

April 16, 1957

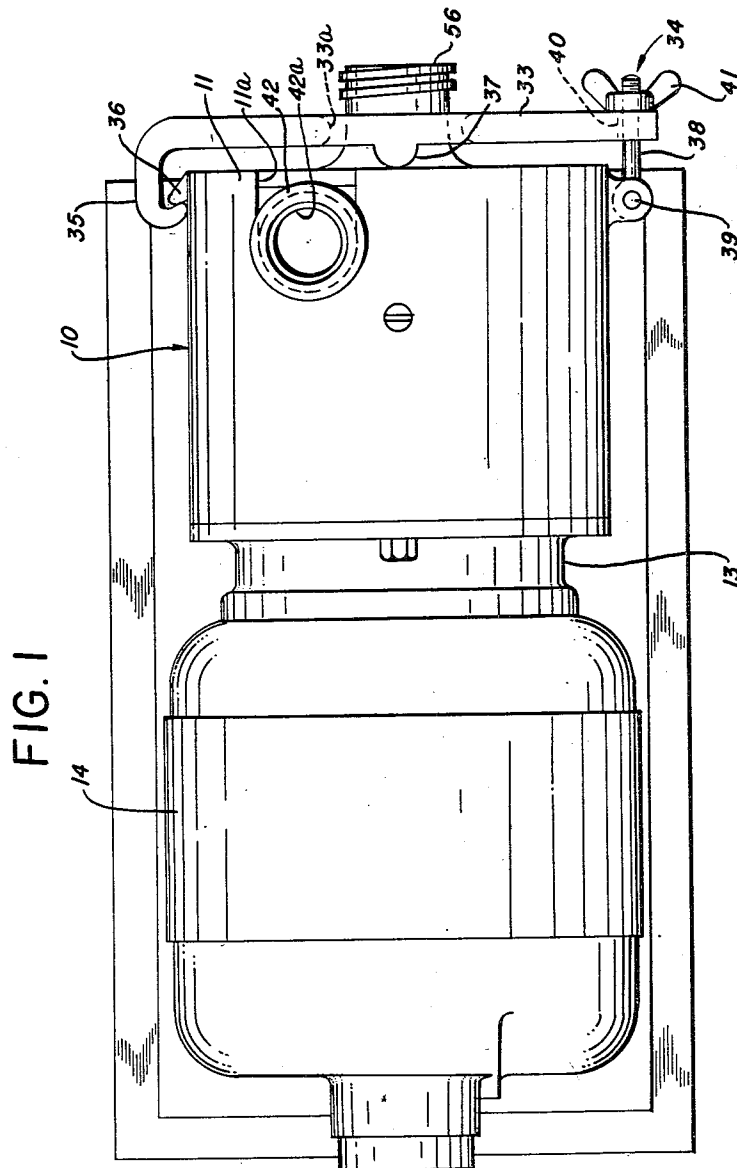
M. W. HUNTER

2,788,747

MAGNETIC PUMP

Filed Nov. 12, 1953

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

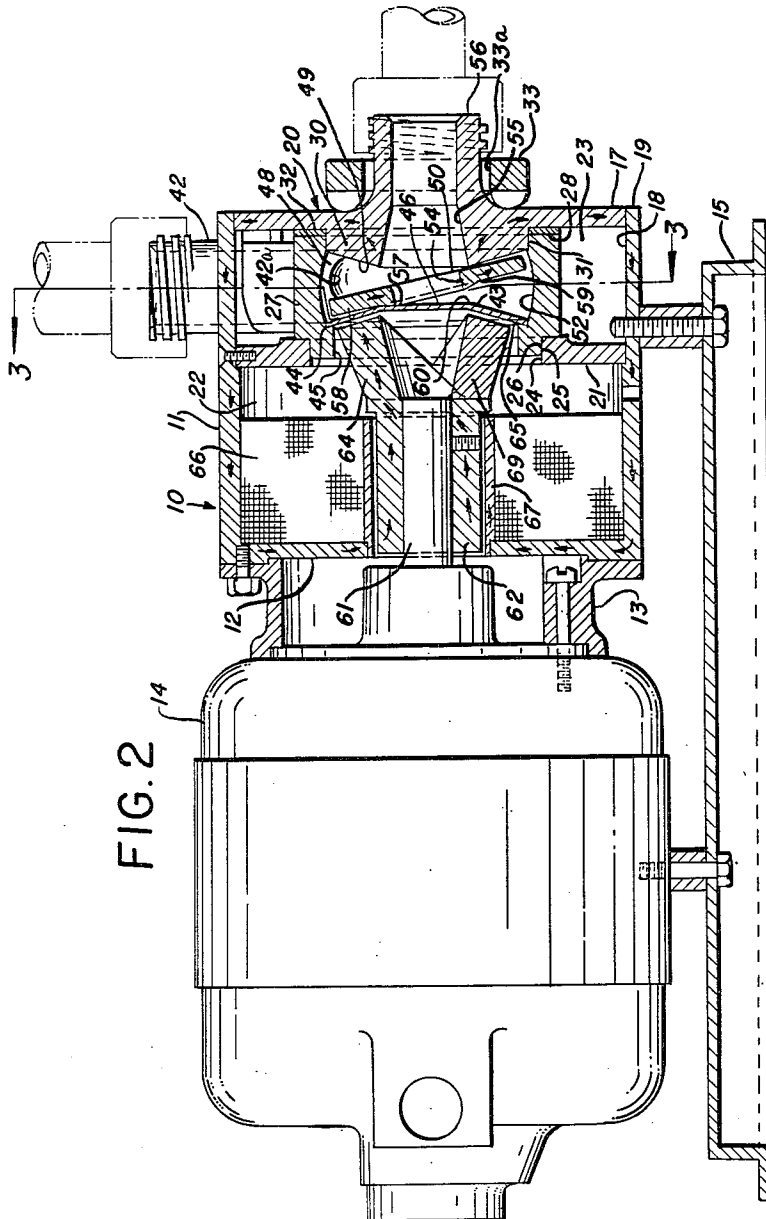


FIG. 2

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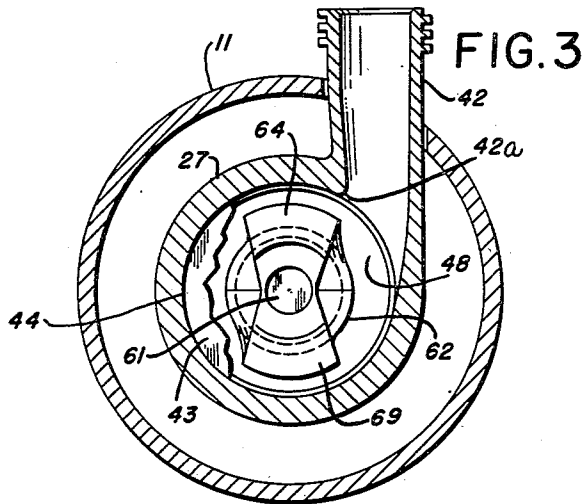


FIG. 4

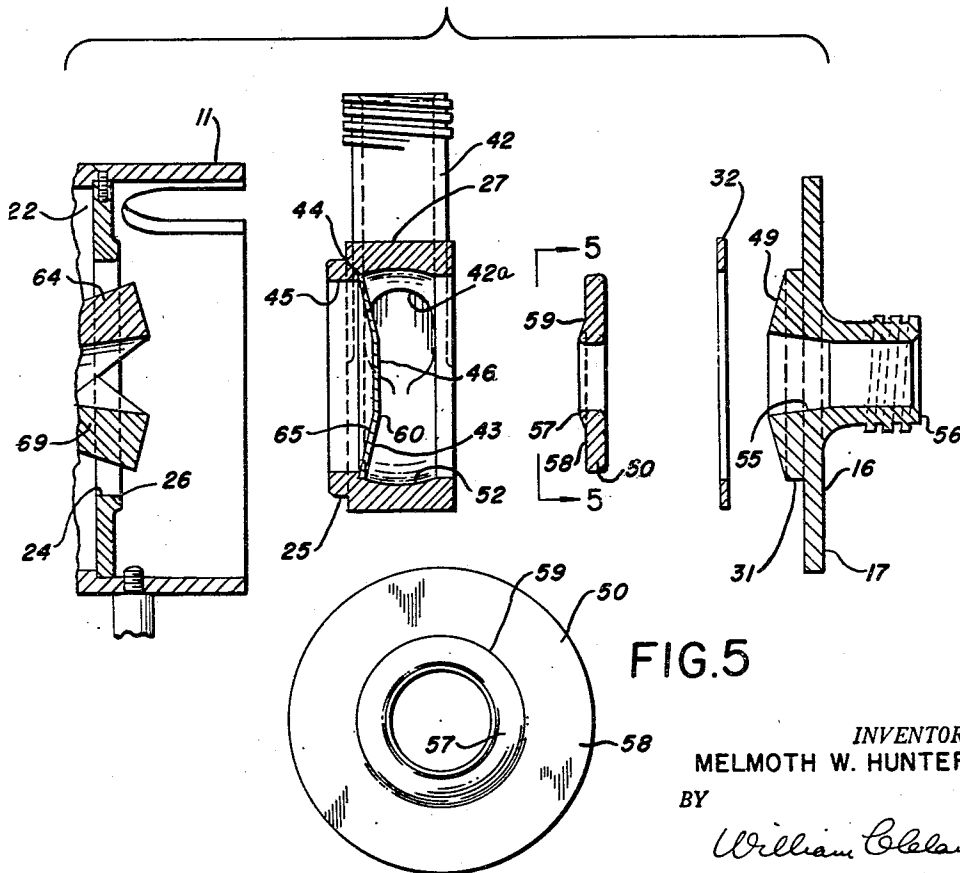


FIG. 5

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2,788,747

MAGNETIC PUMP

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Application November 12, 1953, Serial No. 391,616

19 Claims. (Cl. 103—118)

This invention relates to pumps, and in particular relates to a magnetically actuated pump for pumping fluids.

The present invention is an improvement over prior Melmoth W. Hunter Patent No. 2,033,577, which had certain disadvantages relating to the construction and operation thereof. For example, in the prior structure a magnetic coil unit and a power means had to be taken apart substantially piece-by-piece from a main housing supporting the same, in order to reach a magnetic pump device in said housing, as for cleaning purposes, and hence the prior structure would have been unsuitable for pumping a fluid such as milk, which is required to be treated under strict sanitary conditions.

It is one object of the invention, therefore, to provide an improved magnetic pump unit, including a magnetic actuator, power means for driving the same, and a pump section wherein a fluid-pumping chamber in the pump section is completely fluid-sealed with respect to the other parts of the unit, and wherein detachable means is provided for quickly reaching the pumping chamber for cleaning and other purposes without breaking the fluid seal to said other parts of the unit or otherwise disturbing the same.

Another object of the invention is to provide in a pump unit of the character described a pump section which cannot be reached by lubricating oil from the other parts of the unit, whether the pump section is open for said cleaning and other purposes or not.

Another object of the invention is to provide a wobbler disc construction of the character described which is accurately self-centering in the unit, without requiring use of a supporting pin through the center of the disc.

Another object of the invention is to provide a magnetic pump of the character described having improved magnetic actuating means, including a rotor for oscillating the wobbler disc and improved means for counterbalancing the rotor without affecting the oscillation of the disc.

These and other objects of the invention will be manifest from the following brief description and the accompanying drawings.

Of the accompanying drawings:

Figure 1 is a top plan view of a milk or like pumping machine embodying the features of the invention.

Figure 2 is a front elevation of the same, partly broken away and in section through the vertical center of the machine in operating condition.

Figure 3 is a vertical cross-section laterally through a pumping section of the machine, taken substantially on the line 3—3 of Figure 2.

Figure 4 is an exploded view of a pump unit or section of the machine and a part of the supporting casing therefor, corresponding to the cross-sectioned structure at the right of Figure 2.

Figure 5 is a side elevation of a wobbler disc incorporated in the pump unit, substantially as viewed on the line 5—5 of Figure 4, and illustrating improved means for self-centering the disc in a pump chamber thereof.

Figure 6 is an enlarged fragmentary cross-section, cor-

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responding to the right-hand portion of Figure 2, illustrating the inoperative condition of the same.

Referring to the drawings, and in particular to Figure 2, the numeral 100 designates a pump casing, of magnetic metal (such as iron) having a cylindrical outer wall 11, a closed inner end wall 12 to which is bolted a suitable bracket 13 of non-magnetic metal on which is bolted an electric motor 14, the casing 10 and motor 14 being suitably mounted on a base 15. A cap 16 has an annular flange 17 removably received within an enlarged bore 18 in casing wall 11 to be flush with an outer lip 19 of the casing, this cap forming part of a segmental pump unit 20, removably clamped against an intermediate wall or partition 21 which is suitably removably received within an extension of the bore 18, to be spaced inwardly from the lip 19 to divide the casing into an inner rotor chamber 22 and an outer pump unit chamber 23.

Partition 21 has a relatively large central orifice 24 providing a peripheral corner edge 25 constituting a forwardly presented annular seat portion, centeringly receiving a complementary annular seat portion 26 at the inner side of a cup-shaped pump-cavity member 27 with an annular flat face or rim 28 thereof presented outwardly substantially in a plane slightly inwardly of the lip 19 of wall 11. Cap 16 has a central hub portion or wall 30 defining with flange 19 an annular corner seat portion 31 in which is complementally seated the outer lip 28 of member 27, a suitable liquid-sealing gasket 32 of rubber or other resilient material being positioned between the pump member and the cap. The pump member 27 may be releasably clamped between the relatively fixed partition 21 and cap 16 as by means of lever bar 33 having adjustable pressure-applying means 34 at one end connected to the casing 11, a hook 35 on the other end of the bar hooked onto a fixed lug 36 on casing 11, at a point diametrically opposite said pressure-applying means, and inwardly presented protuberances 37, 37 on the bar centrally thereof in clamping engagement with cap 16, as best shown in Figures 1 and 2. Said pressure-applying means 34 may comprise an eyebolt 38 pivoted to the casing 11 at 39, and having its free end held in an open ended slot 40 in the bar 33 by a wing-nut 41 threaded on the free end of the bolt against the outer face of the bar. Thus, by tightening wing-nut 41 against the end of the bar, inward clamping pressure is applied to the cap 16 about the fulcrum point at 36, thereby securely to hold the cap and the member 27 in centered position against the partition 21.

The inner wall of the member 27 may comprise a separate relatively thin diaphragm 43 of magnetic metal, the same having a peripheral edge portion secured in fluid-sealing relation within an annular seat 44, as by known brazing or welding methods to overlies a relatively large opening 45 in the inner end of the member, the diaphragm being frusto-conical in shape with the small end face 46 thereof within the pump chamber 47, and the major portion of the concave side of the diaphragm being exposed to the casing chamber 22 through said opening 45. Hub portion 30 of cap 16 constitutes an outer wall of pump chamber 48, and has an inwardly convergent frusto-conical surface portion 49 axially spaced from the oppositely disposed frusto-conical diaphragm 43. In other words, said diaphragm and outer wall have axially spaced, oppositely inwardly convergent frusto-conical guide surfaces, at least portions of which are simultaneously engageable by diametrically and axially opposite sides of a relatively thin, flat-sided wobbler disc 50 of magnetic material, as best shown in Figure 2. Wobbler disc 50 may be of diameter only slightly less than that of the peripheral wall surface 52 of the pump chamber 48, said surface 52 being radially out-

wardly arcuate substantially on a radius from the central longitudinal axis of the pump chamber, so that in all positions of the wobbler disc in operation of the pump in a manner to be described later, the peripheral edge of the wobbler disc will be in substantially close conformity with said peripheral wall of the pump chamber, and cannot fall out of position which would prevent automatic self-centering of the disc upon electrical generation of magnetic flux in the system. Thus, the wobbler disc at all times divides the pump chamber 48 into two substantially distinct, wedge-shaped pockets at opposite sides of the disc, which communicate with each other substantially only through a central opening 54 of substantial flow area provided through the disc in alignment with an inlet opening 53 in the cap 16 of substantially equal flow area. The opening 53 in the cap 16 extends axially through a reduced neck 56 on the cap to which neck may be threaded a coupling device on a conduit (see chain-dotted lines in Figure 2) from a gravity feed source of liquid supply, such as of milk. A neck 42 extending radially outwardly from member 27 and through an open ended slot 11a in the casing wall 11, has an output opening 42a therethrough from the pump chamber 48, the outer end of neck 42 being threaded for coupling attachment of a conduit (see chain-dotted lines in Figure 2). The clamping lever 33 has an aperture 33a freely removably receiving the inlet neck 56 through the same.

As shown in Figures 2, 4 and 5, the wobbler disc 50 may have on the side thereof next to the diaphragm 43 a raised annular portion or rib 57 defining with a flat outer portion 58 of the disc a peripheral groove or guide surface of V-shaped or angular cross-section, capable of substantially complementally receiving the angular peripheral edge 60 defined by the small end of the diaphragm guide surface portions at points of progressive contact therewith in a manner to be described. This structure is adapted to retain the wobbler disc in self-centered relation in operation of the pump to impart a desired progressive tilting or wobbling action to the disc.

For providing such wobbling action, extending from motor 14 into the rotor compartment 22 may be a driven shaft 62 on which is keyed or otherwise affixed a cylindrical rotor 63 of magnetic metal, the rotor having an integral crank or extension 64 of the same material as the rotor extending at an angle to the common axis of rotor 63 and pump member 27, and the crank having a free outer end of substantial surface area conforming to the shape of the conical surface 65 of the concave side of diaphragm 43, but with a slight air gap between the opposing surfaces sufficient to permit flow of magnetic flux from the rotor and crank, across the air gap to the magnetic diaphragm. Magnetic flux is continuously supplied by a suitable annular electric coil 66 mounted in the rotor compartment 22, on a cylindrical sleeve 67 of magnetic material secured to the inner casing wall 12 to surround the rotor 62 with an air gap therebetween sufficient to permit passage of flux from the coil 66 and sleeve 67 to the rotor 62, the casing 10, including rear wall 12, the peripheral wall 11, and the cap 16, being of magnetic material to provide for continuous passage of magnetic flux in the direction indicated by small arrows in Figure 2. Upon continuous rotation of the rotor by motor 14, the magnetic attraction of the wobbler disc to the rotating crank is effective to tilt the disc continuously at an inclination to the common axis of the rotor and pump member in circumferential progression.

For preventing vibration in the pump disc due to the off-center relation of the crank 64, an angular protrusion 69 of non-magnetic metal (brass) and of the same size, shape and weight as crank 64 may be welded or otherwise secured to the rotor diametrically oppositely to the crank, as best shown in Figures 2 and 3. The protrusion 69, being non-magnetic otherwise has no effect upon the action of wobbler disc 50.

In operation of the improved pump, as for pumping

milk fed by gravity to pump chamber 48, the motor 14 is continuously operated to revolve rotor 62 and thereby swing crank 64 in a circumferential path or orbit at a substantially high rate of speed. Magnetic attraction of wobbler disc 50 through the diaphragm 43 to the revolving crank 64 imparts to the disc a circumferentially progressive tilting movement without substantial rotation, the disc being held at the same inclination by engagement with the conical guide surfaces of diaphragm 43 and outer wall or hub 30 of cap 16, which is part of the pump unit assembly. Disc 50 is maintained in centered relation, with its central opening 54 in alignment with inlet opening 55 in the cap, by circumferentially progressive engagement of the annular corner edge 60 of the diaphragm 43 in the complemental groove 59 of the disc, whereby no pivot pin or other supporting means is required. Milk entering the pump chamber 48 through inlet opening 55 in the cap fills the wedge-shaped pockets at opposite sides of the disc and is continuously moved by the circumferentially progressive tilting action of the disc toward the outlet opening 42a, to be conveyed under substantial pressure induced in the pump chamber to a milk treating device, such as a cream separator.

Due to the large opening in the wobbler disc providing equal distribution of milk at both sides of the same the flow of milk toward the outlet opening will be continuously steady, and without creation of eddy currents which might have detrimental effect on the quality of the milk. Moreover, provision of the non-magnetic counterbalance 69 opposite the magnetic rotor crank 64 prevents chattering or vibration throughout the entire pumping device, which would also be detrimental to steady operation of the pump unit 20 and possibly affect the quality of the milk being treated.

When motor 14 is stopped (see Figure 2), to stop rotation the magnetic crank 64, the wobbler or disc 50 is demagnetized and, therefore, is free to drop by gravity to one of various positions of edgewise support on the bottom of the peripheral wall surface 62 of the pump chamber 48. One such position of support is shown in Figure 6, where the disc 50 is tilted toward the diaphragm 43 with the center of the disc slightly below the axis of rotation of the rotor 62. Thus, in the inoperative condition of the pump the disc 50 is always freely and unobstructedly supported in the pump chamber in substantially axially centered position for tilting movement in all directions. In other words, there are no pins or other obstructions to interfere with subsequent self-centering movement of the disc, or with continuous progressive tilting of the same with rotation of the magnetic crank.

Upon actuation of motor 14 to start rotation of the crank, the resultant flow of magnetic flux through the diaphragm, following an arcuate path, immediately attracts the disc, initially at a point of least resistance, and starts to apply progressive tilting action thereto. Because the edge of the disc aperture 54 is radially inwardly of the path of movement of the revolving flux field, created by the crank movement, there is a tendency for the disc to be drawn toward axially centered position, which is then maintained by the previously described self-centering engagement of the continuous guide portions 57 and 60 on disc 50 and diaphragm 46, respectively.

In the milk treating or dairy industry it is particularly essential that equipment be kept in clean sanitary condition at all times. Accordingly, in the present invention the pump unit 20 is completely sealed against entry of foreign matter to the pump chamber 48, from the rotor compartment 22, the pump compartment 23, or otherwise from the exterior of the pump generally. The pump unit is easily cleaned after each use, simply by unscrewing wingnut 41 sufficiently to release both ends of clamping lever 33 from casing wall 11, after removing the inlet conduit from neck 42 (see Figures 1 and 2), thereby permitting free outward removal of cap 16, sealing gasket

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32, wobbler disc 50, and pump cavity member 27 from the pump casing 10 in the order given (see Figure 4). Conversely, after these parts have been thoroughly cleaned they are just as easily assembled in the liquid-sealed operative positions thereof previously described, and as best shown in Figures 1, 2 and 3.

Although the improved magnetic pump is particularly adaptable for use in pumping milk, it may also be utilized in other industries where liquid must necessarily be pressurized in such a manner that it will not come in contact with or be exposed to foreign matter such as lubricating oil from bearings of moving parts.

Modifications of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. A magnetic pump, comprising a casing having walls defining therein a fluid-pump chamber, a relatively thin inner wall of said casing being of material having the property of passing magnetic flux therethrough and having a generally conical portion dished inwardly of said chamber, a wobbler element mounted in said chamber, a rotor having a magnetically energized core rotatable on an axis through the center line of said conical portion, said core having a magnetic extension thereof unobstructedly terminating in a surface portion complementary to said generally conical surface portion at the concave side thereof and in spaced relation thereto, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to the rotating magnetic extension the wobbler is continuously tipped at an inclination to said axis of said rotor in circumferential progression, said rotor having an extension of non-magnetic material affixed thereon to counterbalance said magnetic extension and terminating in a surface portion unobstructedly spaced from said concave side of said conical portion.

2. A magnetic pump, comprising a casing having walls defining therein a fluid-pump chamber, said casing walls including oppositely disposed inner and outer walls, said inner wall being relatively thin and of material having the property of passing flux therethrough and having a generally conical portion dished inwardly of said chamber, a wobbler element mounted in said chamber, a rotor having a magnetically energized core rotatable on an axis through the center line of said conical portion, said core having a magnetic extension thereof unobstructedly terminating in a surface portion complementary to said generally conical surface portion at the concave side thereof and in spaced relation thereto, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to the rotating magnetic extension the wobbler is continuously tipped at an inclination to said axis of said rotor in circumferential progression, said inner and outer walls of said casing having guide surfaces at least portions of which are engageable by opposite sides of said wobbler element to guide the same at an angle to said axis, at least one said guide surface defining an angular peripheral edge portion, said wobbler element having on one face thereof a peripheral angular portion substantially complementally receiving said angular peripheral edge portion of the guide surface at the points of the circumferentially progressive contact therewith.

3. A magnetic pump, comprising a casing having walls defining therein a fluid-pump chamber, said casing walls including oppositely disposed inner and outer walls, said inner wall being relatively thin and of material having the property of passing flux therethrough and having a generally conical portion dished inwardly of said chamber, a wobbler element mounted in said chamber, a rotor having a magnetically energized core rotatable on an axis through the center line of said conical portion, said

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core having a magnetic extension thereof unobstructedly terminating in a surface portion complementary to said generally conical surface portion at the concave side thereof and in spaced relation thereto, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to the rotating magnetic extension the wobbler is continuously tipped at an inclination to said axis of said rotor in circumferential progression, said rotor having an extension of non-magnetic material affixed thereon to counterbalance said magnetic extension and terminating in a surface portion unobstructedly spaced from said concave side of said conical portion, said inner and outer walls of said casing having guide surfaces at least portions of which are engageable by opposite sides of said wobbler element to guide the same at an angle to said axis, at least one said guide surface defining an angular peripheral edge portion, said wobbler element having on one face thereof a peripheral angular portion substantially complementally receiving said angular peripheral edge portion of the guide surface at the points of the circumferentially progressive contact therewith.

4. A magnetic pump, comprising a casing having walls defining therein a fluid-pump chamber, said casing walls including oppositely disposed inner and outer walls, said inner wall being relatively thin and of material having the property of passing flux therethrough and having a generally conical portion dished inwardly of said chamber, a wobbler element mounted in said chamber, a rotor having a magnetically energized core rotatable on an axis through the center line of said conical portion, said core having a magnetic extension thereof unobstructedly terminating in a surface portion complementary to said generally conical surface portion at the concave side thereof and in spaced relation thereto, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to the rotating magnetic extension the wobbler is continuously tipped at an inclination to said axis of said rotor in circumferential progression, said inner and outer walls of said casing having oppositely inwardly convergent frusto-conical guide surfaces at least portions of which are engageable by opposite sides of said wobbler element to guide the same at an angle to said axis, said outer wall having therein an inlet opening of substantial flow area concentric with the axis of said rotor and the center of said wobbler element, said wobbler element having a central opening therethrough of substantial flow area and being substantially concentrically aligned with the inlet opening, said element being free and unobstructed at the central portion thereof including said central opening, said casing having outlet means in the same from said chamber.

5. A magnetic pump, comprising a casing having walls defining therein a fluid-pump chamber, said casing including oppositely disposed inner and outer walls and a peripheral wall connecting the same, said inner wall being relatively thin and of material having the property of passing flux therethrough and having a generally conical portion dished inwardly of said chamber, a wobbler element mounted in said chamber, a rotor having a magnetically energized core rotatable on an axis through the center line of said conical portion, said core having a magnetic extension thereof unobstructedly terminating in a surface portion complementary to said generally conical surface portion at the concave side thereof and in spaced relation thereto, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to the rotating magnetic extension the wobbler is continuously tipped at an inclination to said axis of said rotor in circumferential progression, said inner and outer walls of said casing having oppositely inwardly convergent frusto-conical guide surfaces at least

portions of which are engageable by opposite sides of said wobbler element to guide the same at an angle to said axis, said outer wall having therein an inlet opening of substantial flow area concentric with the axis of said rotor and the center of said wobbler element, said wobbler element having a central opening of substantial flow area and being substantially concentrically aligned with the inlet opening, said element being free and unobstructed at the central portion thereof including said central opening, said casing having outlet means in the same from said chamber, said wobbler element being a relatively thin disc having its peripheral edge relatively closely conforming to said peripheral wall whereby the wobbler element divides said chamber into substantially distinct pockets at diagonally opposite side portions of the wobbler element and communicating with each other substantially only through said central opening in the wobbler element.

6. A magnetic pump, comprising a housing having an opening therein and housing seat means around the housing opening, a pump member having portions seating against said housing seat means, said pump member having a pump cavity therein extending outwardly from a relatively thin inner wall of material having the property of passing magnetic flux therethrough and the cavity having an opening outwardly at the outer side of the pump member, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said cavity, a cap removably seating against said outer seat means in fluid sealing relation over said cavity opening and constituting an outer wall of said member, releasable means for securing said cap seated in fluid-sealing relation against said outer seat means, a wobbler element mounted in said chamber, a rotor having a magnetically energized core in said housing and rotatable on an axis through the center line of said conical portion, said core having a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tipped at an inclination to the axis of said rotor in circumferential progression.

7. A magnetic pump, comprising a housing having an opening therein and seat means around the housing opening, a pump member having portions seating against said seat means, said pump member having a pump cavity therein extending outwardly from a relatively thin inner wall of material having the property of passing magnetic flux therethrough, and the cavity having an opening outwardly at the outer side of the pump member, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said cavity, a cap removably seating against said outer seat means in fluid sealing relation over said cavity opening and constituting an outer wall of said member, releasable means for securing said cap seated in fluid-sealing relation against said outer seat means, a wobbler element mounted in said chamber, a rotor having a magnetically energized core in said housing and rotatable on an axis through the center line of said conical portion, said core having a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tipped at an inclination to the axis of said rotor in circumferential progression, said inner and outer walls hav-

ing oppositely inwardly convergent frusto-conical guide surfaces at least portions of which are engageable by diagonally opposite side portions of said wobbler element to guide the same at an angle to said axis, said outer wall having therein an inlet opening of substantial flow area substantially concentric with the axis of said rotor and the center of said wobbler element, said wobbler element having an opening of substantial flow area and substantially concentrically aligned with the said inlet opening, said pump member having an outlet orifice from said pump cavity.

8. A magnetic pump, comprising a housing having an opening therein and seat means around the housing opening, a pump member having portions seating against said seat means, said pump member having a pump cavity therein extending outwardly from a relatively thin inner wall of material having the property of passing magnetic flux therethrough and the cavity having an opening outwardly at the outer side thereof, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said cavity, a cap removably seating against said outer seat means in fluid sealing relation over said cavity opening and providing an outer wall for said member, releasable means for securing said cap seated in fluid-sealing relation against said outer seat means, a wobbler element mounted in said cavity, a rotor having a magnetically energized core in said housing and rotatable on an axis through the center line of said conical portion, said core having a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tipped at an inclination to the axis of said rotor in circumferential progression, said inner and outer walls having oppositely inwardly convergent frusto-conical guide surfaces at least portions of which are engageable by diagonally opposite side portions of said wobbler element to guide the same at an angle to said axis, said outer wall having therein an inlet opening of substantial flow area substantially concentric with the axis of said rotor and the center of said wobbler element, said wobbler element having an opening of substantial flow area and being substantially concentrically aligned with the same, said pump member having an outlet passage from said cavity, said wobbler element being a relatively thin disc having its peripheral edge relatively closely conforming to the peripheral wall portions of said pump cavity whereby the wobbler element divides said cavity into substantially distinct pockets at diagonally opposite sides of the wobbler element and communicating with each other substantially only through said opening in the wobbler element.

9. A magnetic pump, comprising a housing having an opening therein and housing seat means around the housing opening, a pump member having portions seating against said housing seat means, said pump member having a pump cavity therein extending outwardly from a relatively thin inner wall of material having the property of passing magnetic flux therethrough and the cavity having an opening outwardly at the outer side of the pump member, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said cavity, a cap removably seating against said outer seat means in fluid sealing relation over said cavity opening and constituting an outer wall of said member, releasable means for securing said cap seated in fluid-sealing relation against said outer seat means and for releasably retaining said pump member seated in said housing seat means, a wobbler element mounted in said cavity, a magnetic rotor rotatably mounted in said housing, said rotor hav-

ing a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tipped at an inclination to the axis of said rotor in circumferential progression.

10. A magnetic pump, comprising a housing having an opening therein and housing seat means around the housing opening, a pump member having portions seating against said housing seat means, said pump member having a pump cavity therein extending outwardly from a relatively thin inner wall of material having the property of passing magnetic flux therethrough and the cavity having an opening outwardly at the outer side of the pump member, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said cavity, a cap removably seating against said outer seat means in fluid sealing relation over said cavity opening and constituting an outer wall of said member, releasable means for securing said cap seated in fluid-sealing relation against said outer seat means and for releasably retaining said pump member seated in said housing seat means, a wobbler element mounted in said cavity, a magnetic rotor rotatably mounted in said housing, said rotor having a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tipped at an inclination to the axis of said rotor in circumferential progression, said rotor having thereon an extension of non-magnetic material diametrically oppositely disposed to said magnetic extension to counterbalance the same.

11. A magnetic pump, comprising a housing having an opening therein and housing seat means around the housing opening, a pump member having portions seating against said housing seat means, said pump member having a pump cavity therein extending outwardly from a relatively thin inner wall of material having the property of passing magnetic flux therethrough and the cavity having an opening outwardly at the outer side of the pump member, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said cavity, a cap removably seating against said outer seat means in fluid sealing relation over said cavity opening and constituting an outer wall of said member, releasable means for securing said cap seated in fluid-sealing relation against said outer seat means, a wobbler element mounted in said cavity, a rotor having a magnetically energized core in said housing and rotatable on an axis through the center line of said conical portion, said core having a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tipped at an inclination to the axis of said rotor in circumferential progression, said inner and outer walls of said pump member having guide surfaces at least portions of which are engageable by opposite sides of said wobbler element to guide the same at an angle to said axis, at least one said guide surface defining an angular peripheral edge portion, said wobbler element having

on one face thereof a peripheral angular portion substantially complementally receiving said angular peripheral edge portion of the guide surface at the points of the circumferentially progressive contact therewith.

12. A magnetic pump, comprising a housing having an opening therein and housing seat means around the housing opening, a pump member having portions seating against said housing seat means, said pump member having walls defining a pump cavity, said walls including oppositely disposed inner and outer walls, said inner wall being relatively thin and of material having the property of passing magnetic flux therethrough and the pump cavity having an opening outwardly of the outer side of the pump member, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said cavity, a closure element at least a portion of which constitutes said outer wall, said closure element being removably seated against said outer seat means in fluid sealing relation over said cavity opening, releasable means on said housing for securing said closure element seated in fluid sealing relation against said outer seat means and through the same retaining said pump member seated on said housing seat means, a wobbler element mounted in said chamber, a rotor rotatable on an axis through the center line of said conical portion, said core having a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tipped at an inclination to the axis of said rotor in circumferential progression, said inner wall and said closure element having oppositely inwardly convergent frusto-conical guide surfaces at least portions of which are engageable by opposite sides of said wobbler element to guide the same at an angle to said axis, said outer wall of the pump member having therein an inlet opening of substantial flow area concentric with the axis of said rotor and the center of said wobbler element, said wobbler element having an opening therethrough of substantial flow area, said pump member having an outlet passage from said pump cavity.

13. A magnetic pump, comprising a housing having an opening therein and housing seat means around the housing opening, a pump member having portions seating against said housing seat means, said pump member having walls defining a pump cavity, said walls including oppositely disposed inner and outer walls, said inner wall being of material having the property of passing magnetic flux therethrough constituting an inner wall of the pump member and the cavity having an opening outwardly of the outer side thereof, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said cavity, a closure element removably seating against said outer seat means in fluid sealing relation over said cavity opening, releasable means for securing said closure element seated in fluid sealing relation against said outer seat means, a wobbler element mounted in said cavity, a rotor rotatable on an axis through the center line of said conical portion, said core having a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tipped at an inclination to the axis of said rotor in circumferential

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progression, said inner wall and said closure element having oppositely inwardly convergent frusto-conical guide surfaces at least portions of which are engageable by opposite sides of said wobbler element to guide the same at an angle to said axis, said outer wall of the pump member having therein an inlet opening of substantial flow area concentric with the axis of said rotor and the center of said wobbler element, said wobbler element having an opening of substantial flow area and substantially concentrically aligned with said inlet opening, said wobbler element being a relatively thin disc having its peripheral edge relatively closely conforming to the peripheral wall of said pump cavity whereby the wobbler element divides said cavity into substantially distinct pockets at diametrically opposite sides of the wobbler element and communicating with each other substantially only through said opening in the wobbler element.

14. A magnetic pump, comprising a housing having an opening therein and housing seat means around the housing opening, a pump member, means for removably mounting said pump member on said housing over said opening in the same, said pump member having a pump cavity therein extending outwardly from a relatively thin inner wall of material having the property of passing magnetic flux therethrough and the cavity having an opening outwardly at the outer side of the pump member, an outer seat means on the outer side of the member, said inner wall having a generally conical portion dished inwardly of said chamber, a closure element removably seating against said outer seat means in fluid sealing relation over said cavity opening of the pump member and constituting an outer wall of said member, releasable means for securing said closure member seated in fluid-sealing relation against said outer seat means and through the same retaining said pump member seated in said housing seat means, a wobbler element mounted in said cavity, a rotor having a magnetically energized core in said housing and rotatable on an axis through the center line of said conical portion, said core having a magnetic extension unobstructedly terminating in a terminal surface portion at the concave side of said inwardly dished inner wall and in spaced relation to said generally conical surface thereof, said terminal surface portion thereby being generally offset with respect to said axis, means for rotating said rotor whereby through magnetic attraction of said wobbler element to said rotating magnetic extension the wobbler is continuously tripped at an inclination to the axis of said rotor in circumferential progression.

15. A magnetic pump, comprising a casing having peripheral and inner and outer walls defining a fluid-pumping chamber having an axis therethrough, said inner wall being relatively thin and being of material having the characteristic of passing magnetic flux therethrough and said outer wall being in axially spaced relation to said inner wall, a magnetically attractive wobbler disc having central opening means of substantial flow area through the same, inlet and outlet means in said casing for passage of fluid through said chamber, said peripheral wall portion of said casing presented radially inwardly of said

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casing being of such slightly greater periphery than the outer periphery of said disc as to support the disc freely and unobstructedly in substantially axially centered relation within said chamber in a demagnetized inoperative condition of the disc, thereby permitting tilting movement of the disc in all directions angularly of said axis, said inner and outer walls having inwardly oppositely converging, generally conical surface portions and rotatable magnetic attraction means presented exteriorly of said chamber and terminating adjacent said inner wall at a point offset with respect to said axis to move in a continuous orbit co-extensive with said conical surface portion of the inner wall, progressively to attract said disc toward the inner wall and to tilt the disc toward engagement of opposite sides thereof with said opposite conical surface portions, whereby through continued rotation of said magnetic attraction means in said orbit said disc is continuously tipped at an inclination to said axis in circumferential progression, the resultant relatively close conformity of the outer periphery of the disc to said peripheral wall portion of said casing thereby dividing said chamber into substantially distinct pockets at diagonally opposite sides of the disc and communicating with each other and with said inlet and outlet means at least partially through said opening means in the disc.

16. A pump as set forth in claim 15, progressively interengageable continuous cooperating guide portions being provided on said disc and said casing for maintaining the progressively tilted disc substantially centered with respect to said axis.

17. A pump as set forth in claim 16, wherein the included angle of said conical surface portions are such that as said continuous cooperating guide portions progressively interengage, the adjacent surface portions of the disc and the respective said conical surface portions will be radially divergent from the points of said progressive interengagement of said continuous cooperative guide portions.

18. A pump as set forth in claim 16, wherein continuous portions of said disc extend radially beyond said orbit of said magnetic attraction means and thereby tend also to attract the tilted disc radially toward the magnetic attraction means and into said centering engagement with said continuous cooperating guide portions.

19. A pump as set forth in claim 15, including a housing for said magnetic attraction means, said housing having an opening and seat means around the same, said casing having portions seating in said seat means and said outer wall constituting a part removably attached to said casing, and releasable means being provided for securing said casing seated on said housing seat means.

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