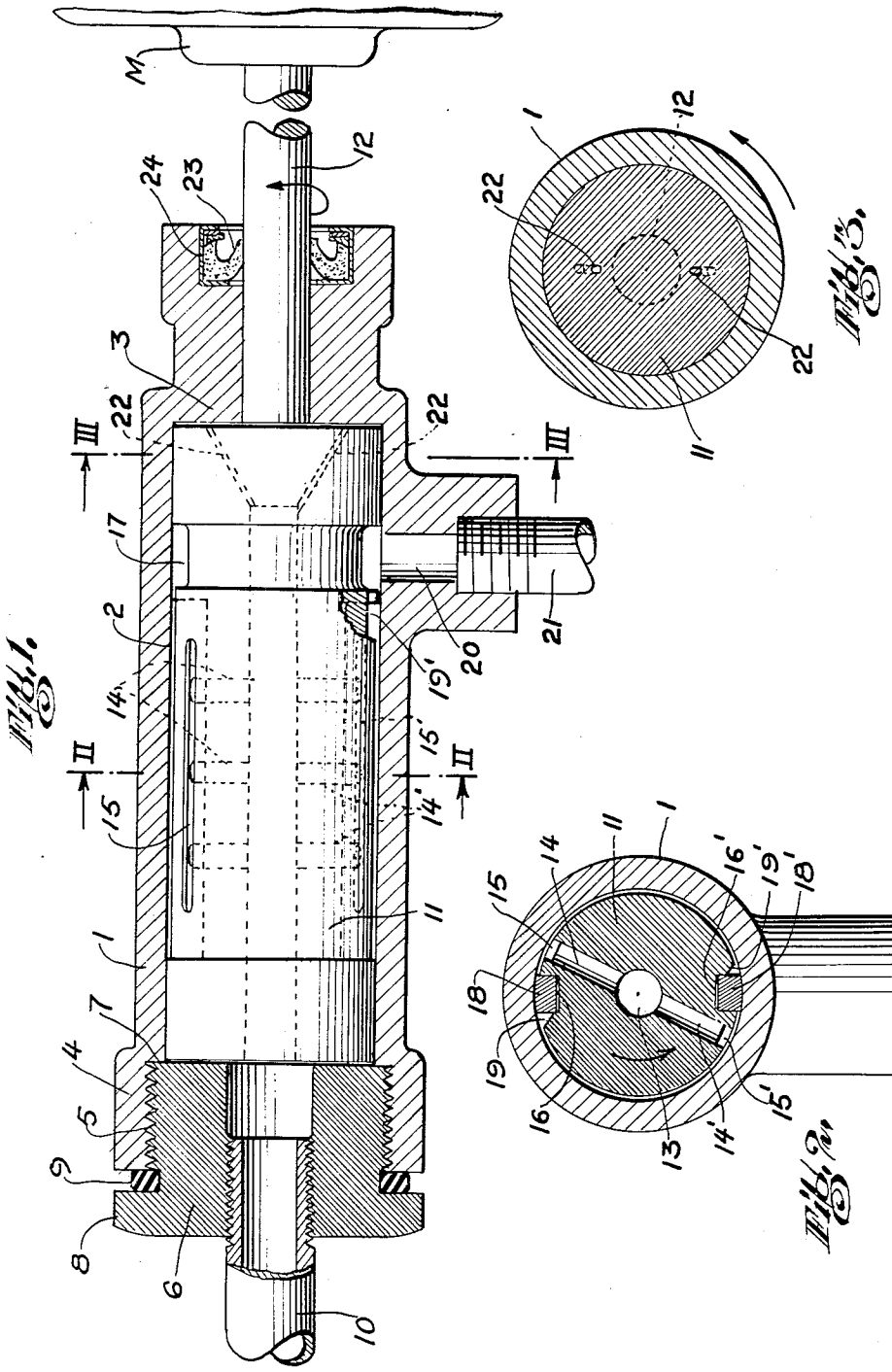
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This invention relates to a pump for fluids of appreciable viscosity and particularly to such a pump in which the shear resistance of the fluid is utilized as a causational factor in creating a pressure condition.

An object of the invention is to provide such a pump in which centrifugal force is utilized in combination with the shear resistance to give improved results.

Another object is to provide such a pump in which the parts are of simple form, so that the construction of the pump is easy and inexpensive.

A further object is to provide certain improvements in the form, construction and arrangement of the parts whereby the above named and other objects may effectively be attained.

A practical embodiment of this invention is represented in the accompanying drawings, in which:

Fig. 1 represents an axial section through the stator of the pump, the rotor being shown in elevation.

Fig. 2 represents a transverse section, taken on the line II—II of Fig. 1, looking in the direction of the arrows, and

Fig. 3 represents a transverse section, taken on the line III—III of Fig. 1 looking in the direction of the arrows.

Referring to the drawings, the pump stator comprises an essentially cylindrical body portion **1**, the interior of which is in the form of a more or less elongated cylindrical chamber **2**. At one end said chamber terminates in the axially bored wall **3**, and at the other end the body portion is enlarged to form the annular flange **4**, internally threaded at **5**. A bushing **6** is screwed into said enlarged end, the inner end of the bushing being designed to seat tightly against the annular shoulder **7** around the end of the chamber **2**, while the enlarged head **8** of the bushing compresses a sealing ring **9** in the space between said head and the outer end of the flange **4**. A fluid inlet pipe **10** is screwed tightly into the interior of the bushing **6**.

The pump rotor comprises an elongated cylindrical body **11** having a length such that it will fit in the chamber **2** with free fit clearance at each end. Throughout the greater part of its length said body has a diameter slightly less than the interior diameter of the chamber so that there exists also a slight clearance between the concentric cylindrical surfaces of the rotor and stator. The rotor body is mounted at one end on a drive shaft **12**, journaled in the axial bore of the wall **3**, said shaft engaging the rotor body, for instance, with a driving fit between the end of the shaft and a hole in the end of the rotor, not shown. The shaft is driven in any suitable manner, as by means of a motor M.

From its free end the rotor body is axially bored as shown at **13** throughout most of its length and at one or more points in the middle half of the body, longitudinally considered, said bore communicates with the surface of the rotor body through radial passages **14**. In the example illustrated there are three such passages in line along one side of the rotor with their continuations across the complete diameter thereof constituting three

more passages **14'** angularly spaced 180° from the passages **14**. In the zone of each said line of passages the surface of the rotor is slightly relieved, as indicated at **15**, **15'** in order to increase the clearance in such zones.

Adjacent each line of passages the rotor surface is provided with longitudinal grooves **16**, **16'** extending from points near the free end of the rotor body to points near the drive-shaft end. At the latter points the rotor surface is provided with a circumferential groove **17**. Vanes or blades **18**, **18'** preferably of suitable antifriction material, fit freely in the grooves **16**, **16'** with their outer surfaces bearing against the inner cylindrical wall of the chamber **2**. The edges of the grooves **16**, **16'** on the sides opposite to the passages **14**, **14'** are preferably beveled to form elongated pressure zones **19**, **19'** which open at one end into the circumferential groove **17**.

In the wall of the chamber **2** and registering with the groove **17** there is formed the outlet passage **20**, into which may be screwed suitable fittings **21** for connection of the pressure side of the pump to any desired utilization apparatus, not shown.

At the drive-shaft end of the rotor one or more small bleed passages **22** may be drilled from the end surface of the rotor to the end of the bore **13**. Leakage of fluid through the drive shaft journal may be prevented or minimized, if desired, by the provision of a suitable shaft seal **23** in the recess **24** at the end of the stator body **1**.

In operation, the rotor **11** is driven by the motor M in the direction indicated by the arrows. The fluid to be pumped is supplied through the pipe **10**, from which it flows into the bore **13** of the rotor and thence into the radial passages **14**, **14'**. Flow through said passages is materially aided by centrifugal force resulting from rotation of the rotor, so that when the fluid enters the zones **15**, **15'** it is already under somewhat increased pressure. From the zones **15**, **15'** the fluid flows, particularly in a circumferential direction, through the clearance between the rotor and the stator, but this flow is interrupted by the vanes **18**, **18'** against which the fluid builds up pressures (in the zones **19**, **19'**) which can be very high. Since the zones **19**, **19'** are in communication with the groove **17**, the fluid under pressure will fill said groove and feed thence through the outlet **20** to the point of use.

The pressure in zones **19**, **19'** is due in substantial part to the shear resistance in the fluid filling the small clearance between the relatively moving surfaces of the rotor and stator. This shear and fluid wedge effect can be varied by controlling or predetermining the affinity between the fluid and either or both surfaces; for increased pressure the fluid should tend to adhere to the stator and be repelled by the rotor. The vanes **18**, **18'** are caused to press outward against the cylindrical surface of the stator by centrifugal force; the centrifugal pressure of the vanes thus varies in the same sense as the fluid pressure in the pressure zones.

It is evident that the fluid under pressure in the zones **19**, **19'** and groove **17** will tend, if possible, to leak endwise, toward the ends of the rotor. Such leakage is opposed inherently by the resistance to flow resulting from the length of the land areas beyond the ends of the pressure zones, and this resistance can be increased by reducing the clearance in said areas, i. e., the diameter of the rotor adjacent its ends can be made greater than the diameter between said end areas. The clearances will normally be so slight that illustration of the clearance difference is impossible except with considerable exaggeration, and the drawing is to be so understood. Any fluid leakage at the free end of the rotor returns the fluid to the inlet (low pressure) side where it can flow again into the bore **13**. Leakage at the driveshaft end of the rotor is also led directly to the low pressure intake

stream in the bore **13** through the passages **22**, so that the drive shaft journal and shaft seal **23** are not required to resist high pressures.

A practical advantage of the structure shown resides in the fact that the stator comprises, basically, a simple cylindrical chamber without slots, grooves, or passages other than the inlet and outlet, while the rotor is the element in which the bore **13**, passages **14**, **14'**, zones **15**, **15'**, grooves **16**, **16'** and **17**, and zones **19**, **19'** are formed. The drilling and/or machining of such configurations in the solid cylindrical rotor body is quite simple.

In the pump shown and described the rotor is provided with two abutments (vanes) with their associated elements, located at diametrically opposite points. It will be understood, however, that the structure and operation would be basically the same if three or more abutments were provided, so long as they are uniformly spaced circumferentially around the rotor. If only one such abutment is provided, the pump can operate but the unbalanced condition of the rotor must then be taken into account in some suitable manner, e. g., operate only at low speeds, or correct the balance.

It will be evident that various changes can be made in the form, construction and arrangement of the several parts without departing from the spirit and scope of the invention, hence I do not intend to be limited to the particular embodiment shown and described.

What I claim is:

1. A pump for viscous fluids comprising, a stator provided with a cylindrical chamber, a cylindrical rotor freely rotatable within said chamber and having a complementary surface concentric with the surface of said chamber and defining a clearance therebetween, means for rotating the rotor, at least one radially floating elongated axially disposed vane mounted on said rotor to bear resiliently against the surface of said chamber along at least a major part of the length thereof, an axial bore in said rotor, at least one radial passage providing communication from said axial bore to the surface of the rotor at a point adjacent to said vane on the upstream side thereof considered circumferentially with respect to the direction of rotation of the rotor, means for supplying fluid to said axial bore and means for conducting fluid under pressure from the clearance on the downstream side of said vane and for delivering said fluid.

2. A pump according to claim 1 in which the means for conducting fluid includes an annular groove in the surface of the rotor, and in which there is an outlet passage in the stator so located as to be in continuous communication with said groove.

3. A pump according to claim 1 in which there are a plurality of radially floating elongated axially disposed vanes, spaced uniformly in the circumferential direction.

4. A pump according to claim 1 in which the clearance between the rotor and the stator is reduced in zones adjacent the ends thereof.

5. A pump according to claim 1 in which the surface of the rotor is relieved to provide a fluid distributing inlet zone extending axially and communicating with said radial passage.

6. A pump according to claim 1 in which the rotor is provided with at least one axially disposed groove having radial depth to receive and guide said vane.

7. A pump according to claim 6 in which the edge of said axially disposed groove on the downstream side of the vane is cut away to provide a fluid pressure zone.

8. A pump according to claim 7 in which the means for conducting fluid includes an annular groove in the surface of the rotor and in which said axially disposed groove is in communication with said annular groove.

9. A pump according to claim 1 in which the axial bore in the rotor extends inward from one end of said rotor and in which the means for rotating the rotor include a drive shaft connected to the other end of said rotor and journaled in an end wall of the stator.

10. A pump according to claim 9 in which the drive shaft end of the rotor is provided with at least one passage extending from the end surface of the rotor to the axial bore therein.

No references cited.