Feb. 16, 1937. W. KLEIN 2,070,738

PUMP WITH CAM DRIVE

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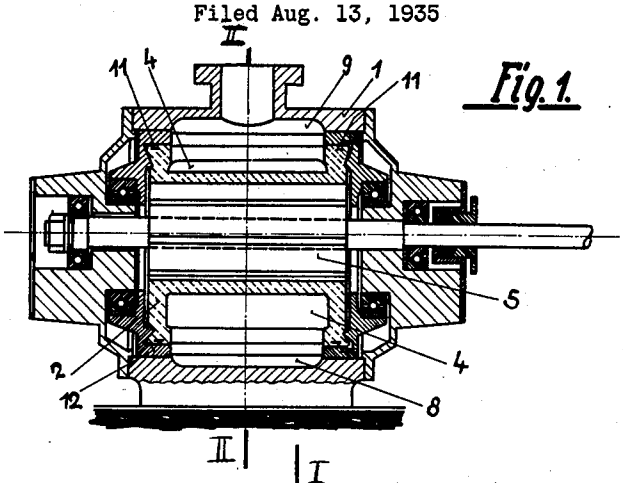


Fig. 1.

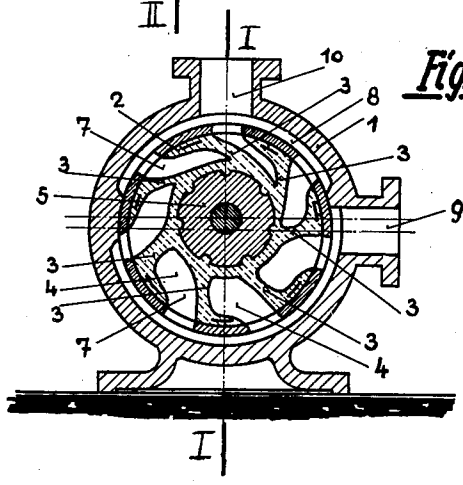


Fig. 2.

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PUMP WITH CAM DRIVE

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2 Claims. (Cl. 103—21)

In order to obtain a substantially uniform delivery output, piston pumps with separate working chambers arranged in star shape have been proposed. These are, however, open to the same objections as the ordinary piston pumps and specially to the objection that, owing to wear of the pistons or of the rotary cyinders leakages occur. To overcome this objection multiple acting diaphragm pumps with seamless resilient bodies have been proposed. These pumps are, however, extremely expensive to manufacture and the delivery nevertheless remains irregular. Finally pumps are known with elastic working chambers arranged like a hose, in which one or more eccentrically mounted pressure elements or cam-actuated pressure rods press from the inner side against the elastic wall of the working chamber so that the liquid is forced to the delivery. Such pumps, however, only come into question for small deliveries.

For compressing air and delivering liquids machines are also known which have an eccentric drive and a ring-shaped, stationary pump body surrounding the same. This pump body consists of a small metal and a large metal ring surrounding the small ring which has also been proposed in the form of a metal core, and between the two rings partitions are arranged extending tangentially at uniform distances apart and made of metal, rubber, or the like, which partitions are fixed in a suitable manner to the outer surface of the inner ring and the inner surface of the outer ring. Thus the annular space is divided up radially into a plurality of working chambers of uniform size arranged in star-shape and which are successively widened to produce suction and compressed to effect delivery by the eccentric movements of the inner ring. The two side walls of the cylindrical, ring-shaped pump body with the individual working chambers each consist of a flat metal disc, both of which discs are either stationary and form part of the stator body or are in one piece with the outer pump body ring and consequently rotate therewith and the rotor body. As the inner metal ring of the pump body must slide over these discs due to its eccentric movement, leakages always occur here even with the most accurate machining. The same objections occur in pumps in which the outer metal ring of the pump body is stationary forming part of the stator and slides over the partitions rotating with the rotor body.

Pumps are also known for delivering liquid which consist of a ring-shaped rubber hose in the interior of which a single radial partition is arranged. Suction and pressure conduits are connected to the hose directly in front of and behind this partition. This rubber hose is accommodated in a metal housing which only serves as counterbearing on the outer side where a cylindrical roller mounted on a crank shaft compresses the hose on the inner side producing suction and pressure during the movement of the roller along a circular path. These pumps are, however, only suitable for small deliveries and hand operation. They can, however, only deliver liquid if the hose is completely compressed at the point contacting with the roller. An adjustment of the pump for different deliveries can therefore be attained merely by changing the speed of rotation of the crank shaft. Pumps of this kind are entirely unsuitable for delivering uniform liquids as the pressure roller would press the solid bodies into the hose and destroy the same in a very short time.

Finally arrangements for delivering liquids are known which are similar to gear pumps and in which it has been proposed to make the rotors similar to toothed wheels of elastic material, such as rubber. Compressors are also known which have between the rotor and stator separate movable crescent-shaped elastic rubber chamber elements arranged in star-shape, which elements carry out reciprocating movements during the rotation of an eccentric shaft.

The invention also relates to a pump with a ring-shaped working chamber made of elastic material. A known cylindrical pump body constructed as a hollow ring is fitted in a cylindrical pump casing and subdivided into a plurality of uniformly large delivery chambers by means of likewise known partitions made in one piece with the pump body. The hollow ring-shaped body together with the partitions is, according to the invention, completely made of a single piece of rubber, so that the individual working chambers which each have an aperture for the admission and discharge of the fluid outwards towards the outer ring surface are absolutely tight. This ring-shaped pump body is rigidly mounted on an eccentric shaft so that, during the rotation of this shaft, the elastic pump body is rotated and compressed towards one side and expanded towards the other side, this resulting in a corresponding reduction or enlargement of the delivery chamber spaces, so that during the expansion of the chambers suction and towards the other side delivery takes place. In order

that between casing and pump body a good fit is obtained and clearance losses are avoided, the elastic pump body is reinforced on its periphery by metal inserts or by an impeller ring vulcanized on the body in known manner. The pump body, however, may be encased in a cylindrical moving bush to prevent sliding contact of the pump body of rubber with the casing wall.

Valves are not necessary in this arrangement of the pump body and the delivery chamber spaces communicate directly with recesses in the stator casing, each one through a port. Two recesses are provided one on the suction side as admission channel and the other on the pressure side as discharge channel.

The pumps which are suitable for motor drive and all deliveries do not possess the drawbacks of the known arrangements and are characterized by the accurate adjustability of the delivery, by elimination of all clearance losses by leakages, by a very good suction capability and particularly by low cost of manufacture because the precision work generally necessary in pumps can be eliminated. The peculiar construction increases the life of the machine, because the pump body proper which is stressed by expansion and compression does not come into injurious contact with any part of the pump subject to wear.

An embodiment of the invention is illustrated by way of example in the accompanying drawing in which:—

Fig. 1 is a longitudinal section on line I—I of Fig. 2 through a pump with rotating pump body fixed on the cam shaft.

Fig. 2 is a cross section through the same pump taken on line II—II of Fig. 1.

A cylindrical pump body **2** made of elastic material such as, for example, rubber, is fitted in a casing **1**. It is in the shape of a hollow ring and subdivided into a plurality of uniformly large chambers **4** by preferably tangentially arranged partitions **3**. The cylindrical pump body is fixed on an eccentric shaft **5** by vulcanizing or in some other suitable means, so that, when the eccentric rotates the pump body **2** rotates therewith and by the eccentric rotation of the shaft **5** the chambers **4** are expanded towards the one side and compressed towards the other side to cause suction and delivery. When the pump body rotates with the shaft control valves are not necessary, the chambers **4** have outlet or inlet ports **7** facing the inner wall of the casing **1**, so that the liquid to be delivered can directly enter into and flow out from the segment-shaped recesses **8** provided in the casing. For each chamber there is provided only one single port. The recesses **8** communicate with corresponding pipe connections **9**, **10** on which the pressure and suction conduits can be fitted. **9** is the suction side and **10** the pressure side. It is advisable in this construction of the pump to reinforce the outer ring surface of the pump body by metal rings, metal inserts and the like, or to enclose the whole body. The elastic pump body **3** is then arranged in a sleeve **12** with similar passages facing the casing wall.

I claim:—

1. In a pump with eccentric drive shaft and working chambers arranged about said eccentric shaft in star-shape in a ring-shaped hollow pump body a single element made of elastic material forming the hollow ring-shaped pump body, and a plurality of radial partitions subdividing said pump body into working chambers each said working chamber being provided with an opening towards the outer periphery of the ring, said element being fixed on the eccentric shaft.

2. In a pump as specified in claim 1 the elastic pump body being enclosed in a rotatable cylinder with external running face.

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