Feb. 1, 1955 J. W. SACKETT 2,700,936

FLEXIBLE HELIX ROTOR PUMP

Filed Oct. 5, 1951

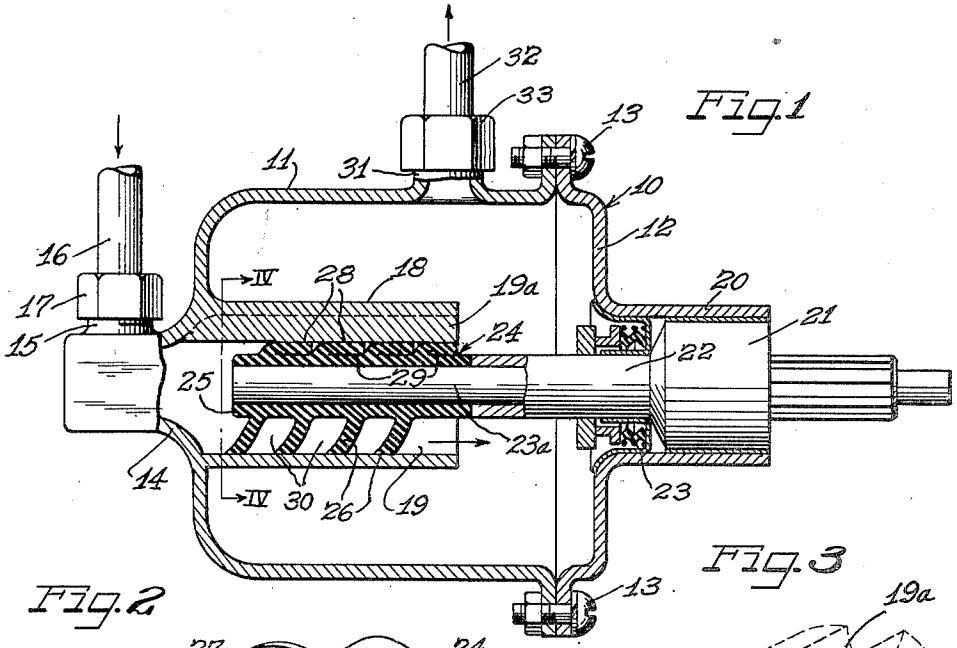


Fig. 1

Fig. 2

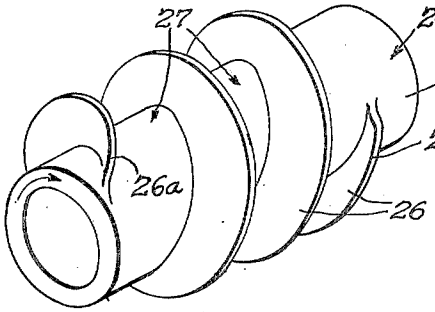


Fig. 3

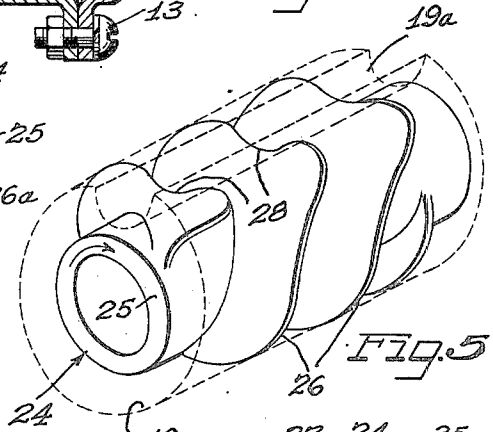


Fig. 5

Fig. 4

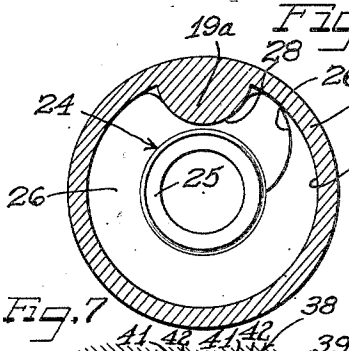
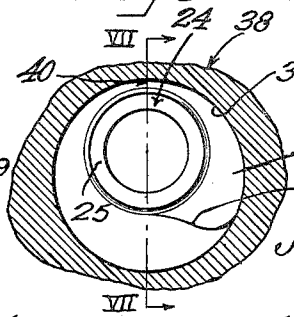


Fig. 6



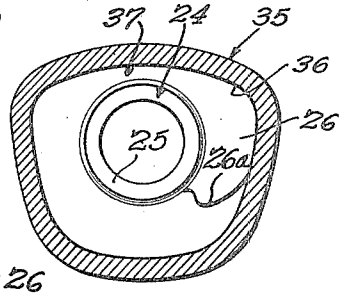
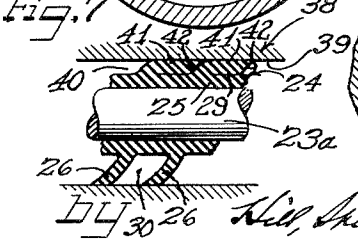


Fig. 7



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FLEXIBLE HELIX ROTOR PUMP

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3 Claims. (Cl. 103—117)

This invention relates to a helix pump having a rotor with flexible screw vanes operating in an elongated pump bore shaped to locally deflect the vanes to cause fluid flow along the length of the rotor.

Specifically, the invention relates to a helix pump having an elongated screw type rotor mounted for rotation on a fixed longitudinal axis in a bore which is shaped so as to locally collapse flexible screw vanes on the rotor to create compartmentalized pockets causing flow along the longitudinal axis of the rotor through the bore while sealing the bore.

Helical pumps of the type forming closed spaces between rotor and stator elements which advance in a longitudinal direction when the rotor element is rotated have heretofore required a rotor mounting which accommodated wobbling action of the rotor as in the Moineau Patents 1,892,217 and 2,028,407.

The present invention, however, now provides a helix pump with longitudinally advancing closed spaces between rotor and stator members wherein the rotor is mounted for rotation on a fixed longitudinal axis and the stator is stationary. The heretofore required wobble-accommodating mountings are eliminated.

In accordance with this invention, a rotor is equipped with a flexible helical vane defining a helix path. This rotor is mounted for rotation on a fixed axis in a stationary pump bore. The bore has a configuration which will locally deflect the helix vanes for compartmentalizing the space between the vanes. The resulting compartments advance as the rotor is rotated in the bore to move fluid through the bore. As the vanes collapse to pass through the narrow portion of the bore, seals are formed to progressively isolate the compartments between the vanes preventing rotation of the fluid with the vanes and causing back flow of the fluid along the length of the rotor. The vanes are collapsed locally against the rotor hub so that no gaps will occur across the narrow part of the bore and each compartment will thereupon be completely isolated from the next adjacent compartment.

The pumps of this invention are capable of pumping both liquids and gases and are effective to create a vacuum pull on the inlet.

It is, then, an object of this invention to provide a helix pump with flexible vanes which collapse locally in operation to compartmentalize the helix space between the vanes.

Another object of this invention is to provide a helix pump having a rotor having a hub mounted for rotation on a fixed axis in a bore and carrying a radiating deformable screw vane sealingly wiping the bore wall along its length and being locally deformed against the hub to divide the helical path confined by the vane into a plurality of chambers in the bore.

Another object of the invention is to provide a helical pump with a flexible rotor and a stationary pump bore arranged to selectively flex the rotor as it rotates about a fixed longitudinal axis.

A still further object of the invention is to provide a helix pump adapted to pull a vacuum without the necessity of wobbling the rotor element thereof.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheet of drawings which, by way of preferred examples only, illustrate several embodiments of the invention.

On the drawings:

Figure 1 is a longitudinal cross-sectional view, with parts in elevation, of a pump according to this invention.

Figure 2 is an isometric view of the rotor of the pump of Figure 1.

Figure 3 is an isometric view similar to Figure 2 but illustrating the pump bore in dotted lines around the rotor to show the manner in which the rotor vanes are collapsed as they pass through the narrow portion of the bore.

Figure 4 is a transverse cross-sectional view taken along the line IV—IV of Figure 1.

Figure 5 is a transverse cross-sectional view of a modified form of pump bore and illustrating the manner in which the vane of the rotor is collapsed.

Figure 6 is a view similar to Figure 5 but illustrating another form of pump bore.

Figure 7 is a fragmentary cross-sectional view taken along the line VII—VII of Figure 6 to show the complete nesting of the vane segments as they pass through the narrow portion of the bore.

As shown on the drawings:

The pump **10** of Figure 1 includes a cup shaped body **11** closed by a cover **12** secured thereon as by means of bolts **13**. The end wall of the cup shaped body has a tubular projection **14** with a nipple **15** thereon receiving an inlet tube **16** secured thereto by means of a coupling nut **17**. A tube **18** is integrally formed with the end wall of the casing **11** and projects into the casing to terminate in spaced relation from the cover **12**. This tubular projection **18** is aligned with the tubular portion **14** and defines the pump bore **19**. The pump bore **19** has a localized longitudinal bead, projection or rib **19***a* extending along the length thereof.

The cover **12** has a tubular projection **20** which supports a bearing **21** carrying a shaft **22**. A seal assembly **23** is provided around the shaft to prevent leakage into the bearing **21**.

A pump rotor **24** is secured on a reduced end portion **23***a* of the shaft in the pump bore **19**. As best shown in Figure 2, the rotor **24** has a cylindrical hub **25** and an integral helical vane **26** projecting radially therefrom for about two and three-quarters turns with the leading and trailing ends of the vane blending into the rotor along tapered edges **26***a*. A helical path **27** is provided between the vane sections.

The vane has a peripheral diameter sized for snug fitting in the bore **19** and has a thickness accommodating collapse along the axis of the hub.

As shown in Figure 3, as the vane sections **26** ride under the rib **19***a* in the pump bore **19**, they are flattened backward from their direction of pitch as at **28**. The deflected portions **28**, as shown in Figure 1, collapse all the way down to the hub **25** to form seals **29** under each collapsed portion **28**, to divide the helical path **27** around the hub **25** into isolated compartments or closed spaces **30** along the length of the bore **19**. As a result, the open helix path **27** of the rotor **24** is compartmentalized or separated into chambers **30**. As the rotor rotates in a clockwise direction as shown by the arrows in Figures 2 and 3, fluid from the inlet tube **16** is picked up by the leading edge of the rotor screw or helix into the compartment **30**. The fluid is held against rotation around the hub **24** of the rotor by the collapsed vane sections **28** and retracts in the compartments afforded by the rotor so as to discharge into the casing **11** out of the open end of the bore **19**. Since the fluid discharges into the housing **11** from the bore **19**, and since the housing **11** has an outlet nipple **31** at the top thereof connected to a discharge tube **32** by a coupling nut **33**, the pump bore will be submerged in fluid and will be lubricated by the fluid when the pump is idle, so that the vanes will not stick to the bore. However, when the pump operates, the pump bore may be freed from liquid in the event that the inlet **16** runs dry. In such event, the rotor is capable of pulling a vacuum on the inlet **16**.

In the event that it is desired to eliminate the use of the bead or rib **19***a*, bore configurations of Figures 5 to 7 may be used. In Figure 5, a stator **35** defines a generally polygonal shaped bore **36** and the rotor **24** is eccentrically mounted in the bore **36** so that the vanes

26 will be completely collapsed at the narrow portion of the bore designated at 37.

In the form illustrated in Figures 6 and 7, the stator 38 has a circular bore 39 but, instead of using the rib 19*a*, the rotor 24 has its fixed axis offset from the axis of the bore to form a narrow portion 40 in the bore along the length of the rotor. This portion 40 is only wide enough to accommodate the completely collapsed vane sections 41 bottomed on the rotor hub 25 as illustrated in Figure 7. In this arrangement, the outer edge of the vane 26 is tapered back from the pitch lead as at 42 to nest against the root portion of the next adjacent collapsed vane section 41 and provide additional contact surfaces for the seals 29.

From the above descriptions it will be understood that this invention provides a helix pump with a fixed rotor mounting and having a deformable helix vane wiping the pump bore and successively collapsed locally to compartmentalize a helical path through the pump bore whereby fluid cannot rotate with the rotor and will be pulled back to flow along the length of the rotor without ever placing the pump inlet and outlet in open communication. The pumps of this invention are, therefore, adapted to create a vacuum pull at the pump inlet.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In a pump including a rotor having a rubber-like flexible helix vane extending at least 360° around said rotor, a stator having a bore receiving said rotor with the vane thereof in snug engagement therewith, and said stator having a vane collapsing projection extending generally radially into said bore along the length thereof and contacting said vane so as to deflect the vane into contact with the periphery of said rotor and thereby compartmentalize the helical path through the bore provided by said vane.

2. A helix pump which comprises a cup-shaped casing having a tubular central portion defining a pump bore in the cup and an extension defining an inlet into one end of the tubular portion, a cover on said casing having a neck, a bearing carried in said neck, a pump shaft rotatably supported by said bearing, a screw impeller on said pump shaft in said tubular portion in the cup, a multi-turn rubber-like flexible helix vane on said impeller in snug engagement with the wall of the tubular portion, said tubular portion having an integral generally longitudinal vane collapsing projection thereof extending generally radially of the hub of the impeller defining a gap of less width than the radius of the vane for collapsing segments of the vane as they pass through the gap to divide the helix path in the tube defined by the vane into a plurality of compartments and said casing having an outlet adjacent said tubular portion.

3. In a pump including a wall with a longitudinal bore, a longitudinally extending vane collapsing projection extending generally radially from the bore wall into said bore and a rotor disposed and relatively rotatable in said bore, a generally radially extending helical rubber-like flexible vane extending at least 360° around said rotor along the length thereof and longitudinally of and in engagement with said bore wall for advancing fluid longitudinally along said bore both by the helical movement of the vane and the flexing of the vane by the vane collapsing projection as the rotor is relatively turned with respect to said bore wall.

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