and which can be assembled in substantially complete form for various types of washing machines and the like, requiring no special construction or fitting of the parts for individual embodiments and uses.

With the above and other objects in view, some of which will be apparent to those skilled in the art and others of which are inherent in the construction and operation and use of this drive means, the invention includes certain novel features of construction and combinations and arrangement of parts which will be hereinafter set forth in connection with the drawings and then pointed out in the claims.

In the drawings:

Figure 1 is a view in elevation of a hydraulic drive means constructed in accordance with an adaptation of the invention, and with parts sectioned substantially on the line 1—1 of Fig. 5.

Fig. 2 is a transverse vertical sectional view taken substantially on the line 2—2 of Figure 1.

Fig. 3 is a view in top elevation of an embodiment of the invention showing control means mounted thereon.

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Fig. 4 is a horizontal sectional view substantially on line 4—4 of Fig. 1.

Fig. 5 shows a sectional view substantially on line 5—5 of Figure 1.

Fig. 6 is a horizontal transverse sectional view through the housing with the oscillator drive in one position.

Fig. 7 is a view similar to Fig. 6 showing another position of the parts.

Fig. 8 is a broken vertical sectional view to better show the hydraulic fluid control valve and operating means therefor.

Fig. 9 is a segmentary sectional view illustrating a fluid control valve.

Fig. 10 is a top plan view of the disclosure in Fig. 9.

Fig. 11 shows a sectional view substantially on lines 11—11 of Fig. 9.

Fig. 12 is a view similar to Fig. 11 showing another position of the parts.

Fig. 13 is a sectional view substantially on lines 13—13 of Fig. 9.

As has been intimated, this invention contemplates the provision of a hydraulic drive means for washing machines and the like which can be manufactured substantially as a completed unit with all parts installed and sealed so that the unit can be furnished complete to washing machine and other manufacturers for whom it is to be used.

An upper case member 1, of pressed sheet metal or other suitable material is made in the desired shape and size and is provided with a depending side wall. A lower case or pan 2, which can also be of pressed sheet metal or other suitable material, has an upstanding side wall preferably of greater extent than the side wall of the upper case member 1. An intermediate supporting plate 3, which can also be of a sheet metal stamping, is made to be interposed between the upper and lower case members 1 and 2, and these case members 1 and 2 are provided around the openings therein with outstanding flanges 4 and 5. The intermediate plate 3 is made of a size and shape to fit substantially between the outstanding flanges 4 and 5. This case and supporting structure can be secured together by the use of rivets or other fastenings 6 received through aligned openings in the flanges 4 and 5 and the interposed edge of the intermediate supporting plate 3. In use, this case structure is filled with oil, or other suitable hydraulic liquid, and it is of course essential that the parts be precision fitted. However, as an added precaution it is perhaps desirable that a seal ring 7 be clamped or otherwise placed around the edges of the outstanding flange portions 4 and 5 and the intermediate edge of the intermediate supporting plate 3.

The lower case or pan 2 will be substantially continuous and closed, with the exception that a filling and drain opening is provided at 8. However, a plug 9 is fitted to close this opening.

A drive shaft 10 is provided to extend into this closed casing through the top of the upper case member 1, and an agitator or transmission shaft 11 is also provided. These two shafts are journaled in the casing in substantially parallel relation and are spaced apart so that they will fit with mechanism to which the drive is to be connected. An oil tight and leak-proof bearing packing is provided at 12 around the power shaft, and the agitator shaft 11 has a similar bearing packing, so that in use the casing made up of the two members 1 and 2 is substantially oil or fluid tight and is proof against leakage. These shafts 10 and 11 can be made to extend beyond the upper casing 1 for any desired distance, and are provided at their ends with such formations that usual connections can be made to the shaft 10, from a motor pulley or other suitable drive, and from the shaft 11 to an agitator. The intermediate supporting plate 3 has suitable bearing

openings, preferably packed to be leak-proof, through which the shafts 10 and 11 extend into the space within the lower case or pan.

The intermediate supporting plate 3 has a case supporting plate disposed therebeneath and conveniently held in place by being clamped between the flanges 4 and 5, and this casing supporting plate 13 is adapted to suspend a pump casing 14 and an operating casing 15 within the space enclosed by the lower case or pan 2. It has been found advantageous to make the pump casing 14 and the operating casing 15 of "nylon" or other plastic that can be moulded and worked to the desired dimensions, and these casings are perhaps best shown in Fig. 5 of the drawings. By using the material as stated, these casings can be moulded or die cast into the desired shapes and will not require a great amount of machining or other work in the finishing. In fact, such moulded parts have been found to be sufficiently perfect that they may not require machine finishing and the like.

As shown in Figures 1 and 4, intermediate supporting plate 3 has a liquid circulating opening 16 therethrough, and the pump casing, as perhaps best shown in Fig. 5, is supported beneath this opening so that liquid confined within the casing can flow through this opening freely into the pump casing 14, the pump casing being provided with an outlet opening 17 below the intermediate supporting plate 3. The pump casing 14, of "nylon" or other suitable material, is provided with an outstanding flange at its upper edge, and a supporting flange 18 provided on the casing supporting plate holds this pump casing 14 tightly against the under side of the intermediate supporting plate. A herring bone gear 19 secured on the lower end of the drive shaft 10 meshes with a suitable herring bone gear 20 on a bearing spindle 21 within the pump casing 14, and as the drive shaft 10 is rotated through an electric motor or other suitable power means, this pump mechanism is operated and oil is taken from the upper case 1 through the liquid circulating opening 16 into this gear pump and is continuously discharged to the outlet opening 17, under pressure, into the lower case or pan 2.

The operating casing 15 is also preferably made of cast "nylon," or other suitable material, and it has been found that this plastic adapts itself well to this use, since the pump casing can be moulded or die cast in one piece and requires little or no machine finishing.

The operating casing 15 is preferably provided with a rim flange 22 around its open top, and the casing supporting plate 13 has a casing rim and engaging flange 23 which clamps the operating casing 15 in place and establishes a liquid tight connection between this casing and the intermediate supporting plate 3. This casing 23 is substantially circular in its general outline, and is provided with a valve casing on that side adjacent to the outlet 17 of the pump. This valve casing 24 is substantially cylindrical and is of such length that it extends through an opening in the intermediate supporting plate 3, projecting above this plate. The lower end of the agitator shaft 11 extends substantially centrally through the casing 15 and is provided with a thrust bearing ball 25 which fits within a thrust bearing opening 26, to thus compensate for any downward endwise pressure upon the agitator or transmission shaft 11. An operating vane or arm structure 27 is provided with a central portion received on the shaft 11 within the casing 15, and this operating vane or arm which extends substantially radially from the agitator or transmission shaft 11 is keyed or splined thereto as at 28. This operating arm or vane 27 is shaped to fit substantially within the operating casing 15 on one side, and at its edges is preferably provided with the feather-edge packing flanges 29. It is preferable that this operating vane or arm 27 be made out of "nylon," or other suitable plastic which will resist wear and which will flex sufficiently in use to assure a substantially liquid tight connection at the edges of the packing flanges so that there will not be appreciable loss of hydraulic pressure past the operating vane or arm 27 when the structure is in

use. The operating vane or arm 27 is preferably provided with a bearing surface 30 which works upon a packing flange 31 on the valve casing 24, this packing flange 31 being of such width that the bearing surface clears on each oscillatory movement of the agitator shaft 11 so that there will be no locking or building up of pressure within the casing 15 through the liquid which moves the operating vane or arm 27.

It is one of the purposes of the present invention to accomplish alternate hydraulic or fluid pressure against opposite sides of the operating vane or arm 27 so that these will in turn impart oscillatory movement to the agitator shaft 11, and it will be seen that as the operating vane or arm 27 is swung back and forth within the casing 15, this will be accomplished.

To accomplish the desired oscillatory movement of agitator shaft 11, hydraulic or fluid pressure must be applied alternately on opposite sides of the operating vane or arm, and, while fluid pressure is being applied on one side the fluid must be exhausted on the opposite side. The alternate exhaust on supply of liquid to the operating vane or arm 27 can be accomplished through oscillating valve 32 operably mounted in the valve casing 24.

As has been stated, this valve casing 24 is substantially cylindrical and has its upper end extending through the intermediate supporting plate 3. Further, the valve casing is preferably at one side within the operating case 15. A supply passage 33 is provided at one side through the wall of the valve casing 24 so that liquid under pressure can be supplied directly from the pump discharge 17 into this supply passage 33 of the valve. This supply passage for hydraulic liquid does not extend directly into the operating casing 15, but into the valve casing 24. The valve casing 24 is provided on opposite sides, and within the operating casing 15, with combination hydraulic liquid supply and exhaust ports 34 and 35, which communicate with the interior of operating casing 15 on opposite sides of the supply passage for hydraulic liquid, as at 33.

The oscillating liquid control valve 32 is made mainly hollow through its center, and is provided on one side with a curved liquid directing wall 36 which will operate or oscillate adjacent to opening 33, the valve 32 being provided on opposite sides of said curved wall with exhaust ports 37 and 38. As has been stated, the oscillating valve 32 is hollow in its middle portion, and these exhaust ports 37 and 38 enter directly into this hollow interior and then exhaust from the upper end of valve casing 24 directly into the space within the upper case 1. From this space within the case 1, the liquid flows through liquid circulating opening 16 into the pump and is again placed under pressure within the lower case or pan 2 so that it can again enter through opening 33 to be supplied into the operating casing 15.

In Figs. 6 and 7 of the drawings the parts are shown in two substantially opposite operating positions, and in Fig. 5 the parts are shown more or less in the middle position.

It has been found that the oscillating valve 32 and the pump gears 19 and 20 can be conveniently made of cast or moulded "nylon" or other plastic, and that these parts will require little finishing.

It is necessary that oscillating valve 32 be moved at the proper intervals, and this can be accomplished through a valve operating gear 39 on the agitator shaft 11, which valve operating gear meshes with a valve operating rack 40. Thus, as the agitator shaft 11 is oscillated the gear 39 will impart movement to the valve operating rack 40 so that the valve will be properly moved for each interval.

To compensate for differences in movement of the part, it is probably advisable that the operating rack and the valve be provided with operating clearance, so that there is provision for slight overriding of the parts. In some instances, it may be found that there will be possibility of the valve operating rack 40 becoming locked or in-

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operative on dead center, and to guard against such occurrences, it is advisable that fluid pressure operated starting means be provided.

As shown in Fig. 4, the valve operating rack has an arm 42 extending therefrom, which arm will be swung to opposite sides as the rack 40 is operated. A piston 43 is connected at one end pivotally with this arm 42, and has its opposite end fitted within a cylinder 44. This cylinder 44 has its outer end mounted rotatably upon a liquid supply nipple 45, which nipple is connected and extended to receive liquid under pressure from the space within the lower case or pan 2, a branch opening 46 being provided to conduct liquid from said liquid supply nipple 45 to the outer end of the cylinder 44. These parts are perhaps best shown in Figs. 4 and 8.

It will of course be understood that the oscillating valve 32 is closely fitted within its casing, and that suitable packing rings or packing grooves and ribs can be provided to assure that the supply of liquid will be controlled. As the liquid is under pressure from the pump structure, within the lower case or pan, it will be appreciated that the parts will properly operate at all times. After the liquid has been used it will escape into the space of the upper case 1, but will again be taken through opening 16 to the pump and will be brought to the proper pressure for operation of the parts. Of course, filling and renewal of liquid can be accomplished through the filling and drain opening at 8, and the plug will assure that proper retention of liquid is accomplished.

With the parts constructed and operating in the manner set forth, the pump shaft is continuously rotated from the motor or other power means, and in consequence the pump is continuously operated to generate fluid pressure within the lower case or pan 2. It is desirable that means be provided to regulate the fluid pressure and to entirely cut this off so that the speed of operation can be controlled, and the operation of the parts oscillating the agitator shaft 11 can be stopped.

With the above in mind, there are provided butterfly openings or passages 47 through the intermediate supporting plate 3, at a point spaced away from the operating parts, and also there is provided an opening intermediate these butterfly openings.

A bearing pin 48 is fitted upwardly through the bearing opening intermediate the butterfly openings or passages, and at its lower end has a cross key on its head, this cross key 49 being held by a member 50 to prevent rotation of the bearing pin 48. At its upper end, the bearing pin is provided to extend considerably above top plate 1 or the upper case and is screw threaded, as at 51.

A valve spool 52 is fitted to revolve on the bearing pin 48 above the intermediate plate 3, and is provided with valve extensions 53 which are sufficiently large to entirely cover over the butterfly openings or passages. The valve spool 52 has its upper end extended through a flanged opening in the top of the upper case member 1, and an O-ring packing 54 is provided to prevent leakage of liquid from the space of the upper case. A coiled spring 55 is fitted upon the upper end of the bearing pin and is adjustably held by a nut 56 turned onto the screw threaded portion 51, so that the bearing of the valve extensions 53 against the upper side of the intermediate plate 3 can be adjusted.

With this mechanism, the valve spool 52 can be adjusted so that the valve extensions open and close the butterfly openings or passage 47 to the degree desired. In other words, by rotation of the spool 52 the valve extensions 53 can be moved so that they will entirely open the butterfly openings or passages 47, and will close these to any degree. In this way, the pressure of liquid within the lower case or pan 2 as supplied to the operating mechanism in the operating casing 15 can be controlled.

While turning of the valve spool 52 can be accom-

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plished in various ways, there has been shown a bearing structure 57 as mounted on the top of the upper case 1. A worm gear 58 is secured to the valve spool and is held against axial movement by the bearing structure.

5 An operating worm 59 is journaled in the bearing structure, and has an operating shaft 60 extending therefrom. As may be desired, this shaft 60 can be extended to any point that may be necessary for control of the parts.

10 From the foregoing it will be seen that there has been provided a structure which is capable of being produced in large quantities from standard parts at low cost, and by the use of stampings and die castings which will not require expensive finishing.

While there has been herein shown and described only 15 one specific embodiment of the invention and there has been suggested only certain possible modifications, it will be appreciated that many changes and variations can be made in the construction and assembly and operation and control of the parts without departing from the spirit and scope of this invention.

What is claimed is:

1. Hydraulic drive means comprising a closed upper casing and a closed lower casing, a horizontal plate separating said casings, a pump casing having an outlet 25 communicating with said lower casing and an intake communicating with said upper casing through a first hole in said plate, a pump in said pump casing, an impeller casing having an intake communicating with said lower casing and an outlet communicating with said upper casing through a second hole in said plate, and an impeller in said impeller casing.

2. Hydraulic drive means as in claim 1, in which said pump and impeller casings are disposed side-by-side immediately below said plate.

3. Hydraulic drive means as in claim 2, in which said pump and impeller casings are both within said second casing.

4. Hydraulic drive means comprising a pump, an impeller casing, an impeller vane in said impeller casing, a cylindrical valve casing communicating with said pump and selectively with either side of said impeller vane, and a valve rotatable in said valve casing having an interrupted cylindrical outer contour complementary to the interior contour of said valve casing and an arcuately concave contour between the edges of said cylindrical contour.

5. Hydraulic drive means as in claim 4, and means for rotating said valve thereby to supply pressure to alternate sides of said vane.

6. Hydraulic drive means comprising a pump, an impeller mounted for oscillatory movement about a first axis, a valve communicating with the outlet of said pump for regulating delivery of pressure fluid from said pump to said impeller and mounted for movement about a 55 second axis, means interconnecting said impeller and valve for simultaneous movement in opposite directions about their respective axes, and means applying a uni-directional torque to said valve when said impeller is on dead center thereby to avoid stalling of said impeller on dead center.

7. Hydraulic drive means as in claim 6, in which said last named means comprises fluid pressure means communicating with the outlet of said pump and acting eccentrically on said valve when said impeller is on dead center.

8. Hydraulic drive means comprising a pair of closed casings, a plate separating said casings, said plate comprising one wall of each of said casings, a pump casing having an outlet communicating with one of said pair of casings and an intake communicating with the other of said pair of casings through a first hole in said plate, a pump in said pump casing, an impeller casing having an intake communicating with said one casing and an outlet communicating with said other casing through a 75

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second hole in said plate, and an impeller in said impeller casing.

9. Hydraulic drive means as in claim 8, in which said plate comprises one wall of said pump and impeller casings.

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