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Kopczynski

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[54] **HELICAL PUMP**

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[52] **U.S. Cl.** **418/48,** 418/55

[51] **Int. Cl.** **F04c 1/06**

[58] **Field of Search** 418/48, 55, 160, 220

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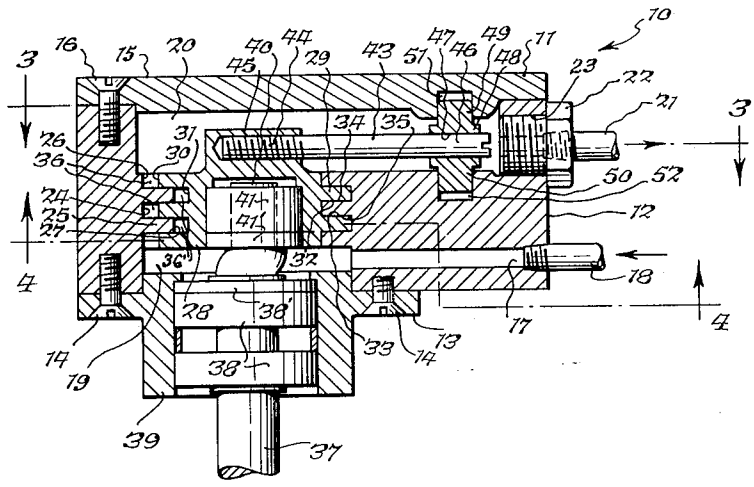
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Assistant Examiner—Leonard Smith
Attorney, Agent, or Firm—Joseph P. Gastel

[57] **ABSTRACT**

A pump comprising a housing having an inlet chamber and an outlet chamber with a pump chamber therebetween, a wall on the pump chamber having a first helical thread formed thereon, a rotor in the pump chamber having a second helical thread in engagement with the first helical thread, the pump chamber having a larger diameter than the rotor so that crescent-shaped fluid containing pockets are formed between the rotor and the wall of the pump chamber, an eccentric drive for causing the rotor to revolve in the path of a circle so as to provide sequential contact between outer portions of the rotor and the wall of the pump chamber, and a linkage for preventing the rotor from rotating about its own axis during said revolving.

2 Claims, 5 Drawing Figures



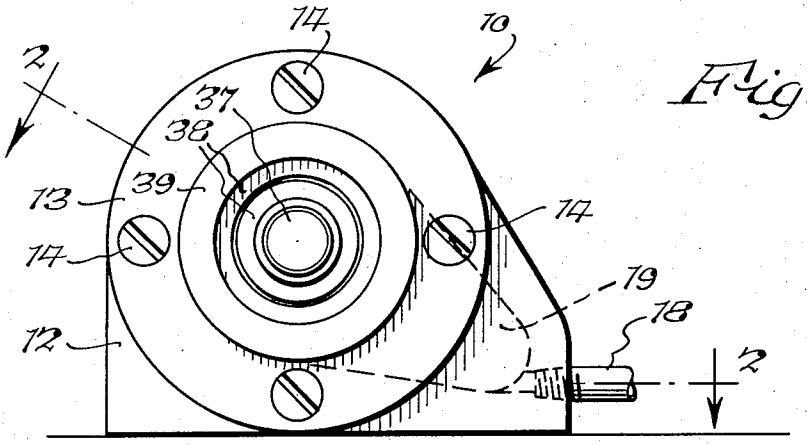


Fig. 1.

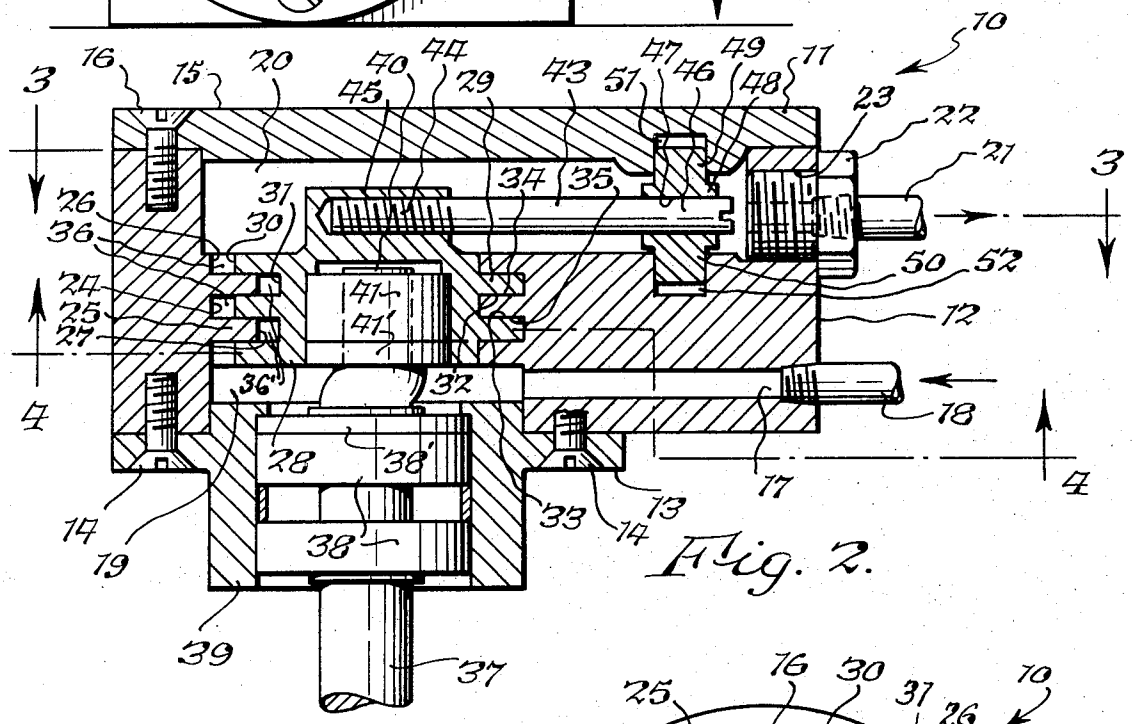


Fig. 2.

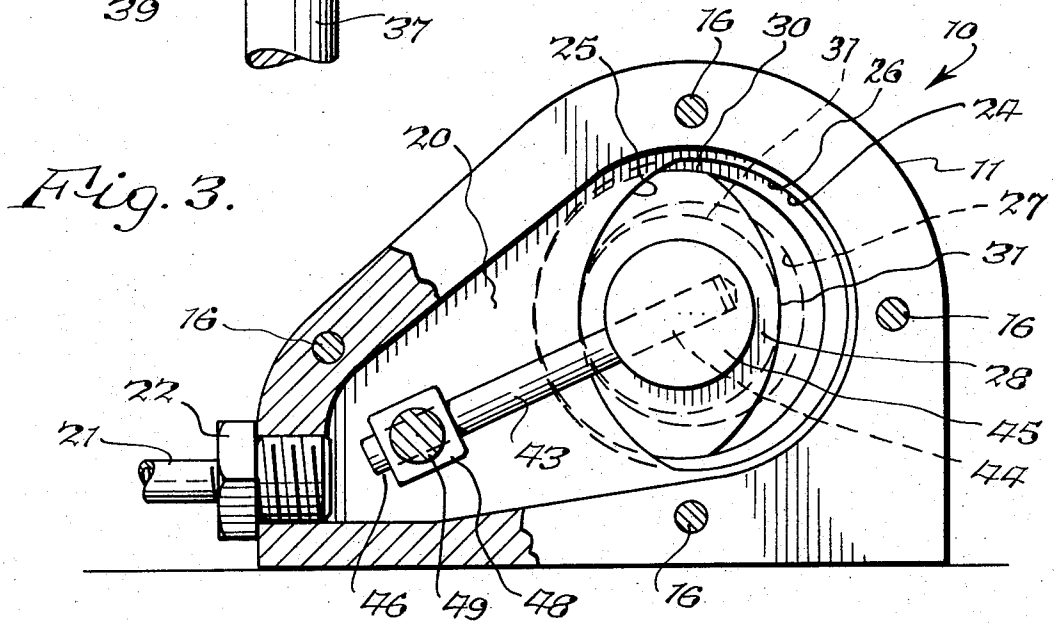


Fig. 3.

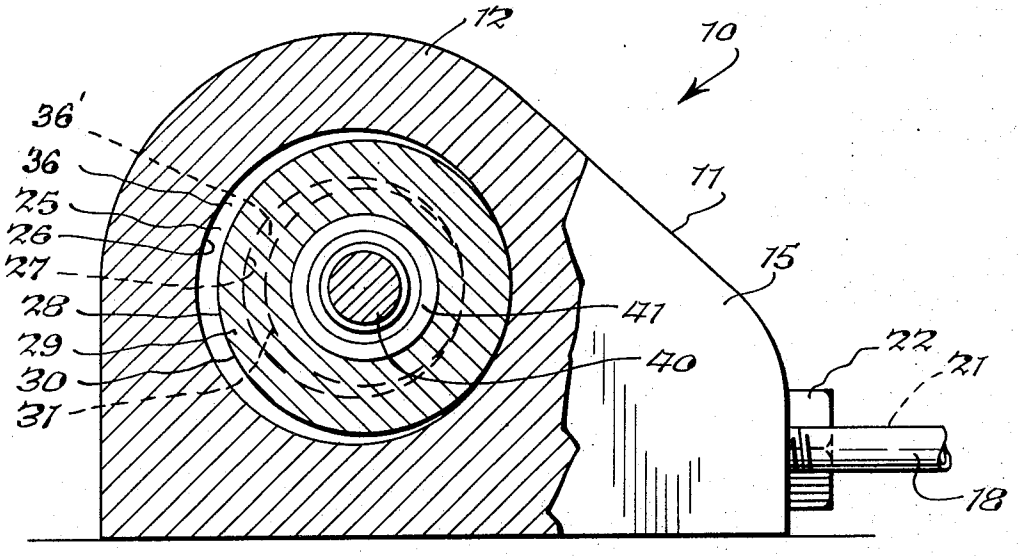

12
70
36'
36
25
26
27
28
29
30
31
71
75
41
40
22
21
18

Fig. 4.

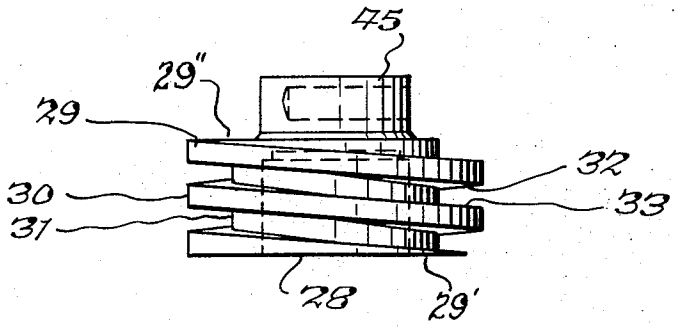

45
29"
29
32
30
33
31
28
29'

Fig. 5.

HELICAL PUMP

The present invention relates to an improved pump for pumping fluids.

It is one object of the present invention to provide an improved pump having relatively few movable parts wherein a fluid is positively displaced by a rotor which is caused to revolve within a pumping chamber.

Another object of the present invention is to provide an improved pump in which simple mechanism is utilized to prevent the revolving rotor from rotating relative to the housing in which it is located, thereby obviating wear due to relative rotation of parts which might otherwise be experienced. Other objects and attendant advantages of the present invention will readily be perceived hereafter.

The improved pump of the present invention includes a housing having an inlet chamber and an outlet chamber with a pumping chamber therebetween. The pumping chamber has a wall in the form of a first helical thread. A rotor is mounted within the pumping chamber and has an outer surface in the form of a second helical thread, which mates with the first helical thread. A drive is provided to cause the rotor to revolve in a circular path within the pumping chamber, and since the outer diameter of the rotor is smaller than the outer diameter of the wall of the pumping chamber, fluid containing pockets located therebetween will be moved through the pumping chamber from the inlet chamber to the outlet chamber. Means are provided for preventing the rotor from rotating about its own axis to thereby minimize relative rotation between the rotor and the pump chamber. The various aspects of the present invention will be more fully understood when the following portions of the specification are read in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevational view of the improved pump of the present invention;

FIG. 2 is a fragmentary cross-sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a fragmentary cross sectional view taken substantially along line 3—3 of FIG. 2;

FIG. 4 is a fragmentary cross sectional view taken substantially along line 4—4 of FIG. 2; and

FIG. 5 is a plan view of the rotor.

The improved pump **10** of the present invention includes a housing **11** having a central housing portion **12**, to which end plate **13** is attached by screws **14**, and to which end plate **15** is secured by screws **16**. Central housing portion **12** includes a bore **17** therein for effecting communication between fluid inlet conduit **18** and inlet chamber **19** formed between central housing portion **12** and end plate **13**. An outlet chamber **20** is located between central housing portion **12** and end plate **15**, and this outlet chamber is in communication with outlet conduit **21** which is threaded into bushing **22** which in turn is threaded into bore **23** in central housing portion **12**.

A pumping chamber **24** is formed in central housing portion **12** and extends between inlet chamber **19** and outlet chamber **20**. The wall of chamber **24** is in the form of a continuous helical thread **25** having an outer diameter at **26** and an inner diameter at **27**. A rotor **28** has a helical thread **29** having an outer diameter at **30** and an inner diameter at **31**. The sides **32** and **33** of thread **29** effect a sealing engagement with sides **34** and **35**, respectively, of thread **25**. Because the outer diameter of rotor **28** is smaller than the outer diameter **26** of pumping chamber **24**, there will always be a plurality of revolving crescent-shaped spaces **36** and **36'** (FIG. **4**) between the outermost portions of rotor **28** and the wall of chamber **24** as the rotor revolves. These spaces **36** and **36'** are shifted from a position proximate inlet chamber **19** to a position in communication with outlet chamber **20** as a result of revolving rotor **28** within pump chamber **24**, to thus carry fluid from the inlet chamber to the outlet chamber.

It can be visualized that end **29'** of thread **29** merges into the inner diameter portion **31** of the rotor. The same is true at end **29''** of thread **29**. Furthermore, the opposite ends of thread **25** merge into the outer diameter **26** of the pumping chamber wall, as can be visualized from FIG. **3**. It is because of the foregoing inherent dimensioning that fluid can enter spaces **36** and **36'** from chamberr **19** and can leave these spaces into chamber **20**.

In order to revolve rotor **28**, a drive is provided which includes shaft **37** journalled in bearings **38** in neck **39** of end plate **13**. A seal **38'** prevents the pumped fluid from entering bearings **38**. Shaft **37** includes a portion **40** which has an axis which is offset from the main axis of shaft **37** and is parallel thereto. Portion **40** is received in bearing **41** on which rotor **28** is mounted. A seal **41'** prevents the pumped fluid from entering bearing **41**. A suitable source of rotary motion is coupled to shaft **37** to cause rotor **28** to revolve about the axis of shaft **37** so that the crescent-shaped spaces **36** and **36'** cause fluid to be carried from inlet chamber **19** to outlet chamber **20**. It is to be especially noted that during the revolving of rotor **28** its center will move in the path of a circle, but rotor **28** will not rotate about its own axis. In other words, rotor **28** will tend to walk along the inside of chamber **24**.

In order to insure that rotor **28** does not rotate about its own axis, arm **43** is provided. End **44** of arm **43** is threaded into tapped boss **45** of rotor **28**, and end **46** of arm **43** is slidably mounted in bore **47** of pin **48** which has opposite cylindrical portions **49** and **50** pivotally mounted in bores **51** and **52** of end plate **15** and central housing portion **12**, respectively. It will thus be seen that the arm **43** and its connections to the housing and the rotor will permit the rotor to revolve without rotating about its axis. Arm **43** also prevents rotor **28** from advancing axially.

It will be appreciated that because of the difference in diameters of the thread in the housing and the thread on the rotor, their dimensions will have to include sufficient clearance so that they do not bind during revolving of the rotor.

It will thus be seen that the foregoing pump is manifestly capable of achieving the above enumerated objects and while a preferred embodiment has been disclosed, it will be appreciated that the present invention is not limited thereto but may be otherwise embodied within the scope of the following claims.

What is claimed is:

1. A pump comprising a housing, an inlet chamber in said housing, an outlet chamber in said housing, a pumping chamber positioned between said inlet chamber and said outlet chamber, said pumping chamber having a wall with a first helical thread thereon with said first helical thread having a first inner diameter and a first outer diameter, a rotor having a second heli-

cal thread thereon, said second helical thread having a second inner diameter and a second outer diameter, said second outer diameter being larger than said first inner diameter but smaller than said first outer diameter so as to provide fluid receiving spaces between said wall and said rotor, said first and second helical threads having side walls for providing sealing engagement with each other, means for revolving said rotor in a circular path relative to said pumping chamber so as to produce sequential contact between circumferential portions of said rotor and said pumping chamber, said means for revolving said rotor comprising means for mounting said rotor eccentrically in said pumping chamber, means for holding said rotor against rotation about its axis during said revolving thereof, said means for mounting said rotor eccentrically comprising a shaft having first and second portions with said second portion being offset from said first portion and with the axis of said second portion extending substantially parallel to the axis of said first portion, first bearing means for mounting said first portion of said shaft on said housing, second bearing means for mounting said rotor on said second portion of said shaft, said means for holding said rotor against rotation comprising an arm having first and second ends, first connecting means connecting said first end to said rotor, and second connecting means connecting said second end to said housing, said link and said first and second connecting means including a slidable connection and a pivotable connection.

2. A pump as set forth in claim **1** wherein said first connecting means comprises a rigid connection between said first end of said link and said rotor and wherein said second connecting means comprises a pin pivotably mounted in said housing with said second end of said link slidably connected to said pin.

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