May 31, 1966 E. E. COOK 3,253,546

COMBINATION SIDE AND END PORT PUMP

Filed Oct. 30, 1963 2 Sheets-Sheet 1

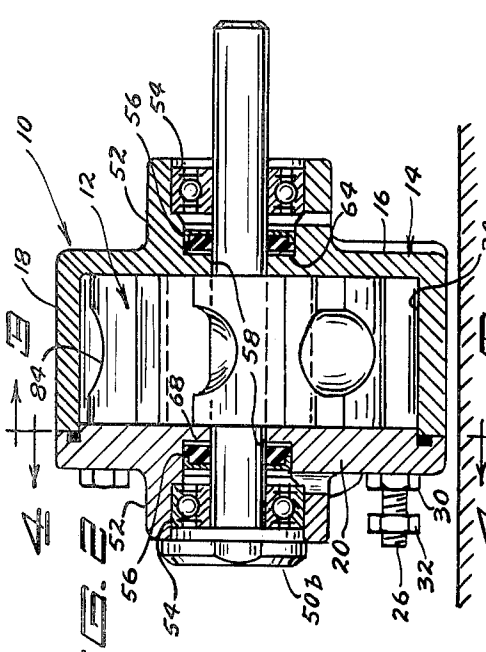


FIG. 2

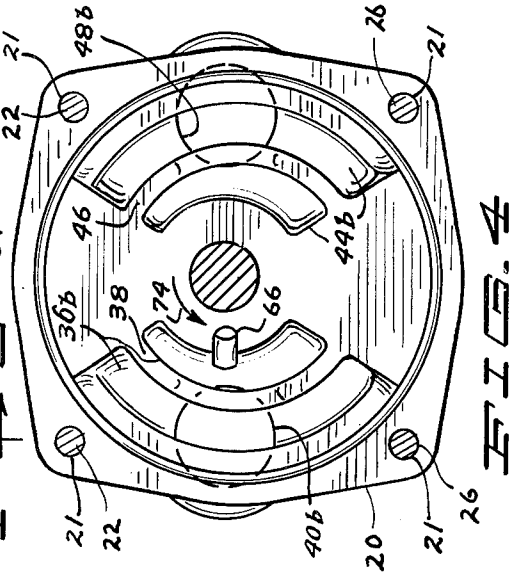


FIG. 4

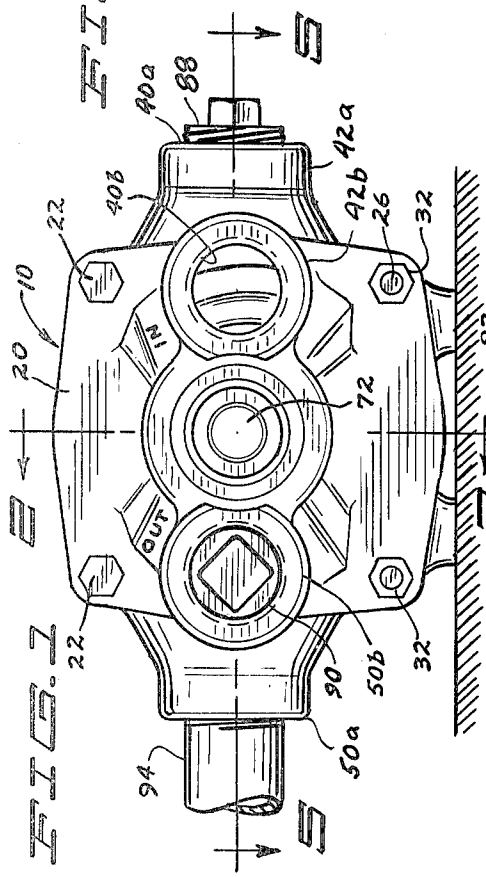


FIG. 7

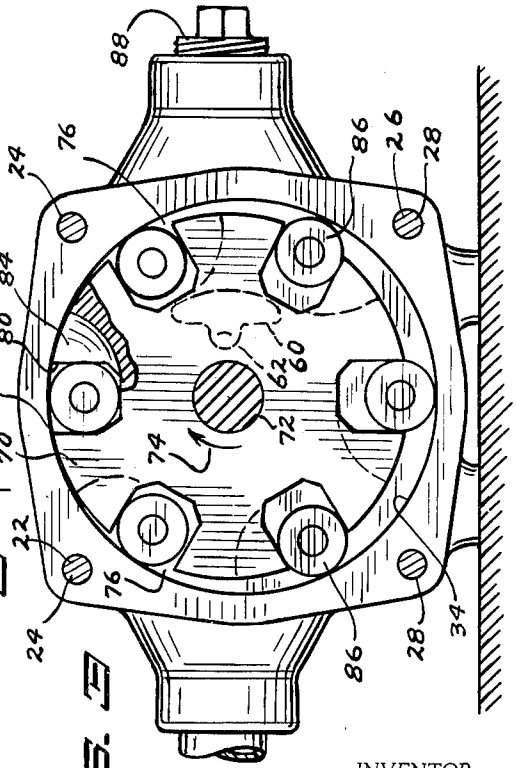


FIG. 3

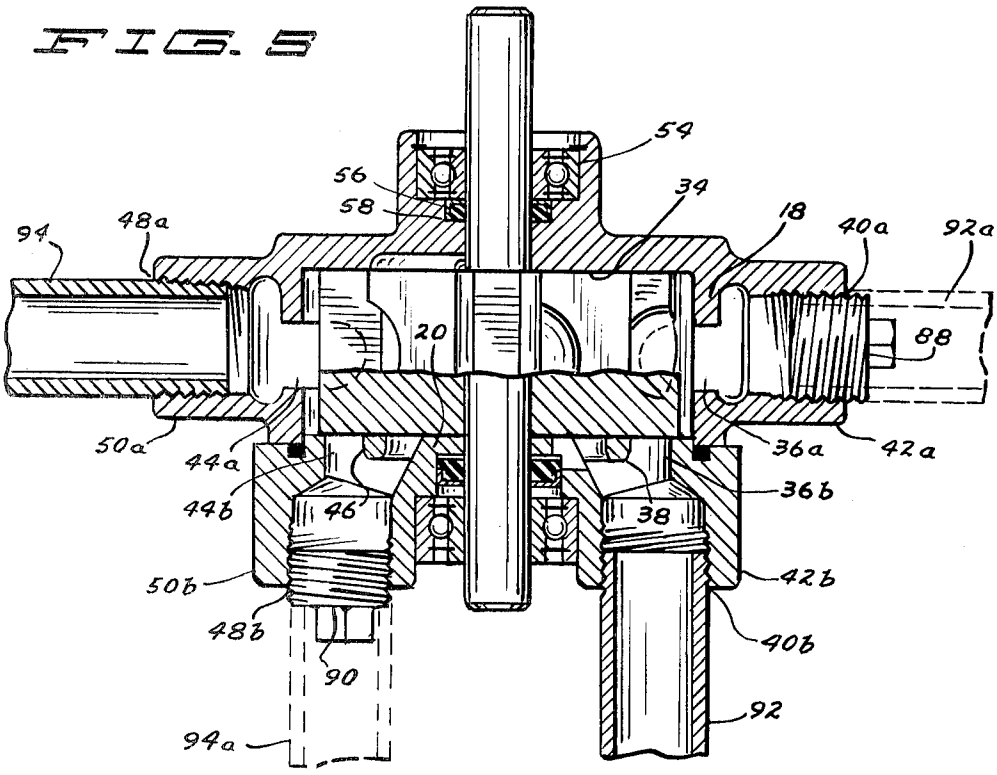
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FIG. 5



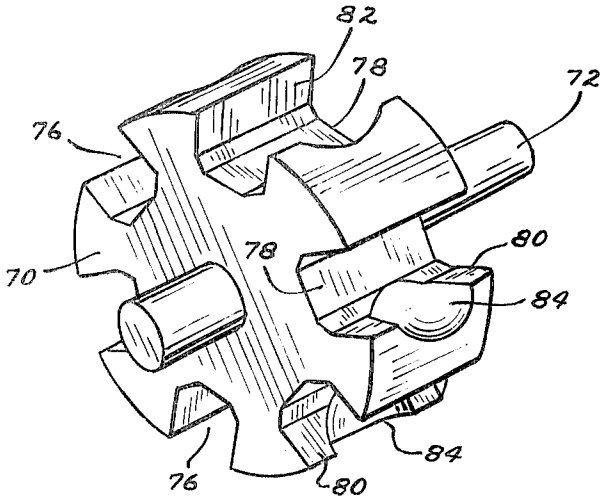


FIG. 6

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COMBINATION SIDE AND END PORT PUMP

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3 Claims. (Cl. 103—2)

This invention relates generally to rotary pumps and pertains more particularly to a rotary pump of the type employing free-floating roller elements.

The present invention has for one important object the provision of a rotary pump possessing considerable versatility in that it is directly provided with both side and end ports, thereby allowing the user a choice as to which ports are to be utilized. It will be appreciated that in a number of instances, pumps are installed in confined quarters, the connecting of appropriate supply and discharge piping being quite difficult where the space is severely limited. Even where sufficient space exists to make the appropriate pipe bends, the use of the extra pipe runs and the necessary fittings unnecessarily increase the installation costs. Therefore, it is an aim of the invention to provide multiple inlets and outlets so that the most efficient and effective connections can be made.

Another object of the invention is to provide a rotary pump with combination side and end ports which can be incorporated into the pump with little or no increase in manufacturing costs.

While the invention envisages a pump that will itself be efficient in its operation, the invention further has for an object the provision of a pumping system in which velocity losses are minimized. More specifically, by selecting the most direct route for the fluid, piping bends or turns can be eliminated which would otherwise cause unnecessary velocity losses. In the instant invention, the fluid flow is initially directed in the proper general direction as velocity is imparted to the fluid.

These and other objects and advantages of the invention will more fully appear from the following description, made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the several views and in which:

FIGURE 1 is an end elevational view of a pump construction exemplifying the invention, the side inlet being shown in a blocked or plugged condition and the end outlet being similarly plugged or blocked;

FIGURE 2 is a vertical section of the pump taken in the direction of line 2—2 of FIGURE 1;

FIGURE 3 is a view corresponding to FIGURE 1 but with the detachable end wall or face plate being removed, the view being taken in the direction of line 3—3 of FIGURE 2;

FIGURE 4 is a view of the inside face of the detachable end wall or face plate, the view being taken in the direction of line 4—4 of FIGURE 2;

FIGURE 5 is a horizontal sectional view taken in the direction of line 5—5 of FIGURE 1, and

FIGURE 6 is a perspective view of a rotor and rotor shaft, the view illustrating the recesses that are associated with the leading faces of the various slots formed in the rotor.

Referring now in detail to the drawings, the rotary pump selected to illustrate the invention comprises a housing 10 and a rotor assemblage 12 journaled therein. The housing 10 includes a cup-shaped body 14 having an integral plate or end wall 16 and an intermediate circumferential wall 18. Additionally, the housing 10 includes a removable or detachable face plate or end wall 20. The end wall 20 is provided with four quadrantly spaced holes 21 (FIGURE 4). The upper two holes accommodate a

pair of tap screws 22 that extend into two tapped upper holes 24 (FIGURE 3) located in the cup-shaped body 14. In a somewhat similar fashion, a pair of threaded studs 26 are anchored in a pair of tapped lower holes 28 in the cup-shaped body 14. Threaded onto the studs 26 are a pair of set nuts 30 which cooperate in holding the face plate or end wall 20 against the cup-shaped body 14. The studs 26 also function as mounting means for attaching the entire pump to a mounting fixture (not shown), a pair of retaining nuts 32 acting in this capacity.

The integral end wall 16 and the intermediate circumferential wall 18 of the cup-shaped body 14 in combination with the removable end wall 20 form a cylindrical pumping chamber 34. Leading into the pumping chamber 34 from one side is an inlet port 36*a* (FIGURE 5) located in the wall 18. An end inlet port 36*b* (FIGURES 4 and 5) leads into the pumping chamber 34 through the wall 20. As best viewed in FIGURES 4 and 5, the end inlet port is divided by reason of an arcuate rib 38. The side inlet port 36*a* has direct communication with an inlet 40*a*, whereas the end inlet port 36*b* has direct communication with an inlet 40*b*. The inlet 40*a* is formed by reason of an internally threaded boss 42*a*, and the inlet 40*b* is similarly formed by an internally threaded boss 42*b*. A side outlet port 44*a* (FIGURE 5) is formed in the wall 18 and an end outlet port 44*b* (FIGURES 4 and 5) is provided in the wall 20. As with the end inlet port 36*b*, the end outlet port 44*b* is divided by an arcuate rib, the rib bearing the reference numeral 46. Directly communicating with the outlet ports 44*a*, 44*b* are outlets 48*a*, 48*b*, respectively, which are formed by reason of internally threaded bosses 50*a* and 50*b*.

As can be discerned from FIGURE 2, the end walls 16, 20 are provided with oppositely directed bosses 52, each of which contains a bearing 54 and a shaft seal 56. These walls 16, 20 additionally include aligned shaft openings 58. The end wall 16 is formed with a shallow cavity 60 (FIGURE 3) which communicates with a small passageway 62 leading from a space or void 64 between the end wall 16 and the shaft seal 56 nearest thereto, the passageway extending to a point of reduced pressure within the pumping chamber 34. In a similar fashion, a passageway 66 in the wall 20 extends from a space or void 68 between the wall 20 and the seal 56 adjacent thereto to the inlet port 36*b* which is, of course, at a point of reduced pressure.

Describing now the rotor assemblage 12, it will be perceived that this assemblage includes a rotor body 70 appropriately secured, as by key means (not shown), to a shaft 72 passing through the previously mentioned shaft openings 58 and being journaled in the bearings 54. The shaft is driven by a source of rotative power (not shown), in the direction indicated by the arrow 74. In other words, the shaft 72 and the rotor body 70 mounted thereon are rotated in a clockwise direction as viewed in FIGURES 1, 3 and 6 (and counterclockwise as viewed in FIGURE 4). As is customary in pumps of this type, the axis of rotation of the rotor body 70 is offset from the central axis of the cylindrical pumping chamber 34.

From FIGURES 3 and 6, it can be seen that the rotor body 70 is formed with a plurality of roller receiving slots 76 that extend radially inwardly from the periphery of the rotor and also extend throughout the width thereof. In other words, the slots 76 are co-extensive in length with the length of the cylindrical pumping chamber 34. The slots 76, therefore, each have a bottom 78 and a leading face 80 and a trailing face 82, the leading and trailing faces 80 and 82 being parallel with respect to each other. The leading face, though, is formed with a recess 84 extending from the bottom 78 in each instance to the circumference or periphery of the rotor body 70. As will

presently be made manifest, the various recesses **84** play an important role in practicing the invention inasmuch as they permit fluid flow to take place between either or both of the outlet ports **44***a*, **44***b*.

Disposed in each of the slots **76**, and co-extensive with the length thereof, is a cylindrical roller element **86** that is movable inwardly and outwardly within its particular slot. The roller elements **86** sequentially produce the requisite pumping action as they move radially inwardly and outwardly with rotation of the rotor body **70**.

In the operation of the pump, the shaft **72**, together with the rotor body **70**, rotates in the direction of arrow **74**, this being in a clockwise direction, as viewed in FIGURES 1, 3 and 6. The various roller elements **86** are thrown outwardly by centrifugal force so as to ride against the inner surface of the circumferential wall **18**. In this regard, it will be remembered that the roller elements **86** are free to move in the slots **76**, the roller elements being carried along with the rotor by reason of the engagement of the roller elements with the respective trailing faces **82** of the slots **76**. The rotor body **70** has its ends residing in a proximal relationship with the end walls **16** and **20**. Hence, the roller elements **86** are prevented from shifting lengthwise of their axes.

As best seen in FIGURE 3, as the roller elements **86** move into juxtaposition with the inlet ports **36***a* and **36***b*, fluid will be drawn or sucked through the particular inlet ports **36***a*, **36***b* (or both) depending on which are unblocked or unplugged. Inasmuch as the side inlet port **30***a* is plugged as indicated at **88**, under these circumstances, the fluid will be drawn in via the end inlet port **36***b*. While under these assumed conditions, the fluid originally enters between the bottom **78** of the particular slots **76** passing past the inlet port **36***b*, the fluid is caused to be drawn into the space between the intermediate circumferential wall **18** and the periphery of the rotor body **70** due to the action derived from the preceding roller **86**. In this regard, it will be recalled that the leading face **82** of each slot **76** is formed with a recess **84** so that intercommunication is made possible.

As the roller elements **86** are progressively moved from a horizontal or three o'clock position to a bottom or six o'clock position, more and more fluid is drawn into the regions between the cylindrical roller elements **86** and the bottoms **78** of the various slots **76**. However, as the roller elements **86** are moved upwardly from their lowermost successive positions toward a horizontal or nine o'clock position, the region or volume between the intermediate circumferential wall **18** and the periphery of the rotor body **70** decreases, as is clearly visible in FIGURE 3, and the progressive decrease causes the entrapped fluid to be forced outwardly through the outlet port **44***a* inasmuch as the outlet port **44***b* is blocked by the plug **90**. It will be appreciated that any fluid between the roller elements **86** and the bottoms **78** of the slots **76** will be forced through the recesses **84**. Thus, communication is provided in such a fashion that the fluid will be discharged through the pipe **94**.

When the end inlet port **36***b* is blocked and the side inlet port **36***a* is open, the pipe **92***a* shown in phantom outline is connected to the internally threaded boss **42***a* and the plug **88** is placed in the boss **42***b*. Similarly, the pipe **94***a* can be utilized as the outlet conduit, the plug **90** then being positioned in the boss **50***a*.

In the modified situation mentioned above, it should be readily apparent that as the various roller elements **86** pass the inlet port **36***a*, fluid will be drawn into the region between the circumferential wall **18** and the periphery of the rotor body **70**. The fluid will be carried downwardly and after the roller elements **86** reach their lowermost position, this being the six o'clock position, then the confined fluid will be forced upwardly because the space between the circumferential wall **18** and the periphery of the rotor body **70** gradually decreases. Any fluid between the circumferential wall **18** and the periphery of the rotor body **70** will be forced through the various recesses **84** and thence outwardly through the now open outlet port **48***b*. It will be remembered that the plug **90** has for the sake of discussion been transposed from the boss **50***b* to **50***a*. Hence, fluid will be discharged under pressure through the pipe **92***a* shown in phantom outline in FIGURE 5.

While the pump herein shown will normally be operated with either the inlet port **36***a* or **36***b* open, it is contemplated that both of these ports under certain circumstances will be utilized. By the same token, while it is planned that either the outlet port **44***a* or **44***b* be used, there will be times when both of these ports will be open. Thus, it should be apparent that considerable versatility is possible when using a pump of the character disclosed herein.

It will, of course, be understood that various changes may be made in the form, details, arrangements and proportions of the parts without departing from the scope of the invention as set forth in the appended claims.

What is claimed is:

1. A combination side and end ported pump comprising:

(a) a housing having longitudinally spaced end walls and an intermediate circumferential wall defining a generally cylindrical pumping chamber,

(b) one of said end walls having first arcuately spaced inlet and outlet ports extending transversely therethrough, said first arcuately spaced inlet and outlet ports being disposed adjacent to the outer periphery of said end wall and generally radially inwardly of said circumferential wall,

(c) said circumferential wall having second arcuately spaced inlet and outlet ports, said first and said second inlet and outlet ports each having means for engaging pipes for individually accommodating the fluid capacity of the pump,

(d) a rotor rotatably mounted within said pumping chamber and having its axis in an offset parallel relation to that of said pumping chamber and having a length such as to extend from said one end wall to the other,

(e) said rotor having a plurality of roller receiving slots formed into and across the circumferential surface thereof, each slot having spaced, generally radially extending leading and trailing faces, and

(f) a roller received for free rotation in each of said slots, said slots communicating sequentially with each of said ports during rotation of said rotor,

(g) said leading and trailing faces being arranged to provide communication between said outlet ports and each of said slots when each of said rollers is moved into proximal relationship with said outlet ports, and

(h) whereby either or both of said inlet ports can be selectively connected to a source of fluid and either or both of said outlet ports can be used to discharge fluid therethrough.

2. A combination side and end ported pump comprising:

(a) a housing having longitudinally spaced end walls and an intermediate circumferential wall defining a generally cylindrical pumping chamber,

(b) one of said end walls having first arcuately spaced inlet and outlet ports extending transversely therethrough, said first arcuately spaced inlet and outlet ports being disposed adjacent to the outer periphery of said end wall and generally radially inwardly of said circumferential wall,

(c) said circumferential wall having second arcuately spaced inlet and outlet ports,

(d) a rotor rotatably mounted within said pumping chamber and having its axis in an offset parallel relation to that of said pumping chamber and having a length such as to extend from said one end wall to the other,

(e) said rotor having a plurality of roller receiving slots formed into and across the circumferential surface thereof providing a bottom and generally parallel leading and trailing faces when said rotor is rotated in one direction,

(f) a roller received for free rotation in each of said slots in close clearance with the faces thereof and substantially co-extensive in length with the length of said rotor, and

(g) passage means disposed within the slots of said rotor for providing communication within said housing and between said pumping chamber and slots so that fluid can be drawn into said pumping chamber and into said slots through either of said inlet ports and discharged through either of said outlet ports.

3. A combination side and end ported pump comprising:

(a) a housing having longitudinally spaced end walls and an intermediate circumferential wall defining a generally cylindrical pumping chamber,

(b) one of said end walls having first arcuately spaced inlet and outlet ports extending transversely therethrough, said first arcuately spaced inlet and outlet ports being disposed adjacent to the outer periphery of said end wall and generally radially inwardly of said circumferential wall,

(c) said circumferential wall having second arcuately spaced inlet and outlet ports,

(d) a rotor rotatably mounted within said pumping chamber and having its axis in an offset parallel relation to that of said pumping chamber and having a length such as to extend from said one end wall to the other,

(e) said rotor having a plurality of roller receiving slots formed into and across the circumferential surface

thereof providing a bottom and generally parallel leading and trailing faces when said rotor is rotated in one direction, and

(f) a roller received for free rotation in each of said slots in close clearance with the faces thereof and substantially co-extensive in length with the length of said rotor,

(g) the leading face of each slot having a recess therein extending from a locus radially inwardly of its received roller to a locus at the circumference of said rotor to provide communication between said outlet ports when each of said rollers is moved into a proximal relationship with said outlet ports,

(h) whereby either or both of said inlet ports can be selectively connected to a source of fluid and either or both of said outlet ports can be used to discharge fluid therethrough.

References Cited by the Examiner

UNITED STATES PATENTS

1,466,904	9/1923	Jackson	103—136
2,460,018	1/1949	Looke	103—136
2,520,724	8/1950	Jessop	103—136
2,765,745	10/1956	Sadler et al.	103—136
3,072,067	1/1963	Beller	103—136
3,119,345	1/1964	Cook	103—136
3,130,673	4/1964	Finstad	103—2

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