Oct. 26, 1965 G. J. MEYER 3,213,803

ROTARY PUMP

Filed Nov. 6, 1963 2 Sheets-Sheet 1

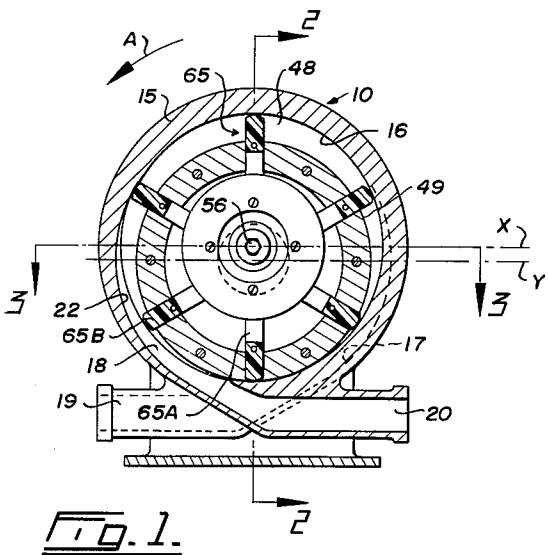


FIG. 1.

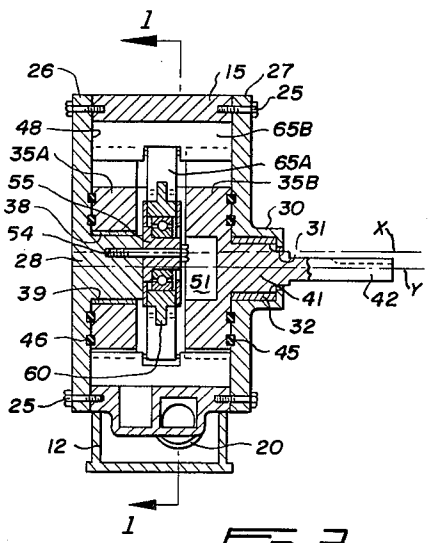


FIG. 2.

FIG. 5.

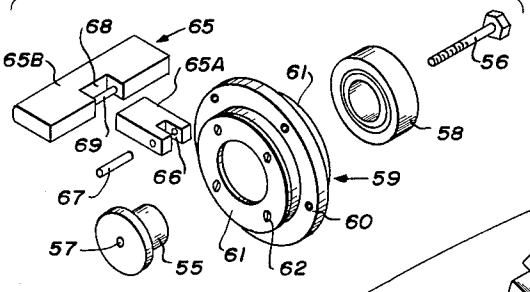
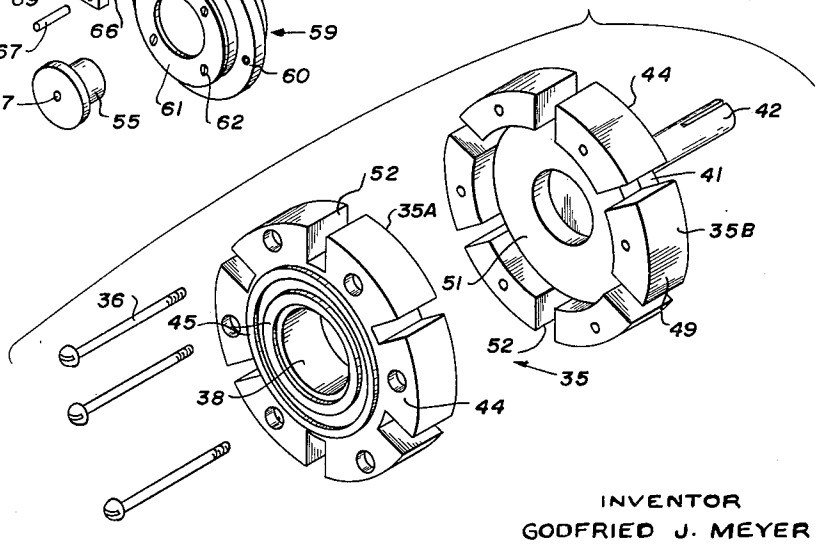


FIG. 4.



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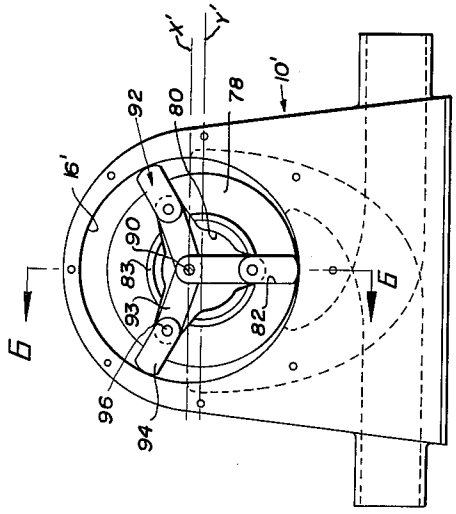


FIG. 7.

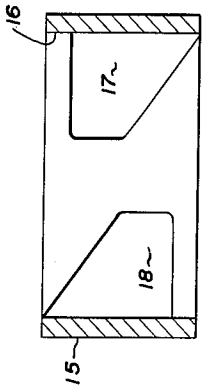


FIG. 3.

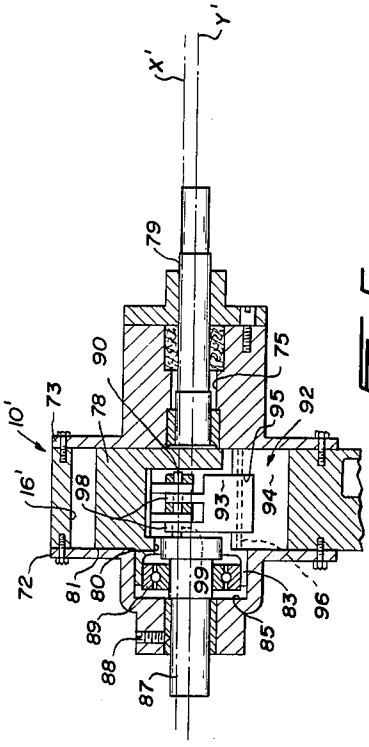


FIG. 6.

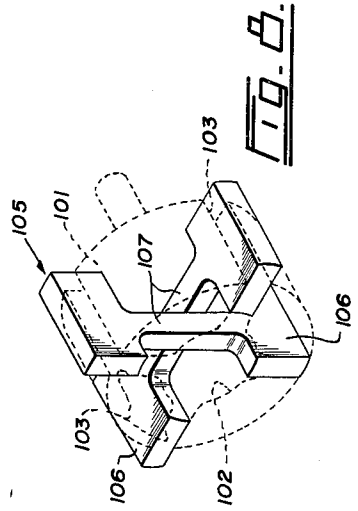


FIG. 8.

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ROTARY PUMP

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3 Claims. (Cl. 103—144)

My invention relates to a fluid pump having vanes which are mounted on a stator part so as to be rotated about a fixed orbit by the rotor.

In my United States Patent No. 3,053,438 issued September 11, 1962, I described one such rotary pump having the pumping capacity and high speed characteristics which are essential in so many installations. However after prolonged periods of use it was found that my patented pump required a certain amount of maintenance if maximum efficiency was to be maintained. In this respect at least the pump had a weakness common to most rotary and other pumps which require periodic overhauls.

The objects of the present invention are to provide a rotary pump having few working parts which can wear or break down, to mount the pumping elements in such a way that little or no heat is generated and the need for cooling is obviated and to provide a large volume high speed air flow which is free from pulsations and resulting vibrations within the pump itself.

These and other objects will appear in the following specification and be shown in the accompanying drawings.

Referring to the drawings:

FIGURE 1 is a vertical section taken on the line 1—1 of FIG. 2.

FIGURE 2 is a vertical section taken on the line 2—2 of FIG. 1.

FIGURE 3 is a sectional plan taken on the line 3—3 of FIG. 1 with the casing end plates and rotor removed.

FIGURE 4 is an exploded perspective view of the rotor.

FIGURE 5 is a similar view of one of the rotor vanes and the parts supporting the vanes within the pump casing.

FIGURE 6 is a vertical section taken on the line 6—6 of FIG. 7 and showing a modification of the pump.

FIGURE 7 is a front elevation of the modified pump with one end plate removed.

FIGURE 8 is a perspective view showing a modification of the rotor.

The numeral 10 indicates generally a cylindrical casing or stator which is mounted on a base 11, the base consisting of side flanges 12 and a connecting web 14. The casing 10 has a side wall 15, the inner surface 16 of this wall being concentric to the longitudinal axis X of the casing. Formed on this surface are inlet and outlet ports 17 and 18 respectively. The port 17 communicates with a pipe 19 which extends outwardly between the base flanges 12 and the port 18 connects with a similarly located outlet pipe 20 which is spaced to one side of the inlet pipe. Both the inlet and outlet ports have an arcuate surface 22 which is radiused about an axis Y, this axis being disposed a short distance below and in vertical alignment with the casing axis X. As shown in FIGS. 1 and 3, the upper portions of the ports 17 and 18 extend substantially the full width of the peripheral wall 15. From this wide upper portion the ports decrease in width and increase in depth down to the point where they merge into their respective inlet and outlet pipes, thus the volumetric capacity of the two ports remains constant throughout their length.

Secured to the peripheral wall 15 of the casing by bolts 25 are end plates 26 and 27. The plate 26 has an inwardly projecting stub shaft 28 which is centered on the axis Y. A bearing cap 30 is formed on the outer face of the end

plate 27, this cap also being disposed on the axis Y. The cap 30 has an end wall opening 31 and encloses a bearing 32.

The casing 10 journals a rotor 35 which has a cylindrical body made up of portions 35A and 35B. These rotor portions are of equal width and they are fastened together in face to face contact by means of bolts 36, see FIG. 4. Portion 35A has a through bore 38 which is fitted with a bearing 39 to rotatably mount this side of the rotor on the shaft 28. A boss 41 is integrally formed on the portion 35B and is journalled in the bearing 32 carried by the cap 30. Extending outwardly from the boss 41 and through the opening 31 is a driven shaft 42.

The side faces 44 of the rotor are both fitted with a pair of sealing rings 45 and these rings are received in complementary grooves 46 cut in the adjacent faces of the end plates 26 and 27. Thus a pumping chamber 48 is defined between the periphery 49 of the rotor and the surface 16 of the casing, which chamber is sealed by the rings 45 and communicates with the exterior of the casing only through the ports 17 and 18. It will be noticed, particularly in FIG. 1, that the rotor periphery 49 is eccentric to the surface 16 and is concentric to the surface 22 of the inlet and outlet ports. The abutting faces of the rotor portions are both counterbored to provide a cylindrical recess 51. A number of radially disposed slots 52 are formed in the rotor which slots communicate with the recess 51.

Referring now to FIGS. 2 and 5 it will be seen that the inner end of the stub shaft 28 has an internally threaded opening 54, the axis of which coincides with the casing axis X. A flanged spindle 55 is secured to the stub shaft by a bolt 56 which extends through the bore 57 of the spindle and is received in the opening 54. The spindle serves to support a roller bearing 58 and mounted on this bearing is a wheel 59 having a centrally disposed peripheral flange 60. The spindle 55, bearing 58 and wheel 59 are secured together as a unit by rings 61 and grub screws 62.

Mounted in each of the rotor slots 52 is a vane 65 made of a tough, hard wearing material such as a plastic or the like. The vane has an inner part 65A which is forked as at 66 to fit over the flange 60 of the wheel 59. A hinge pin 67 secures the forked end 66 to this flange. The outer part 65B making up the remainder of the vane is a flat rectangular block of material which closely fits the sides of its slot 52. A very slight clearance which may be in the order of a few thousandths of an inch is provided between the side edges and the outer edge of the part 65B and the adjacent surfaces of the casing. A central groove 68 in the part 65B receives the outer end of the part 65A and a hinge pin 69 secures these two vane parts together.

In the modified form of the rotary pump as shown in FIGS. 6 and 7 the casing 10^1 has a longitudinal axis X^1 and the surface 16^1 is concentric about this axis as before. The casing 10^1 is fitted with plates 72 and 73 which have bores both being centered on an axis Y^1. A single piece rotor 78 is mounted in the casing with its driven shaft 79 extending out through the bore 75 and being suitably journalled therein. The rotor has a cylindrical recess 80 which extends in from the rotor face 81 and three radial slots 82 are formed on the rotor to communicate with this recess. The face 81 has arcuate flanges 83 which project into a recess 85 formed in the end plate 72.

End plate 72 is fitted with a shaft 87 which is non-rotatably secured in the bore 74 by a grub screw 88. This shaft carries a bearing 89 which is housed within the recess 85 with its outer race supporting the flanges 83 of the rotor. The inner end of the shaft 87 is fitted with

a spindle **90** which bridges the recess **80** and this spindle is located on the axis X^1.

Each rotor slot **82** is fitted with a vane **92** consisting of an inner part **93** and an outer part **94**. Part **94** is grooved as at **95** to receive the part **93** and the two parts are connected together by a hinge pin **96**. The radial inner ends of the parts **93** are provided with forks **98** and the forks have openings **99** through which the spindle **90** rotatably projects. In FIG. 6 it will be seen that the transverse spacing of the forks **98** differs for each vane part so that the forks will mesh together on the spindle and occupy a space substantially equal to the total width of the vanes.

FIG. 8 shows a modified rotor **101** which has a cylindrical recess **102** and four radial slots **103** equi-distantly spaced about the circumference of the rotor and extending into said recess. This rotor is fitted with two members **105** each consisting of a pair of vanes **106** which are connected together by a bar **107**. The members are mounted in the rotor with the pairs of vanes lodged in opposing slots **103** and with the bars **107** extending across the recess **102** in the form of a cross.

The rotor **101** is adapted to be installed in a casing, not shown, which could be similar in design to the casing 10^1. However the end plate **72** of this casing would be replaced by one having simply a plane inner surface. Since the members **105** are not directly connected to a spindle but are fully floating within the rotor the outer edges of the vanes will be in rubbing contact with the inner surface of the casing during at least part of the vane travel.

In operating the main embodiment of the rotary pump the shaft **42** is coupled to the drive shaft of an electric motor. No reducer is required as part of this coupling since the pump is adapted to operate at the normal running speed of the motor. It may be assumed that the pipe **19** is suitably screened to serve as an air intake and that the pipe **20** is directly connected to the point of discharge.

As the rotor is driven in the direction of arrow A of FIG. 1, the vanes are rotated to progressively sweep the chamber **48** and the ports **17** and **18**. Since the vanes are firmly anchored to the ball bearing mounted wheel **59** and are not actually in sliding contact with the casing walls very little effort is required to rotate the vanes in this manner. The vanes reciprocate to some extent in the slots **52**, this movement obviously being equal to twice the distance between the axes X and Y. In addition the two parts making up the vanes will swing very slightly about the hinge pins **67** and **69** but the friction produced by this and the above mentioned sliding movement is, of course, negligible.

Air is drawn in through the port **17** and is propelled around the chamber **48** and out through the port **18** at a high rate of speed. As previously mentioned the volume of the inlet outlet ports is substantially constant throughout their length and it will be noted that the combined port volumes is approximately equal to the volume of the pumping chamber. Thus, there is little or no suction and compression effect within the casing and this coupled with the absence of friction ensures a particularly cool running pump. Since so little heat is generated by the present pump water jacketing or cooling vanes on the casing are unnecessary.

The modified pump 10^1 is particularly intended for use in pumping water or other fluids and its operation is similar to the preferred pump as above described. The rotor **78** impells the vanes so that they rotate around the spindle **90**. In so doing water is drawn into the casing and is discharged therefrom at a high rate of speed. By virtue

of the simplicity of its design it has been found that the pump 10^1 may be run for extended periods without danger of breakdown or loss of efficiency.

In operation, the modified rotor **101** is driven as before, the member **105** being free to slide back and forth with their rotor slots. Centrifugal force tends to keep the outer edges of the vanes in contact with the adjoining casing wall. However since the vanes are connected together in pairs the edges are only lightly pressed against the wall. As a result little friction is produced or heat generated and again the casing is not required to be cooled.

What I claim is:

1. A rotary pump comprising a cylindrical casing having a side wall and end plates, said side wall having an inlet port and an outlet port, said ports each having an arcuate surface part of which is eccentric to the inner surface of the side wall, a cylindrical rotor journalled in the end plates, a driven shaft on the rotor projecting through an end plate, the periphery of the rotor being eccentrically disposed to the inner surface of the side wall and defining therewith a pumping chamber, said pumping chamber having a volume substantially equal to the combined volumes of the inlet and outlet ports, said rotor having a central recess and radial slots communicating between the central recess and the pumping chamber, a spindle carried by an end plate and extending into the central recess, said spindle being concentrically disposed to the inner surface of the side wall, a vane slidably mounted in each of the radial slots and means operatively connecting the radial inner end of each vane to the spindle.

2. A rotary pump as claimed in claim **1**, wherein the volumes of the inlet and outlet ports are substantially constant throughout their length.

3. A rotary pump comprising a cylindrical casing having a side wall and end plates, said side wall having an inlet port and an outlet port, said ports each having an arcuate surface part of which is eccentric to the inner surface of the side wall, a cylindrical rotor journalled in the end plates, a driven shaft on the rotor projecting through an end plate, the periphery of the rotor being eccentrically disposed to the inner surface of the side wall and defining therewith a pumping chamber, said pumping chamber having a volume substantially equal to the combined volumes of the inlet and outlet ports, said rotor having a central recess and radial slots communicating between the central recess and the pumping chamber, a pair of members disposed at right angles to one another, said pair of members each consisting of end vanes having free sliding movement in opposing slots and a connecting bar extending across the recess.

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