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3,671,136

MULTICOMPARTMENT PUMP STRUCTURE

Filed Feb. 30, 1970

2 Sheets-Sheet 1

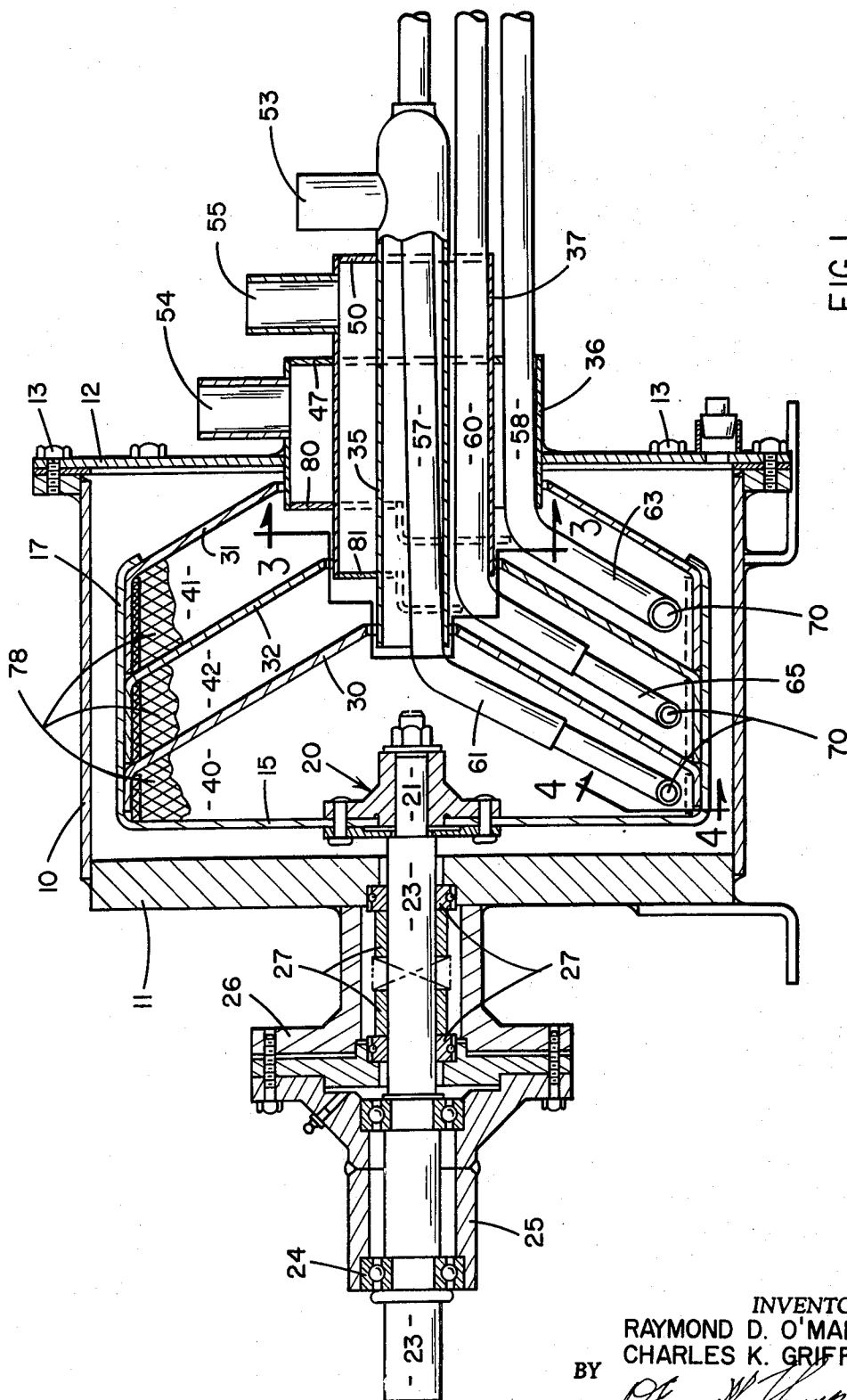


FIG. 1

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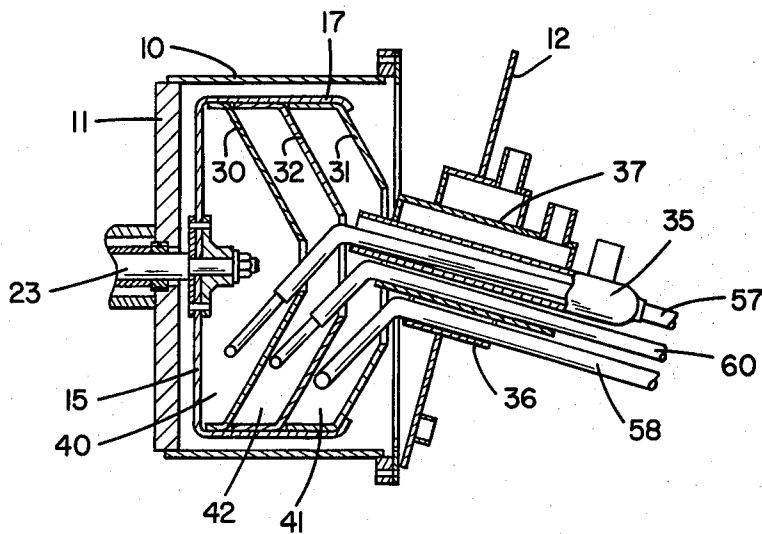


FIG. 2

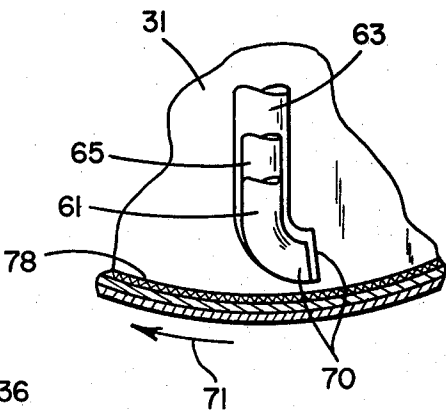


FIG. 4

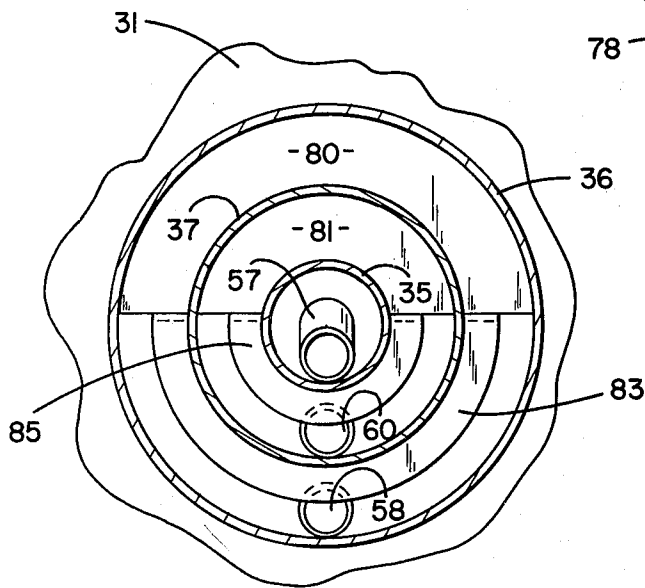


FIG. 3

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MULTICOMPARTMENT PUMP STRUCTURE

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9 Claims

ABSTRACT OF THE DISCLOSURE

A cylindrical cup-shaped rotor is journaled in a closed casing and has a plurality of axially spaced-apart, frusto-conical partition members forming fluid receiving compartments. An assemblage of inlet tubes is arranged in concentrically spaced relation about the axis of the rotor. The inlet tubes convey liquid to the rotor compartments respectively. A discharge tube is associated with each inlet tube and is formed with an inner end portion extending toward the periphery of the compartment supplied with liquid by the inlet tube with which the discharge tube is associated. The inner end portions of the discharge tubes incline in a direction from the axis of the rotor on an angle comparable to the partition members and have fluid pickup heads positioned contiguous to the periphery of the rotor compartments. The inner ends of the discharge tubes are arranged in a common plane.

BACKGROUND OF THE INVENTION

So-called scoop pumps have advantages when used in certain pumping installations. Such pumps, involving one stage or pumping compartment, are constructed at low cost and are relatively free from maintenance. However, when such pumps embody two or more pumping stages or compartments, and are operated by a single or common power source for simultaneously pumping different liquids, the cost of construction becomes high. This is due to the fact that in presently known designs, the components and parts of the pump must be assembled individually to obtain the close clearance which are important in scoop pump operation. The pump of our invention embodies a structural arrangement consisting of two assemblies, each of which is completely prefabricated prior to being incorporated into the complete pump structure.

SUMMARY OF THE INVENTION

A preformed rotor assembly, including a plurality of frusto-conical partition members forming individual compartments, is rotatably mounted in a casing. A preformed assembly of inlet and discharge tubes is attached to the casing and serves to pass liquid to the respective rotor compartments and to discharge liquid therefrom.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a lengthwise sectional view of a pump structure embodying our invention;

FIG. 2 is a view similar to FIG. 1, but in a reduced scale, illustrating the inlet and discharge tube assembly being inserted in the rotor assembly;

FIG. 3 is a view taken on line 3—3 of FIG. 1; and

FIG. 4 is a view taken on line 4—4 of FIG. 1, showing the inner end portions of the discharge tubes, the con-

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tiguous portions of partition members 30, 32 being omitted.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The pump consists of a casing, illustrated FIG. 1, as having a cylindrical side wall 10, to one end of which there is fixedly secured, as by welding, an inner end wall 11. An outer end wall 12 is detachably secured to the opposite end of the cylindrical side wall as by cap screws 13.

A rotor assembly is mounted on the inner wall for rotation about the axis of the casing. The rotor assembly consists of a discoidal, radially extending end wall 15, to the periphery of which there is attached a cylindrical, axially extending wall 17 forming a cup-shaped member with the open side confronting the end wall 12. The discoidal end wall of the rotor is affixed to a collar structure 20 mounted on an inner portion 21 of a drive shaft 23. The shaft 23 is journaled in bearings 24 mounted in a housing 25 attached to a hub 26 fixed to the end wall as by welding. Seals 27 are mounted in the hub member 26 and serve to prevent outward leakage from the casing along the shaft 23. The outer end of the shaft 23 is connected to a prime mover, such as electric motor, to effect rotation of the rotor assembly.

Inner, outer and intermediate partition members 30, 31 and 32, of frusto-conical form, are fixedly mounted in the cylindrical portion 17 of the rotor. The truncated ends of the partition members 30—32 are in confronting relation to outer end wall 12.

Inner, outer and intermediate inlet tubes 35, 36 and 37 are mounted in the outer end wall 12. These inlet tubes are arranged in spaced concentric relation about the axis of the rotor. The partition members 30—32 form compartments 40, 41 and 42. The outermost inlet tube 36 is fixed in the end wall 12 as by welding, and the inner end of the tube 36 extends inwardly a short distance through the opening in the truncated end of the partition member 31.

The intermediate inlet tube 37 is fixedly mounted in an annular member 47, also fixed in the outer end of the outer tube 36. The inner end of the tube 37 extends inwardly a short distance through the opening in the truncated end of the partition member 32. The innermost inlet tube 35 is fixed in an annular member 50, which is also fixed in the intermediate tube 37. This tube 35 extends inwardly a short distance through the opening in the truncated end of the partition member 30. The tubes 35, 36 and 37 are connected to supply nipples 53, 54, 55, which in turn are connected to lines extending to the apparatus with which the pump is used. With this arrangement, it will be apparent that the inlet tubes 35—37 supply liquid to the compartments 40, 41, 42 respectively.

A discharge tube is associated with each inlet tube, there being a discharge tube 57 associated with the inlet tube 35, a discharge tube 58 associated with the inlet tube 36, and a discharge tube 60 associated with the intermediate inlet tube 37. As shown in FIG. 1, the discharge tubes may be conveniently arranged by being mounted inside of the respective inlet tubes.

The discharge tube 57 is formed with an inner end portion 61 inclining in a direction from the axis of the rotor assembly toward cylindrical portion 17, and termi-

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nating in proximity thereto. In like manner, the inlet tube 58 has an inner end portion 63 arranged in the compartment 41, and the discharge tube 60 is formed with an inner end portion 65 extending into the compartment 42. The inner end portions 61, 63, 65 terminate in pickup heads 70, which face in a direction opposite to the direction of rotation of the rotor assembly indicated by the arrow 71, FIG. 4.

In operation the liquid supplied to the compartments 40, 41, 42 of the rotor assembly by the inlet tubes 35, 36 and 37 accumulates in an annular mass against the peripheries of the compartments, defined by the cylindrical portion 17 of the rotors, by centrifugal force brought about by high speed rotation of the rotor. To impart high velocity in the annular accumulations of liquids in the rotor compartment, ring members 78 formed of expanded sheet material may be fixedly mounted in the inner peripheral surfaces of the compartments 40, 41, 42. It will be apparent that the masses of liquids in the respective compartments, rotating at high speed, is forced through the pickup scoops 70 and outwardly through the discharge tubes 57, 58, 60.

The apertures at the truncated ends of the partition members are dimensioned for a relatively close running fit with the inner ends of the inlet tubes 35, 36 and 37.

Preferably, the axis of the shaft 23 is disposed horizontally. To restrain the flow of liquid from the outer intake tube 36 along the top outer surface of the intermediate tube 37, with the probability of the liquid entering the compartment 42, a semi-circular baffle 80 is sealed in the inner end of tube 36, and to the upper peripheral surface of the tube 37 (see FIGS. 1 and 3). The baffle 80 is spaced outwardly from the truncated end of partition member 32.

A similar baffle 81 is sealed in the outer end of the tube 37 and to the upper peripheral surface of the tube 35. This baffle being placed inwardly of the truncated end of the partition member 30. With these baffles 80, 81 a liquid is dispelled through the lower halves of the tubes 36 and 37.

In order to reduce the possibility of liquid flowing through the lower half of tube 36 and passing into the compartment 42 rather than the outer compartment 41, a semi-circular baffle 83 is sealed to the lower peripheral surface of the tube 37. This baffle 83 is formed with a radial dimension approximately one-half the radial distance between the tubes 36 and 37 and the baffle is located outwardly of the partition member 32.

A similar lower baffle 85 is sealed to the lower peripheral surface of the inner inlet tube 35 and serves to control the passage of liquid from the tube 37 into the inner compartment 40.

With the baffles 80, 81, 83 and 85 so arranged there is substantially no transfer of liquid from the inlet tubes other than to the respective, intended compartments.

With the inner ends 61, 63, 65 of the outlet tubes arranged in a common plane as illustrated in FIG. 4 of the drawing, the entire tube assembly including the end plate 12, the inlet tubing 35, 36, 37 and the outlet tubes 57, 58 and 60 may be completely prefabricated and attached to the casing of the pump. With the inner ends of the outlet tube arranged in line, they may be inserted through the truncated ends of the partition members 30, 31, 32 with the assembly disposed in angular relation to the axis of shaft 23 as illustrated in FIG. 2. This assembly during insertion is swung about the lower edge of the plate 12 until the end plate is moved into engagement with the edge of the casing whereupon it is secured by cap screws 13.

This structural arrangement permits the rotor to be completely prefabricated and then mounted as an assembly on the inner end of the shaft 23. It also permits the inlet and outlet tube assembly to be completely prefabricated and attached as a unit to the casing. It will

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be apparent that upon removal of the cap screws 13 the inlet and outlet tube assembly may be conveniently removed from the pump for repair or replacement.

While we have described a preferred embodiment of the invention, it will be understood the invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

We claim:

1. A multicompartment pump structure for simultaneously pumping a plurality of different fluids comprising a hollow casing; an inner end wall sealed to one end of said casing; an outer end wall sealed to the opposite end of said casing; a rotor assembly mounted within said hollow casing and journaled for rotation about an axis extending normal to said wall; said rotor assembly comprising a radial wall portion and a cylindrical wall portion extending from the peripheral edge of said radial wall portion toward said outer end wall; inner and outer partition members fixed in said cylindrical portion in axially spaced apart relation, said partition members being of frusto-conical form having truncated ends of said partition members open and confronting said outer end wall, said partition members forming inner and outer fluid compartments in said rotor, inlet passage means mounted on said outer end wall for directing liquid through the open truncated ends of said partition members into each of said compartments, discharge passage means extending from each of said compartments and mounted on said outer end wall and including pickup members positioned in proximity to the peripheries of said compartment, the inner end portions of said discharge tubes inclining on an angle comparable to the inclination of said frusto-conical partition members, to facilitate assembly of said inlet and discharge members with said rotor member; and driving means having an operable connection to said rotor for effecting rotation thereof in said casing.

2. A pump structure as set forth in claim 1 wherein said inlet passage means consists of a plurality of inlet tubes extending through said outer end wall and being arranged in concentrically spaced apart relation about the axis of said rotor, said discharge passage means consists of a discharge tube associated with each of said inlet tubes and extending in a direction axially thereof, each of said discharge tubes being formed with an inner end portion disposed in the rotor compartment supplied with fluid by the inlet tube with which the outlet tube is associated.

3. A pump structure as set forth in claim 2 wherein the inner inclined end portions of said discharge tubes are arranged in a common plane.

4. A pump structure as set forth in claim 2 wherein the openings at the truncated ends of said partition members are dimensioned for a running fit with the inner ends of said inlet tubes respectively.

5. A pump structure as set forth in claim 2 wherein said discharge tubes are mounted within said inlet tubes.

6. A pump structure as set forth in claim 2 and including a semi-circular imperforate baffle mounted in the space between the inner end of each of said inlet tubes and the discharge tube inwardly adjacent thereto.

7. A pump structure as set forth in claim 7 wherein said baffles are positioned in an area diametrically opposite the area in which said discharge tubes are located.

8. A pump structure as set forth in claim 2 wherein said inlet and discharge tubes are permanently sealed in said outer wall and said outer wall is detachably secured to said cylindrical casing.

9. A multicompartment pump structure as set forth in claim 1 wherein said rotor is mounted for rotation about a horizontal axis, including inner, outer and intermediate partition members forming inner, outer and intermediate compartments, said inlet passage means consists of inner, outer and intermediate inlet tubes arranged in concentrically spaced apart relation about the axis of said

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rotor and extending inwardly through said outer end wall and through the truncated ends of the said frusto-conical partition members for passage of liquid into said compartments respectively, semi-circular baffle members positioned on the lower sides of said inner and intermediate inlet tubes outwardly of the truncated ends of said inner and intermediate conical partition members, said baffle members having a radial dimension less than the radial spacing between said inner and intermediate inlet tubes and between said intermediate and outer inlet tubes.

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C. J. HUSAR, Primary Examiner

U.S. Cl. X.R.

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