Dec. 16, 1952 C. MARK, JR 2,621,605

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Fig. 1

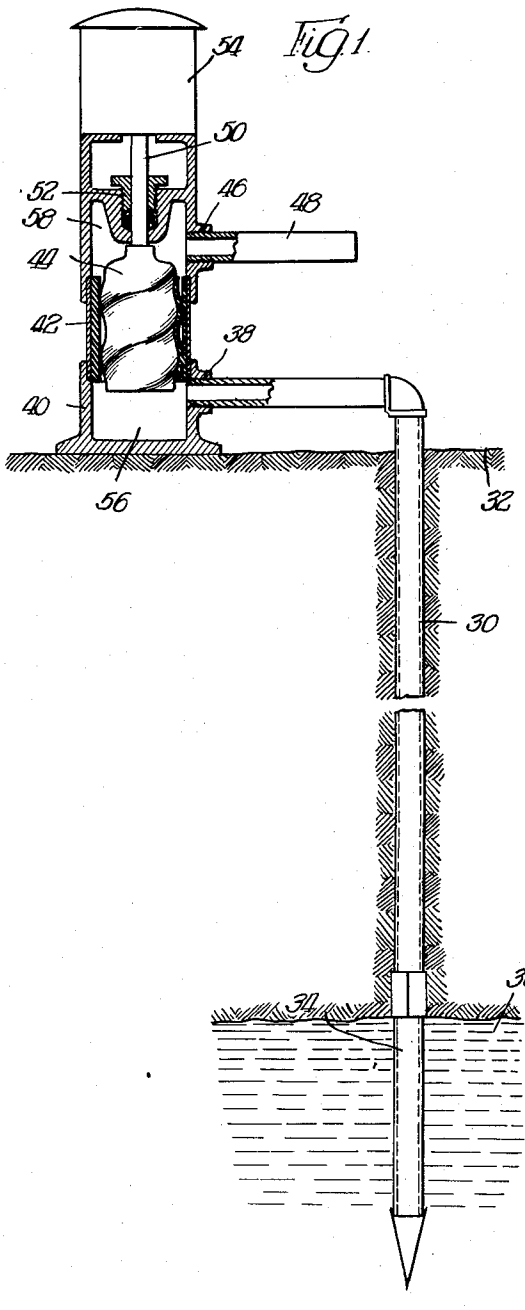
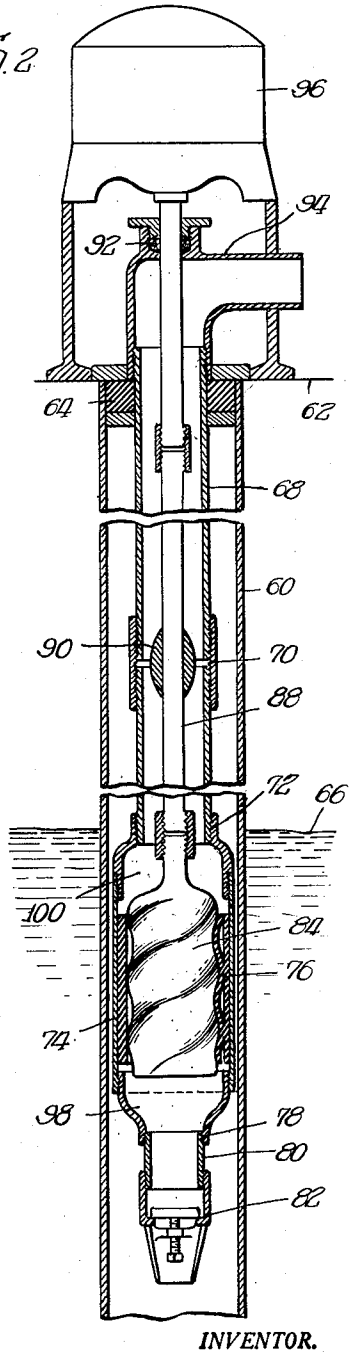


Fig. 2



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Fig. 3.

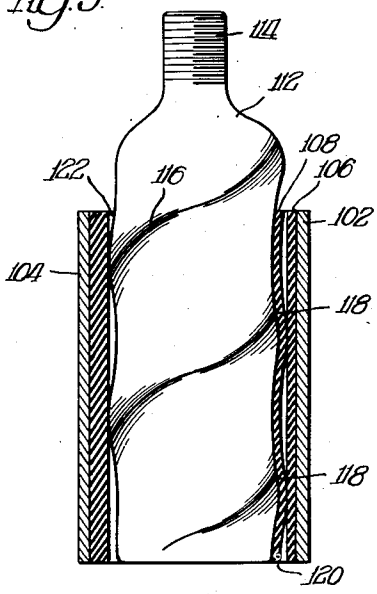


Fig. 7.

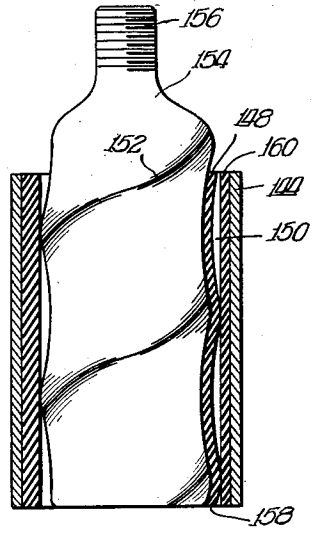


Fig. 4.

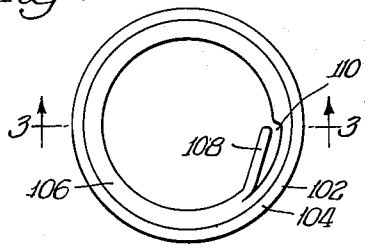


Fig. 8.

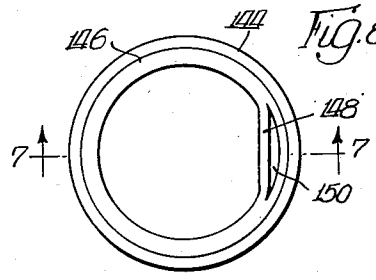


Fig. 5.

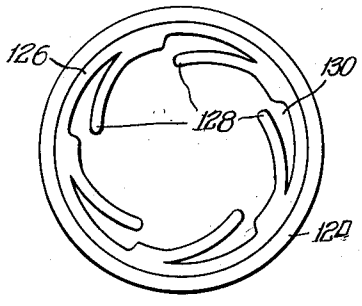
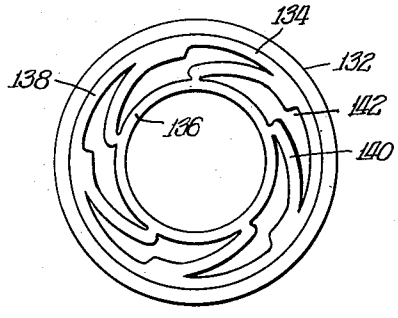


Fig. 6.



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Fig. 9.

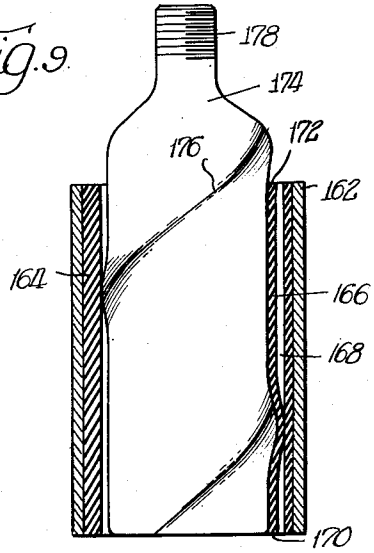


Fig. 11.

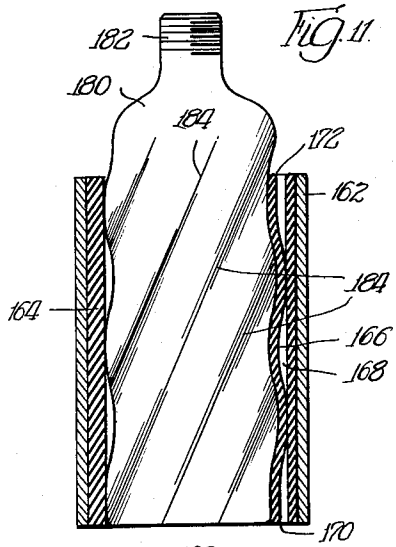


Fig. 10.

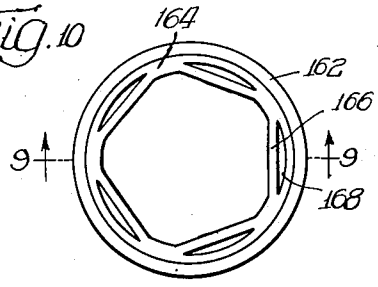


Fig. 12.

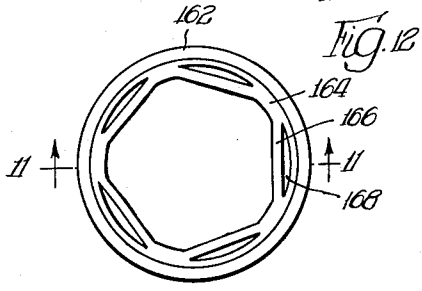


Fig. 13.

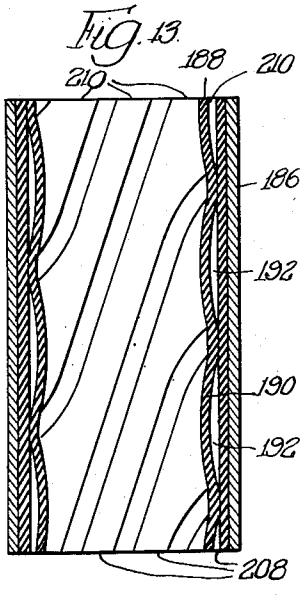
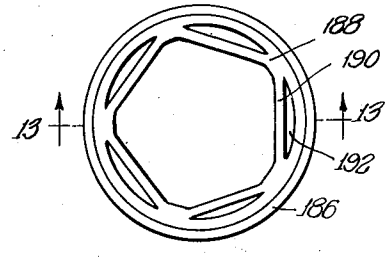


Fig. 14.



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Fig. 15.

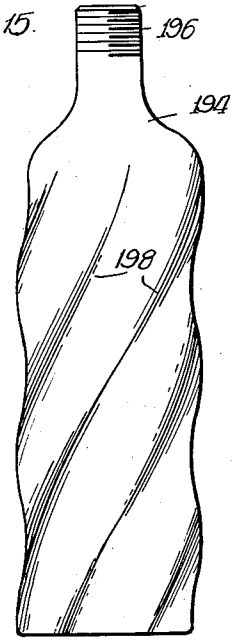


Fig. 16.

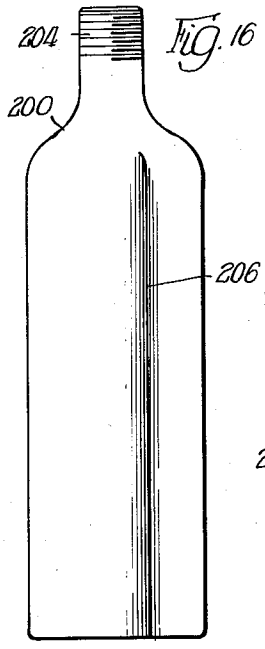


Fig. 18.

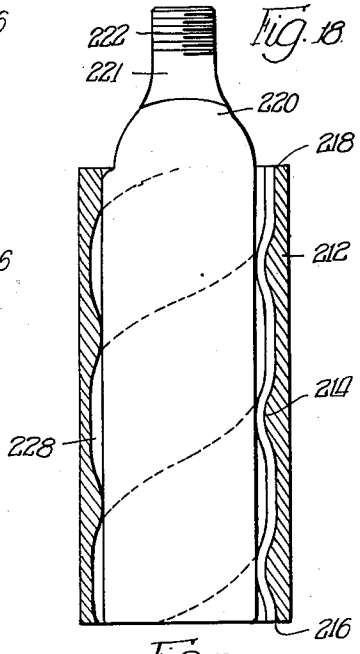


Fig. 17.

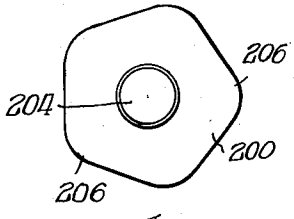


Fig. 19.

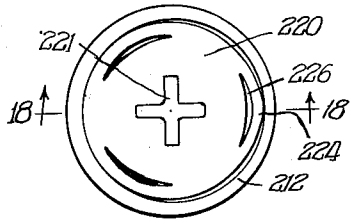


Fig. 20.

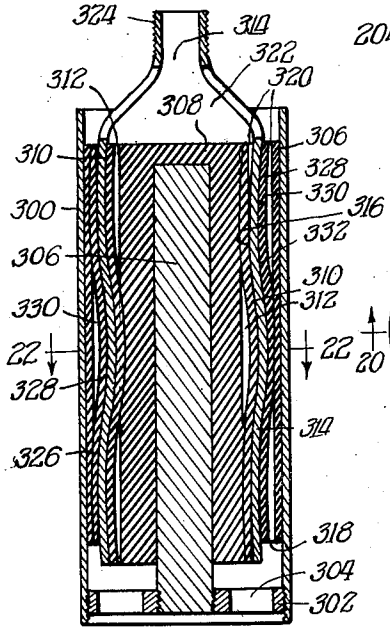


Fig. 21.

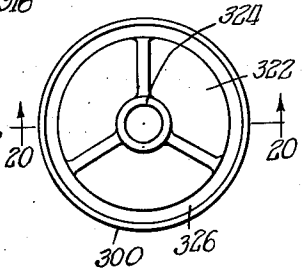
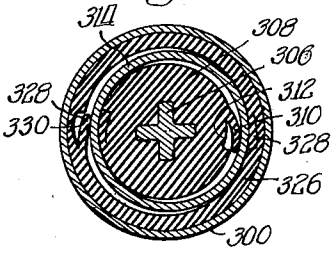


Fig. 22.



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Patented Dec. 16, 1952 2,621,605

UNITED STATES PATENT OFFICE

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Clayton Mark, Jr., Wilmette, Ill., assignor to Clayton Mark & Company, Evanston, Ill., a corporation of Delaware

Application October 12, 1945, Serial No. 621,908

23 Claims. (Cl. 103—149)

1

This invention pertains to pumps.

Heretofore there have been a number of types of pumps used to deliver liquid from both deep and shallow wells and for otherwise moving liquid, such as pumps of the centrifugal, turbine, jet, reciprocating, compressed air and gear types. Certain of these pumps are satisfactory for pushing liquid, while others are satisfactory for suction installations, but the pumps are not always suitable for various types of installations.

It is, therefore, an object of this invention to provide a rotary type pump suitable for pumping liquid from either deep or shallow wells and adapted for use as either a suction type pump, or a sump or deep well type pump.

Another object of the invention is to provide a pump which is inexpensive to manufacture and maintain, is very simple in construction and has a minimum of moving parts.

Another object of the invention is to provide a pump wherein the rotatable parts are in balance, and whereby it is possible to avoid the use of numerous bearings.

Another object of the invention is to provide a pump wherein friction between the relatively moving parts is reduced to a minimum, and wherein there is natural lubrication between the engaging surfaces of the rotor and stator.

Another object of the invention is to provide a pump of high efficiency that can be used at any desired pressure, thereby overcoming difficulties incident to the use of centrifugal, and jet pumps.

Another object of the invention is to provide a pump so constructed that it is capable of pumping sandy or muddy water, such as is necessary in clearing out a well, the pump being capable of pumping such sludge without damage to the pump.

Another object of the invention is to provide a pump comprising a rotor and stator wherein the stator is so arranged that it acts as a bearing for the rotor.

Another object of the invention is to provide a pump which can be operated by any convenient source of energy, such as a motor, gasoline engine, windmill or the like, and wherein the rotor can be operated at any practical, desired speed.

Another object of the invention is to provide a pump that is self-lubricating and wherein a steady stream of liquid is delivered instead of a pulsating stream.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out

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in the specification, drawings and claims appended hereto.

In the drawings which illustrate embodiments of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a fragmentary sectional elevation showing a pump embodying the invention applied to the suction pipe of a well and wherein the pump is utilized as a suction pump;

Figure 2 is a fragmentary sectional elevation showing the adaptation of the pump embodying the invention to a deep well installation;

Figure 3 is an enlarged sectional elevation through one form of pump embodying the invention, the section through the stator being taken substantially in the plane as indicated by the line 3—3 of Figure 4;

Figure 4 is a top plan view of the stator of the pump illustrated in Figure 3;

Figure 5 is a top plan view of a modified form of stator for a pump embodying the invention;

Figure 6 is a top plan view of another modified form of stator for a pump embodying the invention;

Figure 7 is an enlarged sectional elevation through another form of pump embodying the invention, the section through the stator being taken substantially in the plane as indicated by the line 7—7 of Figure 8;

Figure 8 is a top plan view of the stator of the pump illustrated in Figure 7;

Figure 9 is an enlarged sectional elevation through another form of pump embodying the invention, the section through the stator being taken substantially in the plane as indicated by the line 9—9 of Figure 10;

Figure 10 is a top plan view of the stator of the pump illustrated in Figure 9;

Figure 11 is an enlarged sectional elevation through another form of pump embodying the invention, the section through the stator being taken substantially in the plane as indicated by the line 11—11 of Figure 12;

Figure 12 is a top plan view of the stator of the pump illustrated in Figure 11;

Figure 13 is an enlarged sectional elevation through a modified form of stator for a pump embodying the invention, the section through the stator being taken substantially in the plane as indicated by the line 13—13 of Figure 14;

Figure 14 is a top plan view of the stator illustrated in Figure 13;

Figures 15 and 16 are elevations of modified forms of rotors adapted for use with the stator illustrated in Figures 13 and 14;

Figure 17 is a top plan view of the rotor illustrated in Figure 16;

Figure 18 is an enlarged sectional elevation through another form of pump embodying the invention, the section through the stator being taken substantially in the plane as indicated by the line 18—18 of Figure 19;

Figure 19 is a bottom plan view of the pump illustrated in Figure 18;

Figure 20 is a sectional elevation of another modified form of pump embodying the invention, the pump shown being a double acting type of pump, taken on line 20—20 of Figure 21;

Figure 21 is a top plan view of the pump shown in Figure 20; and

Figure 22 is a transverse sectional elevation of the pump shown in Figure 20, the same being taken substantially in the plane as indicated by the line 22—22 of Figure 20.

While two types of installations are illustrated in Figures 1 and 2, it is of course, understood that other types of installations are contemplated, such as a suction pump for petroleum products, or a sump pump for petroleum products. However, in Figure 1 an adaptation is illustrated wherein a suction type of pump is utilized, while in Figure 2 there is illustrated a type of pump for a deep well installation. Thus Figures 1 and 2 illustrate in principle different typical installations.

In Figure 1 the suction pipe 30 extends below the ground level 32 and is provided adjacent its lower end with the well point 34 which extends into the water strata 36. The upper end of the pipe 30 is connected to the inlet 38 of the pump 40. The pump 40 is provided with the stator 42, a portion of which forms a part of the pump casing, and the rotor 44 is adapted to rotate therein. The upper end of the pump casing is provided with the outlet 46 connected to the delivery pipe 48. The propeller shaft 50 is connected to the rotor 44 and extends through a suitable stuffing box 52 provided in the pump casing and is adapted to be rotated by the motor 54.

While a motor is shown in Figures 1 and 2, it is of course understood that any source of energy can be used, such as an electric motor, gas engine, windmill, etc. The rotor and stator are formed such as is particularly shown in Figures 3 to 20 inclusive, and the operation thereof will be more particularly described with respect to these figures.

Rotation of the rotor 44 by means of the motor 54 causes suction to lift the liquid through the suction pipe 30 into the suction chamber 56 of the pump, being then pumped by the cooperative relation between the rotor and stator to the pressure chamber 58 from whence it is delivered to the discharge pipe 48.

In the construction illustrated in Figure 2 the casing 60 extends below the ground level 62, being closed by the well cap 64, said casing extending to a point substantially below the liquid level 66 whereby liquid is adapted to enter the lower end of said casing. Drop pipe 68 extends through the well cap 64 and downwardly within the casing 60, and the sections of the drop pipe may be connected as desired as by couplings 70. The lower end of the drop pipe is connected as at 72 to the outlet of the pump casing 74.

The casing 74 is provided with the stator 76 of the construction such as shown in Figures 3 to 20 inclusive, to be later more particularly described, and the inlet of the casing is connected as at 78 to the suction stub 80 provided with the foot valve 82. The rotor 84 is rotatably mounted in the stator 76 and is adapted to be rotated by the line or propeller shaft 88 which extends upwardly, provided with suitable bearings 90 connected through suitable spiders at couplings 70, the upper end of the propeller shaft passing through the stuffing box 92 provided in the outlet fitting 94, being driven by the motor 96. As before pointed out, any source of energy may be used instead of the motor 96.

Rotation of the shaft 88, therefore, causes rotation of the rotor 84 which in turn causes the liquid to be supplied by the rotor 84 to the pressure chamber 100 of the pump casing from whence it is pumped upwardly through the drop pipe, being delivered to the outlet 94.

In the modification illustrated in Figures 3 and 4, the stator 102 comprises the outer metallic shell 104 to which is bonded the inner stator member 106, said member being of resilient material and being provided with a resilient seal means 108 which is a partition or flange biased inwardly of member 106 and extending lengthwise of the casing so that in effect it is a helical thread of infinite pitch.

The seal 108 is adapted to be received within the recess 110 formed in the member 106 whereby when the member 108 is moved wholly within the recess 110, a substantially circular inner surface is provided. The rotor 112 is adapted to rotate within the stator, a suitable shaft being secured thereto as by the thread 114, and said rotor is provided with a helical thread 116, said thread extending within the stator for substantially two and one-fifth (2⅕) turns, i. e., for at least two turns, plus an arc sufficient to span the seal 108. The outside diameter of the helical thread 116 makes a liquid tight fit with the internal diameter of the stator and rotation of the thread causes the resilient seal 108 to serially or gradually move within the recess 110 from the inlet to the outlet as shown at 118. In operation, therefore, the liquid between the body of the rotor and the internal diameter of the stator is confined by the adjacent turns of the helical thread into a long helical passageway extending from the inlet 120 to the outlet 122. Upon rotation of the rotor the seal 108 closes off this passageway to the inlet and forces the liquid up the channel to the outlet and upwardly between the threads and stator to the outlet. While the rotor 112 is disclosed as a metallic member and the inner stator member 106 is disclosed as a resilient member, it is of course understood that the rotor may be composed of resilient material with sealing means and recess such as 108 and 110, and the stator member 106 can be metallic and provided with an internal helical thread comparable to thread 116.

In the modification illustrated in Figure 5 the stator comprises the outer cylindrical metallic casing member 124 and the inner resilient member 126 bonded thereto. A rotor similar to rotor 112 is adapted to be used with the stator and instead of being provided with one seal 108 (Figure 4) and one recess 110, the resilient member 126 is provided with a plurality (shown five) of seals 128 each adapted to be received in a recess 130, upon movement of the rotor. In this instance the rotor, comparable to rotor 112, is provided with a thread which extends for 360° plus a sufficient distance to insure one seal being closed at all times, i. e., at least 360°, plus the spanning of two seals, or approximately one

and two fifths (1⅖) turns within the stator. In this instance, as well as in Figure 4, the thread is determined so as to close the passageway at two places between the inlet and outlet, whereby the sealing means will force the water along the passageway as the seal is gradually received in recess 110 or 130 from inlet to outlet.

The passageways from inlet to outlet in Figure 5, as well as in Figure 4, are formed between the helical threads of the rotor (or stator in case the parts are reversed) and the rubber element which forms the sealing means.

In the pump illustrated in Figure 6, the fluid passageways are not formed between the rotor and stator, but in the stator itself. In Figure 6 the stator comprises the outer metallic member 132 and the inner resilient stator member 134 bonded thereto. The inner member 134 is provided with the inner cylinder portion 136 connected to the outer cylinder portion 138 of the member 134 by the substantially diagonally extending partition members 140, similar to members 128, each of said members 140 being adapted to be depressed into recess 142. Passageways for the liquid to be pumped are thus formed wholly in the resilient element and the helical thread of the rotor acts as the sealing means to progressively collapse the passageways to force the liquid along said passageways. The rotor is provided with a thread of one and three-fifths (1⅗) turns within the stator, i. e., at least one turn, plus the width of the two passageways.

In Figures 7 and 8 a form of pump is shown which is designed to operate at higher pressures than the single seal pump shown in Figure 4. In this pump the stator comprises the outer cylindrical metallic member 144 and the inner resilient member 146 bonded thereto. At a predetermined point on the inner surface of the member 146 there is provided a partition 148 extending the length of the member 146, the partition 148 forming with the member 146 a passageway 150 of substantially segmental shape. The partition 148, as well as the partitions of the other modifications, preferably is so shaped that when the partition is displaced by the helical rotor, it fits within the recess formed by passageway 150 so that the inner surface of the partition forms a continuous circle with the inner surface of the member 146, so that when the partition is moved to engage the arcuate portion of the passageway 150 (as it is of segmental shape), the partition exactly fits, whereby there is substantially the same thickness of member 146 continuously for 360°. Thus the helical thread 152 of rotor 154 revolves against an essentially uniform diameter.

As before, the rotor is provided with connecting means 156 whereby it may be rotated and the seal (partition) must be crossed at least twice, plus the width of the seal or partition, by the helical thread within the stator. In this case rotation of the rotor entraps a non-compressible body of liquid in the passageway 150. The resilient material, being non-compressible, causes the sealed-off section of the material to fill the space between the successive thread crests of the helical screw and upon rotation of the rotor forces the liquid between threads from inlet 158 to outlet 160.

Thus the liquid is pumped both through the passageway and the area between the rotor and stator. Thus it may be said that the action of this type of pump is a combination of that of the pump illustrated in Figures 3 and 6, that is, the helical thread acts as a seal for the liquid forced up passageway 150 and at the same time passageway 150 acts as a seal forcing the liquid up the passageways formed in the rotor between the adjacent turns of the thread. Therefore, there is excellent lubrication for the rotor, and as the seal is made of non-compressible material, increased pumping pressure advances the sealing point to a point where it will hold the pumping pressure.

In the constructions illustrated in Figures 9 to 12 inclusive, the stator comprises the outer cylindrical metallic member 162 and the inner resilient member 164. Member 164 is provided with five seals, that is, five partitions 166 are molded in the resilient member providing five passageways 168, said passageways extending from the entrance 170 to the outlet 172.

In the construction illustrated in Figure 9, the rotor 174 is provided with the helical thread 176 and means 178 for connection to a drive shaft, the thread 176 in this case makes at least one and one-fifth (1⅕) revolutions within the stator plus a sufficient amount to overlap one partition or seal. Thus the thread makes substantially one and two-fifths (1⅖) revolutions in order that the operating seal will be closed twice in any possible position of the rotor. The thread therefor in the pump illustrated in Figures 9 and 10 can be much steeper than that shown in Figure 7 for example, so that one revolution of the rotor will deliver more liquid.

In this instance the rotor would operate one seal 166 at any one instance. If the rotor illustrated in Figure 7 were used in Figure 9 the amount of liquid delivered would be the same as that delivered by the pump in Figure 7, but there would be five seals operating at any one instance, so that the pump would deliver five times the operating pressure of the single seal pump and still deliver the same quantity of liquid.

The pump can be made with one or more seals built in the stator and all of them can be operated by a rotor having one or more threads. More than one thread is desirable on the rotor as it is then possible to obtain a balance of pressure on the sides of the rotor and stator.

While single thread rotors operate satisfactorily at low head pressures in a stator with any number of retractible seals, the forces acting on the rotor will not be balanced and high head pressure will tend to force the rotor out of center with respect to the stator. This will tend to cause a condition of vibration. Bearings can, of course, be used, but to eliminate the use of bearings, the rotor should be designed so that the forces acting on the rotor are balanced. This can be accomplished by designing the rotor with two or more threads and operating it in a stator with an equal number of retractible seals, or a number of retractible seals that are a multiple of the number of threads on the rotor.

The capacity of the pump per revolution can be decreased and its working pressure increased by lessening the pitch of the threads on the rotor, providing the longer threads cross more seals. The same objectives can also be accomplished by increasing the diameter of the body of the rotor which will decrease the liquid delivered per revolution and strengthen the sealing means.

Further, it will be noted in the construction shown, the helices of the rotor and stator must not match and can be any pitch except zero.

Where the passages are helically disposed (Figures 13 and 14) the rotor may be provided with spaced, parallel axially disposed crests or projections (Figures 16 and 17) which may be described as threads with a pitch of infinity.

A single seal pump that is 72° across the seal and with a single thread rotor of two and one-fifth (2⅕) revolutions will give one sealing point and a unit capacity. A rotor of three and one-fifth (3⅕) turns in a single seal pump of the same length will give only 68.8% as much liquid, but can pump twice the pressure, as it is double sealed. A four and one-fifth (4⅕) turn rotor in the same stator will deliver 52.5% as much liquid as one with a two and one-fifth (2⅕) turn rotor, but will pump three times the pressure. Comparing this one seal pump with a five seal pump, if both have a single thread rotor with one sealing point, the rotor of the one seal pump must have two and one-fifth (2⅕) turns and the rotor of the five seal pump must have one and two-fifths (1⅖) turns. The five seal pump will, therefore, pump against the same pressure but will deliver 1.57 times as much liquid per revolution as the single seal pump.

Again, if it is desired to use the same stators and single thread rotors to pump against twice the delivery pressure, the rotor on the single seal pump would have three and one-fifth (3⅕) turns and the rotor on the five seal pump would have one and three-fifths (1⅗) revolutions of the single thread, the five seal pump would, therefore, deliver twice the liquid of the one seal pump.

Comparing the capacity of the single seal pump against the five seal pump, working against the same head pressure or each with one sealing point, the one seal pump using a single thread, and the five seal pump using five threads as shown in Figure 11, with five threads, each thread would have three-fifths (⅗) of a revolution against the single seal pump with two and one-fifth (2⅕) revolutions. In this instance the stator **180** is provided with shaft securing means **182** and five helical threads **184**. It, therefore, would deliver 3.67 times as much liquid.

Thus it may be said that a single seal pump is illustrated in Figures 3 and 7, while a five seal pump is illustrated in Figures 5, 9 and 11. However, the pump can be built with any number of seals, either in single, double or multiple rows until practically all of the liquid flows up the tubular seals (passageways) with just sufficient liquid being pumped adjacent the rotor to provide adequate lubrication.

In the pump shown in Figures 13 and 14, the casing **186** of metal is provided with the resilient stator **188** bonded thereto, the stator being provided with partitions **190**, shown five in number, forming the passageways **192**.

In this case the passageways are formed helically. Rotor **194** (Figure 15) may be utilized with the stator illustrated in Figures 13 and 14, the rotor being provided with securing means **196** for attachment to a suitable propeller shaft. In this case the rotor is a five thread rotor, being provided with the threads **198**, and where used with the stator shown in Figure 13 threads **198** must not match the helical passages of Figure 13 where they contact the partitions of the stator.

The rotor shown in Figures 16 and 17 may also be utilized, the rotor **200** being provided with securing means **204** for attachment to a propeller shaft for rotating the rotor. In this case the rotor is provided with five threads **206** of infinite pitch that is, the threads, crests or spaced ribs or projections **206** are parallel to each other and to the longitudinal axis of the rotor (axis of rotation), extending in the direction of said axis. Rotation of either of the rotors illustrated in Figures 15 or 16 serially operates the partitions **190** (gradually closes the passageways from inlet to outlet) for forcing liquid from the inlet **208** of the stator illustrated in Figures 13 and 14 to the outlet **210**, the liquid passing upwardly of the passageways and upwardly between the rotor and stator.

In the pump illustrated in Figures 18 and 19 the metallic stator **212** is provided with a helical thread **214** extending from the inlet **216** to the outlet **218**. The rotor **220**, of resilient material, is provided with the securing means **222** on rod **221** secured to the rotor for fastening the rotor to a suitable propeller shaft, and said rotor is provided with the outwardly extending partitions **224** forming passageways **226**. The rotation of the rotor then causes the passages to be serially collapsed (closed gradually from inlet to outlet), forcing the liquid from the inlet **216** to the outlet **218** up said passageways **226** and up the passageways **228** between the rotor and the successive turns on the stator.

Referring now to the double acting pump shown in Figures 20 to 22, said pump includes a metallic casing **300** adapted to be connected at its upper end to dispensing means (not shown), the lower end being provided with the spider **302**. The lower end of the casing may be connected to a suction stub or pipe as shown in Figures 1 and 2.

The spider **302** is provided with the openings **304**, and is provided with the fixed center post **306** extending upwardly of the casing. The center post supports the inner resilient stator **308** which in the embodiment shown is provided with the flanges or partitions **310** (of any number and disposition) biased outwardly to form passageways **312**.

The rotor **314** is rotatably disposed to embrace the inner stator, being provided with the internal thread **316** extending for at least substantially two turns adapted to gradually close the passageways of the inner stator from the inlet **318** to the outlet **320** to pump liquid upwardly, as described. The upper portion of the rotor is provided with apertures **322** for permitting the upward passage of liquid and the rotor is provided with securing means **324** for attachment to a suitable propeller shaft.

The outer casing **300** is provided with the resilient outer stator **326**, bonded to said casing and provided with the inner flanges or partitions **328** biased inwardly providing passageways **330** extending from inlet **318** to outlet **320**. The rotor is provided with external threads **332** similar to threads **316** for gradually closing said passageways **330** from the inlet to the outlet to pump liquid upwardly of the outer stator.

Though inner and outer flanges **310** and **328** are shown, it is of course understood that partitions as shown in Figure 12 may be used and also the parts may be reversed on rotor and stators.

In operation, therefore, the rotor operates in a concentric manner about the axis of the stator and rotation of the rotor serves to gradually close the inner and outer passageways from inlet to outlet, as described with respect to the other modifications, causing upward pumping of the liquid through the stators by the rotor and between the stators and rotor, the inner and outer stators causing, in effect, a double action of pumping by the pump.

In order to increase delivery pressure and to meet high head pressures, the pumps shown herein may be slightly modified in one or more of the following different ways. The rotor may be slightly tapered, enlarging toward the outlet. The stator may be tapered, constricting the passageways toward the outlet. The sectional area of the passageways may be decreased toward the outlet. The pitch of the threads may be progressively reduced from the inlet to the outlet on either the rotor or stator.

In the forms of pumps shown, the primary elements are a rotor and a stator, each being provided with a helical element of any pitch except zero and even includes spaced elements extending axially of the rotor as is shown in Figure 16. One element is preferably made of rigid material such as a metal, examples of which are stainless steel, brass, etc., that is, one preferably that is rustless, the other part being made of a resilient material, which is provided with a retractible or collapsible seal, said resilient material being chosen in accordance with the liquid to be pumped and may be natural rubber, synthetic rubber, plastics, or compounds thereof. The resilient material is chosen to have long life, to be resilient and to be resistant to petroleum products and other corrosives, and such material is substantially non-compressible.

Also it is noted that while metal is recited as being used to form the rigid member, other substitute material may be used as rigid material of plastic, etc. Further, while certain types of retractible seals are shown, any type of seal may be used.

Further, the rotor can be rotated as fast as desired, from a standpoint of the life of the rubber. Insofar as motors are concerned at the present time, approximately 1,750 R. P. M. has been found to be a good economical speed, though other prime movers rotating at other speeds may be used.

It is to be understood that this application is not to be limited by the exact embodiments of the device shown, which are merely by way of illustration and not limitation as various and other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. An axially progressive rotary pump comprising a propelling member and a sealing member mounted for concentric rotation with respect to one another, said propelling member having a channel portion, said sealing member having a resilient sealing portion slidably engaging said channel portion, at least one of said portions being helical, said engagement between said portions progressing axially upon concentric rotation between said propelling member and said sealing member, forcing fluid in said channel to progress axially, and means for rotating one of said members with respect to the other.

2. An axially progressive rotary pump comprising a resilient member and a rigid member adapted for relative concentric rotation, means for rotating one of said members with respect to the other, said rigid member being provided with at least one channel portion, said resilient member having a sealing portion having sliding engagement with said rigid member to divide said channel into at least one fluid-tight compartment formed in part by said rigid member and in part by said sealing means, at least one of said portions being helical, said compartment progressing axially upon relative concentric rotation between said members.

3. An axially progressive rotary pump comprising a resilient member and a rigid member adapted for relative concentric rotation, means for rotating one of said members with respect to the other, said rigid member being provided with at least one thread element extending radially thereof to provide a channel portion, said resilient member having at least one sealing portion extending into slidable sealing engagement with said rigid member to divide said channel into at least one fluid-tight compartment formed in part by said rigid member and in part by said sealing portion, one of said portions extending generally helically with respect to said members whereby said compartment progresses axially of said members upon relative concentric rotation therebetween.

4. An axially progressive rotary pump comprising a resilient member and a rigid member adapted for relative concentric rotation, means for rotating one of said members with respect to the other, said rigid member being provided with a plurality of thread elements extending radially thereof to provide channel portions, said resilient member having at least one sealing portion extending into slidable sealing engagement with said rigid member to divide said channels into fluid-tight compartments formed in part by said rigid member and in part by said sealing portion, one of said portions extending generally helically with respect to said members whereby said compartments progress axially of said members upon relative concentric rotation therebetween.

5. An axially progressive rotary pump comprising a resilient member and a rigid member adapted for relative concentric rotation, means for rotating one of said members with respect to the other, said rigid member being provided with at least one thread element extending radially thereof to provide a channel portion, said resilient member having a plurality of sealing portions extending into slidable sealing engagement with said rigid member to divide said channel into fluid-tight compartments formed in part by said rigid member and in part by said sealing portions, one of said portions extending generally helically with respect to said members whereby said compartments progress axially of said members upon relative concentric rotation therebetween.

6. An axially progressive rotary pump comprising a resilient member and a rigid member adapted for relative concentric rotation, means for rotating one of said members with respect to the other, said rigid member being provided with a plurality of thread elements extending radially thereof to provide channel portions, said resilient member having a plurality of sealing portions extending into slidable sealing engagement with said rigid member to divide said channel into fluid-tight compartments formed in part by said rigid member and in part by said sealing portions, one of said portions extending generally helically with respect to said members whereby said compartments progress axially of said members upon relative concentric rotation therebetween.

7. An axially progressive rotary pump comprising a resilient stator member and a rigid rotor member mounted for concentric rotation therein, means for rotating said rotor member,

said rotor member being formed with at least one helically arranged thread element extending radially thereof to provide a channel portion, said stator member having at least one sealing portion extending into slidable sealing engagement with said rotor member to divide said channel portion into at least one fluid-tight compartment formed in part by said rotor member and in part by said sealing portion whereby said compartment progresses axially of said members upon rotation of said rotor member.

8. An axially progressive rotary pump comprising a resilient stator member and a rigid rotor member mounted for concentric rotation therein, means for rotating said rotor member, said rotor member being formed with a plurality of helically arranged thread elements extending radially thereof to provide channel portions, said stator member having at least one sealing portion extending into slidable sealing engagement with said rotor member to divide said channel portions into fluid-tight compartments formed in part by said rotor member and in part by said sealing portion whereby said compartments progress axially of said members upon rotation of said rotor member.

9. An axially progressive rotary pump comprising a resilient stator member and a rigid rotor member mounted for concentric rotation therein, means for rotating said rotor member, said rotor member being formed with at least one helically arranged thread element extending radially thereof to provide a channel portion, said stator member having a plurality of sealing portions extending into sealing engagement with said rotor member to divide said channel portion into fluid tight compartments formed in part by said rotor member and in part by said sealing portions whereby said compartments progress axially of said members upon rotation of said rotor member.

10. An axially progressive rotary pump comprising a resilient stator member and a rigid rotor member mounted for concentric rotation therein, means for rotating said rotor member, said rotor member being formed with a plurality of helically arranged thread elements extending radially thereof to provide channel portions, said stator member having a plurality of sealing portions extending into slidable sealing engagement with said rotor member to divide said channel into fluid-tight compartments formed in part by said rotor member and in part by said sealing portions whereby said compartments progress axially of said members upon rotation of said rotor member.

11. An axially progressive rotary pump comprising a rigid stator member and a resilient rotor member mounted for concentric rotation therein, means for rotating said rotor member, said stator member being formed with at least one helically arranged thread element extending radially thereof to provide a channel portion, said rotor member having at least one sealing portion extending into slidable sealing engagement with said stator member to divide said channel portion into at least one fluid-tight compartment formed in part by said stator member and in part by said sealing portion whereby said compartment progresses axially of said members upon rotation of said rotor member.

12. An axially progressive rotary pump comprising a rigid stator member and a resilient rotor member mounted for concentric rotation therein, means for rotating said rotor member, said stator member being formed with a plurality of helically arranged thread elements extending radially thereof to provide channel portions, said rotor member having at least one sealing portion extending into slidable sealing engagement with said stator member to divide said channel portions into fluid-tight compartments formed in part by said stator member and in part by said sealing portion whereby said compartments progress axially of said members upon rotation of said rotor member.

13. An axially progressive rotary pump comprising a rigid stator member and a resilient rotor member mounted for concentric rotation therein, means for rotating said rotor member, said stator member being formed with at least one helically arranged thread element extending radially thereof to provide a channel portion, said rotor member having a plurality of sealing portions extending into slidable sealing engagement with said stator member to divide said channel portion into fluid-tight compartments formed in part by said stator member and in part by said sealing portions whereby said compartments progress axially of said members upon rotation of said rotor member.

14. An axially progressive rotary pump comprising a rigid stator member and a resilient rotor member mounted for concentric rotation therein, means for rotating said rotor member, said stator member being formed with a plurality of helically arranged thread elements extending radially thereof to provide channel portions, said rotor member having a plurality of sealing portions extending into slidable sealing engagement with said stator member to divide said channel portion into fluid-tight compartments formed in part by said stator member and in part by said sealing portions whereby said compartments progress axially of said members upon rotation of said rotor member.

15. An axially progressive rotary pump according to claim 3, in which the rigid member is provided with at least one helically arranged thread and in which the resilient member is provided with a plurality of sealing portions extending into slidable sealing engagement with the rigid member each comprising a deformable partition forming in part a passageway extending axially of the resilient member.

16. An axially progressive rotary pump according to claim 3, in which the rigid member constitutes a rotor and is provided with an helically arranged thread and in which the resilient member constitutes a part of a stator having a plurality of sealing portions extending into slidable sealing engagement with the rotor each of which comprises a deformable partition forming in part a passageway extending axially of the stator.

17. An axially progressive rotary pump according to claim 3, in which the rigid member is provided with at least one helically arranged thread and in which the resilient member is provided with a sealing portion extending into slidable sealing engagement with the rigid member and comprising a deformable partition forming in part a passageway extending axially of the resilient member.

18. An axially progressive rotary pump according to claim 3, in which the rigid member constitutes a rotor and is provided with an helically arranged thread and in which the resilient member constitutes a part of a stator having a sealing portion extending into slidable sealing engagement with the rotor and comprising a de-

formable partition forming in part a passageway extending axially of the stator.

19. An axially progressive rotary pump according to claim 3, in which the rigid member is provided with at least one helically arranged thread and in which the resilient member has inner and outer tubular portions interconnected by substantially diagonally extending partitions to provide a plurality of passageways extending axially thereof whereby one of the tubular portions form sealing portions extending into slidable sealing engagement with the rigid member.

20. An axially progressive rotary pump according to claim 3, in which the rigid member constitutes a rotor and is provided with at least one helically arranged thread and in which the resilient member constitutes a part of a stator and has inner and outer tubular portions interconnected by substantially diagonally extending elastic partitions to provide a plurality of passageways extending axially thereof, the inner tubular portions being elastic and extending into slidable sealing engagement with the rotor.

21. An axially progressive rotary pump according to claim 3, in which the rigid member constitutes a stator and is provided with at least one helically arranged thread on the inner surface thereof to form a channel portion and in which the resilient member constitutes a rotor having at least one axially extending passageway adjacent the periphery thereof which is defined in part by an outwardly extending elastic partition forming a sealing portion extending into slidable sealing engagement with the stator.

22. An axially progressive rotary pump according to claim 3, in which the rigid member is provided with at least one helically arranged thread and in which the sealing portion of the resilient member is provided by a deformable flange forming in part a recess extending axially of the resilient member and connected to the resilient member adjacent one side of the recess.

23. An axially progressive rotary pump according to claim 3, in which the rigid member constitutes a rotor and is provided with at least one helically arranged thread and in which the resilient member constitutes a stator having a recess extending axially adjacent the inner surface thereof defined in part by a straight flange connected to the resilient member adjacent one side of the recess and extending inwardly thereof to provide a sealing portion extending into slidable sealing engagement with the rigid member.

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