

April 2, 1946.

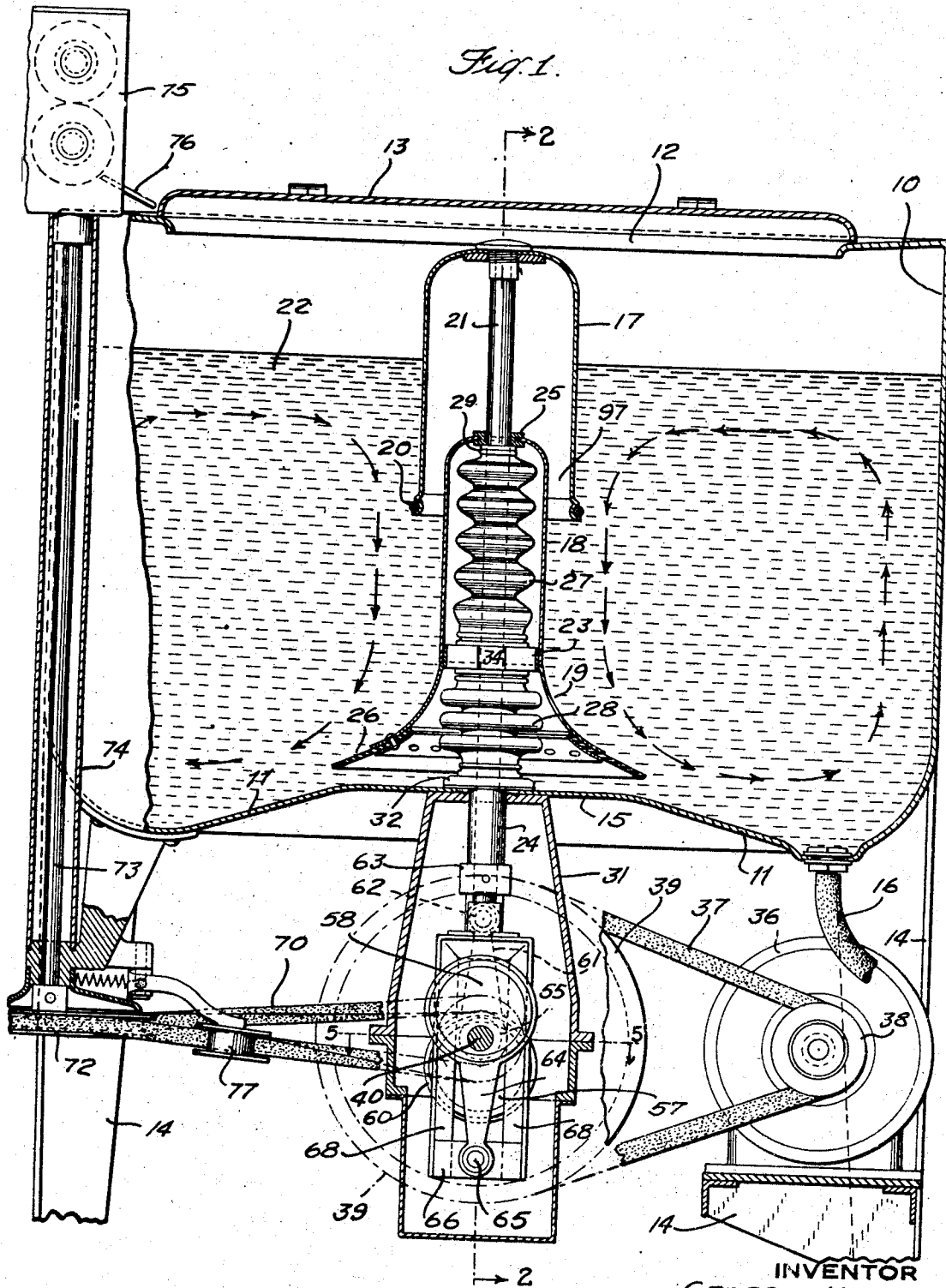
G. KUHN

2,397,873

FLUID TREATING APPARATUS

Filed March 7, 1942

4 Sheets-Sheet 1



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April 2, 1946.

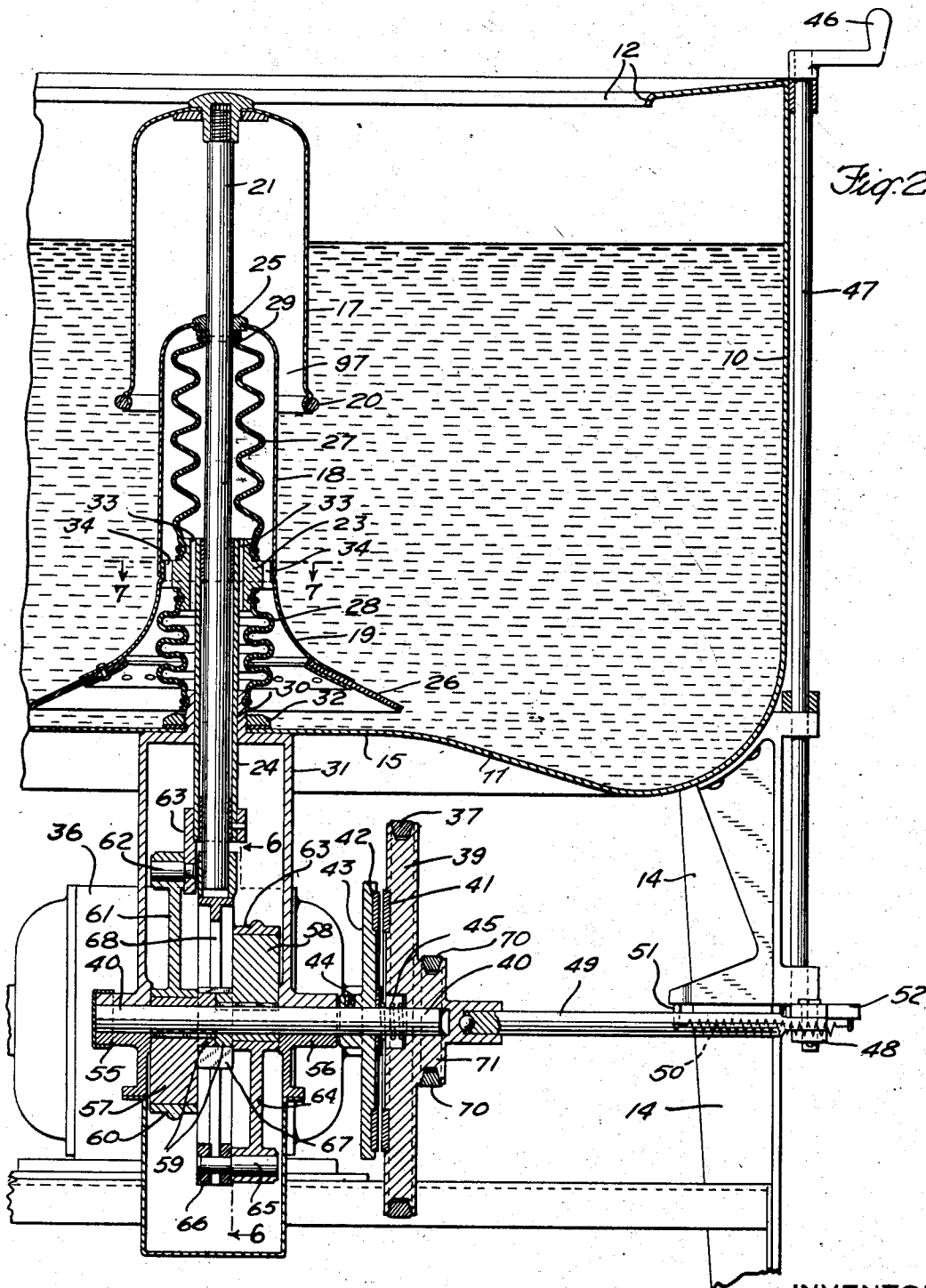
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4 Sheets-Sheet 2



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4 Sheets-Sheet 3

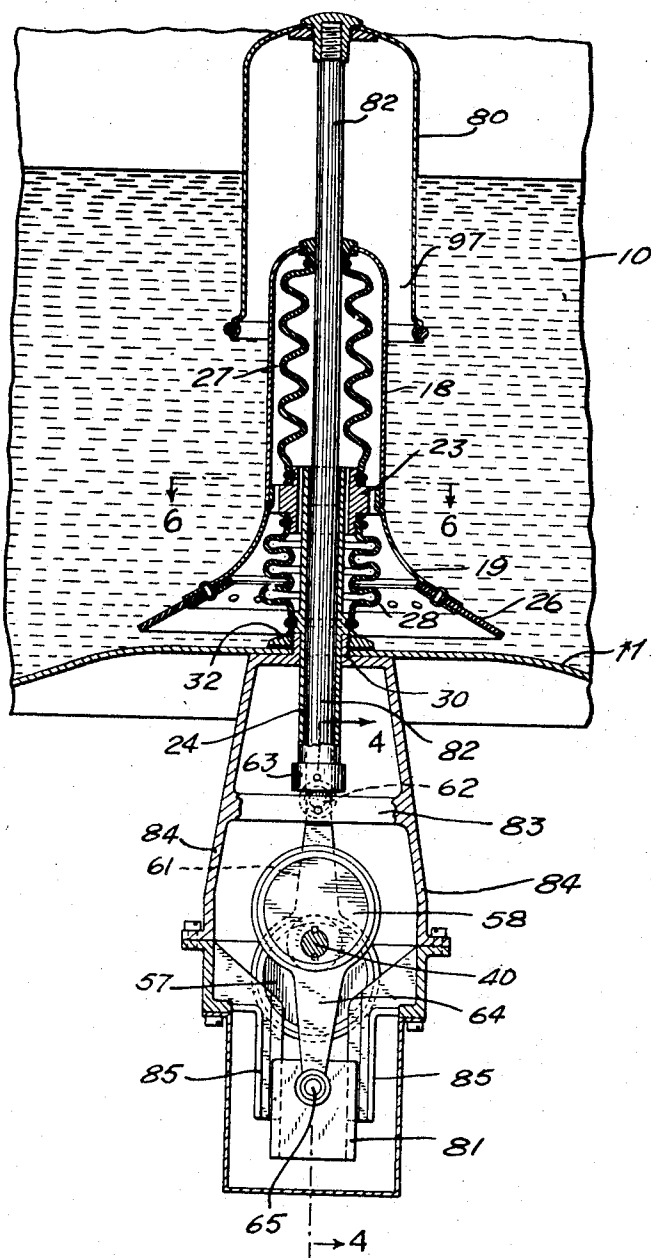


Fig. 3.

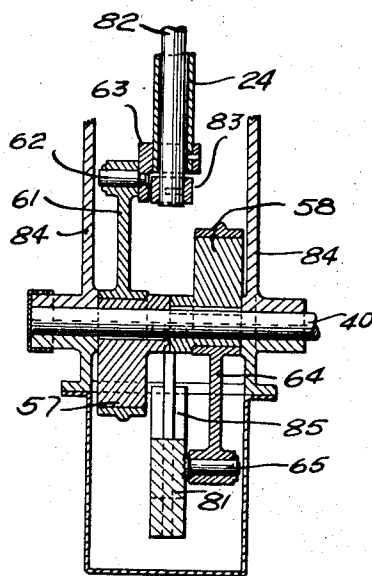


Fig. 4.

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4 Sheets-Sheet 4

Fig. 6.

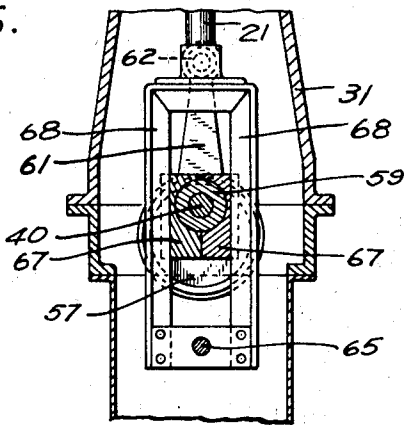


Fig. 5.

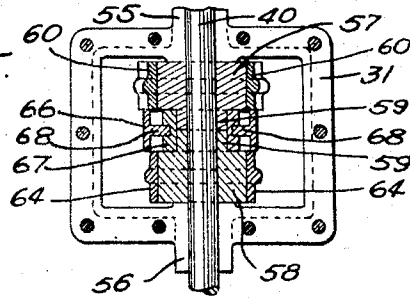


Fig. 7.

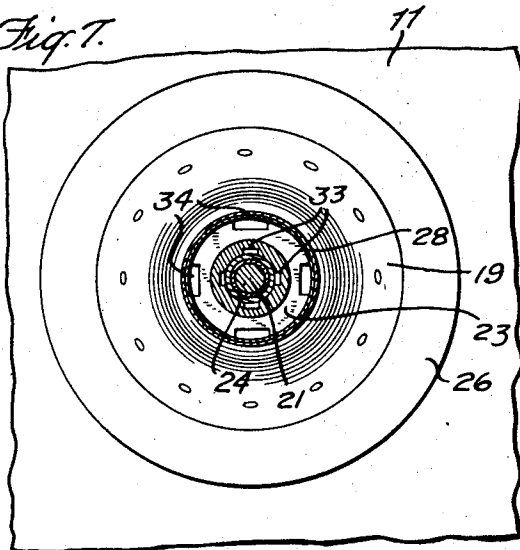


Fig. 8.

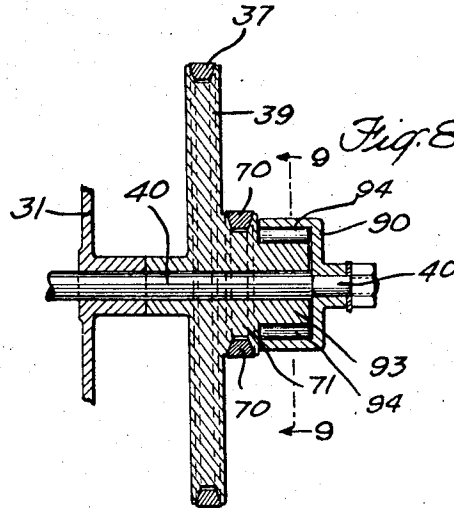
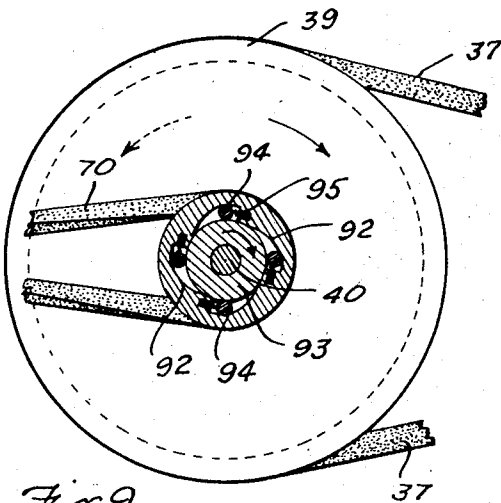
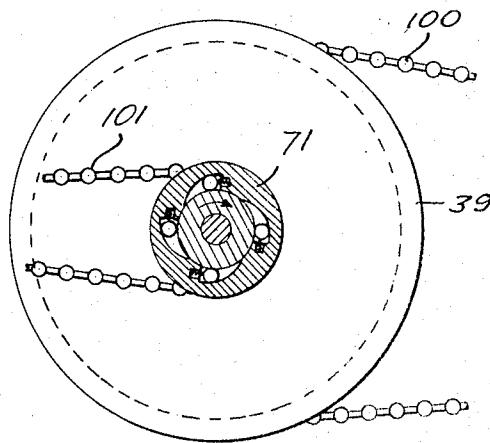


Fig. 10.



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UNITED STATES PATENT OFFICE

2,397,873

FLUID TREATING APPARATUS

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Application March 7, 1942, Serial No. 433,818

1 Claim. (Cl. 74-44)

This invention relates to the washing and cleaning of fabrics and articles and more particularly pertains to power driven washing and cleaning machines.

The invention provides a washing and cleaning machine which operates to effect a rapid and thorough cleaning or washing of the articles without vibration or the production of unbalanced forces. The operations performed by the machine include circulation of the articles in the washing fluid, scrubbing and shaking of the articles, agitating and flexing of the fabric of the articles and rapidly pulsating the fluid through the fabric.

More specifically, the invention provides a washing and cleaning machine having a novel combination of a washing or cleaning device and a fluid extracting device, both devices being driven by driving means which is arranged to be operatively connected to or disconnected from either device at will.

This application is a continuation-in-part of application Serial No. 164,820, filed September 20, 1937, now Patent No. 2,275,444, issued March 10, 1942.

The features and advantages of the invention will be apparent from the following description when considered in connection with the accompanying drawings, forming a part thereof, and in which:

Fig. 1 is a vertical sectional view of a washing machine embodying the invention;

Fig. 2 is a vertical sectional view of part of the machine taken on line 2-2 of Fig. 1;

Fig. 3 is a vertical sectional view, similar to Fig. 1, showing another form of washing machine;

Fig. 4 is a sectional view taken on line 4-4 of Fig. 3;

Fig. 5 is a sectional view taken on line 5-5 of Fig. 1;

Fig. 6 is a sectional view taken on line 6-6 of Fig. 2;

Fig. 7 is a sectional view taken on line 7-7 of Fig. 2;

Fig. 8 is a partial vertical sectional view showing another form of drive for the washing machine;

Fig. 9 is a sectional view taken on line 9-9 of Fig. 8, and

Fig. 10 is a view similar to Fig. 9, showing diagrammatically a chain drive.

Like characters of reference refer to the same or similar parts throughout the several views.

Referring to Figs. 1 and 2 of the drawings, reference character 10 designates the tub of the

washing machine which is preferably cylindrical in form with a closed bottom 11 and an opening 12 at the top which is closed by a hinged cover 13. The tub is supported on a suitable pedestal indicated 14. The bottom of the tub has a raised central portion 15 and a drain 16 connects with the lowermost part of the bottom 11.

The fluid circulating or propelling means is axially disposed in the tub 10 and, in general, comprises a pulsator consisting of a hollow tubular member such as a cylinder 17 and an element such as a piston 18, and a fluid propelling and directing piston skirt 19. The cylinder 17 is of metal and has a closed upper end and an open lower end around the outer periphery of which is a ring 20 of rubber or other suitable material. The cylinder is secured on the upper end of a reciprocable shaft 21 which passes through the upper end of the cylinder and the lower end of the cylinder is submerged so long as the water or other fluid 22 is maintained at substantially the level shown in Figs. 1 and 2. The inner and outer walls of the cylinder are disposed parallel to the direction of motion of the cylinder and during normal operation the cylinder is neither completely submerged nor entirely out of the fluid so that splashing is prevented. The pulsator piston 18 is a cylindrical metallic member shaped similarly to the cylinder 17 but is of sufficiently smaller diameter to provide an annular opening 97 of substantial flow area between the cylinder and piston through which the fluid readily may flow. The piston is axially disposed with respect to the cylinder and is mounted on a fitting 23, preferably a die casting, which is fixed to the upper end of a piston sleeve 24 through which shaft 21 passes and upon which the sleeve bears at its upper end. Shaft 21 passes in a smooth running fit through a collar 25 carried by the upper closed end of the piston 18. The fluid propelling and directing skirt 19 has an outer surface which curves gradually outwardly and downwardly and has a metallic upper part and a flexible fin 26 which is preferably rubber but may be of other suitable flexible material, secured to the upper part. The upper end of the skirt 19 is secured to the fitting 23 and the skirt is axially disposed with respect to the piston 18 and cylinder 17. The piston skirt 19 may be made integral with or separate from the piston 18 and may have other shapes than that disclosed. For example, the outer surface of the skirt may be shaped so that it is horizontal, or approximately so, with a fin on its periphery which extends downwardly and outwardly like the fin 26. This

horizontal skirt is effective for the purpose because the opposing streams of fluid from the upwardly moving skirt and from the cylinder will meet and be thrown radially outwardly. Shaft 21 and sleeve 24 extend through an opening in the bottom 11 of the tub to the operating mechanism disposed beneath the tub. To prevent leakage of fluid through this opening and to eliminate the necessity of a stuffing box upper and lower bellows 27 and 28 of rubber or other fluid-proof flexible material are used. The upper end of the upper bellows 27 is secured by means of a metallic ring 29 or the like in fluid pressure tight relationship to shaft 21 at a point which will not interfere with the movement of the piston 18, and the lower end is similarly fixed to the upper portion of fitting 23. The upper portion of bellows 28 is also similarly fixed to the lower end of fitting 23 and the lower end is fixed to a neck 30 on the operating mechanism housing 31 through which the sleeve 24 and shaft 21 pass. A nut 32 threaded on neck 30 compresses packing material against the bottom 11 of the tub which is pressed against the upper part of the housing 31 thereby preventing leakage of fluid at this point. A plurality of air vents 33 pass through fitting 23 next to sleeve 24 to connect the chambers formed by the upper and lower bellows 27 and 28 to relieve air pressure and vacuum produced during operation. The fitting 23 is also provided with a plurality of water vents 34 next to the walls of the pulsator piston to relieve water pressure in the upper portion of the pulsator piston during operation. In place of the lower bellows 28, a diaphragm, of rubber or other suitable material, of the type disclosed in my copending application Serial No. 106,080, filed October 17, 1936, patented May 12, 1942, No. 2,282,332, may be used.

The fluid circulating or propelling means is driven by a reversible electric motor 36 through mechanism which is mechanically balanced and the parts of which move with complete symmetry of motion during all phases of the operative cycle. A belt 37 runs over a small driving pulley 38 on the shaft of the motor and a larger driven pulley 39 which runs freely on one end of an eccentric shaft 40. Pulley 39 has an annular friction surface 41 on one face thereof which engages a co-operating friction surface 42 on one face of a disc 43 which is fixed to eccentric shaft 40 by a set screw 44. Pulley 39 and disc 43 are normally disengaged due to the action of a coil spring 45 on eccentric shaft 40 positioned within a recess in the hub of pulley 39. This pulley-disc arrangement constitutes a friction clutch which may be operated from the top of the machine. In the form shown, a handcrank 46 at the top of the tub 10 operates a vertically disposed rod 47 at the side of the tub, the lower end of which operates a link 48 which is pivotally connected at one end to a shaft 49 disposed in axial alignment with eccentric shaft 40 and with its other end in a socket of the pulley 71. A coil biasing spring 50 extending between a pin 51 on the frame of the machine and a properly located arm on link 48 retains the clutch in engagement after it has been engaged.

The eccentric shaft 40 has bearings 55 and 56 in the sides of the housing 31 and has keyed thereto within the housing, eccentrics 57 and 58 having laterally extending, abutting hub portions 59. The eccentrics are fixed to the shaft 40 in such manner that their maximum points of eccentricity are diametrically opposed. Eccentric

57 has a strap 60 which carries a connecting rod 61 extending upwardly from strap 60 and shaft 40 and which is connected at its upper end through a wrist pin 62 to an extension 63 fixed to sleeve 24 upon which the pulsator piston 18 and the skirt 19 are mounted. Eccentric 58 has a strap 63 which carries a connecting rod 64 extending downwardly from the strap 63 and shaft 40 and which is connected at its lower end through a wrist pin 65 to the lower end of a yoke 66 of rectangular configuration which straddles shaft 40 and is connected at its upper end to the lower end of rod 21 upon which pulsator cylinder 17 is mounted. The abutting hubs 59 of the eccentrics bear in a vertically split block 67, Fig. 6, having oppositely disposed recesses which receive guides 68 extending vertically along the inner side walls of the yoke 66. With this arrangement, eccentric 58 causes pulsator cylinder 17 to vertically reciprocate in the tub 10 and eccentric 57 causes pulsator piston 18 and skirt 19 also to vertically reciprocate in the tub but in directions opposite to the direction of movement of the cylinder 17. The strokes of the piston and cylinder are such that the piston moves into the cylinder as far as is practically possible to provide the maximum displacement. The several parts are so proportioned that the weight of the cylinder 17 and the parts reciprocating with it are equal to the total weight of the piston 18 and skirt 19 and the parts reciprocating with them. The "opposed" relationship of the connecting rods 61 and 64, that is, the arrangement of the operating mechanism so that connecting rod 61 extends above and is connected to sleeve 24 above a horizontal plane passing through the axis of eccentric shaft 40, and so that connecting rod 64 extends below and is connected to shaft 21, in effect below such plane, results in absolute symmetry of motion through all phases of the operative cycle of the oppositely reciprocating parts and the parts connected to and moving with them with complete mechanical balance being obtained and with resultant freedom from vibration. It will be understood that complete symmetry of motion would not be obtained if both of the connecting rods 61 and 64 extended in the same direction, that is, if they were both connected to the respective parts which they operate at the same side, either above or below, of a horizontal plane passing through the axis of eccentric shaft 40. Also since the cylinder 17, the piston 18 and the skirt 19 are disposed and operate, in alignment with the axis of shaft 21, and the eccentrics are located and operate equidistantly from said axis and also operate in "opposed" relationship as previously mentioned, no unbalanced couples or forces will be produced during operation. So arranged, or similarly arranged, the fluid circulating or propelling means and its operative mechanism is in absolute mechanical balance so that no vibration results which originates in a mechanical source. Complete hydraulic balance is also obtained, due to the fact that the pulsator cylinder and piston are proportioned to perform the same amount of work on the fluid in the tub on each stroke as the skirt performs, and since this work is done in opposite directions and in alignment, no unbalanced forces result. It will be appreciated that mechanical and hydraulic balance has been emphasized herein because these factors have not presented themselves as problems in prior types of fluid treating machines, due to the fact that prior machines operate at speeds many times slower than the machine of the present invention.