

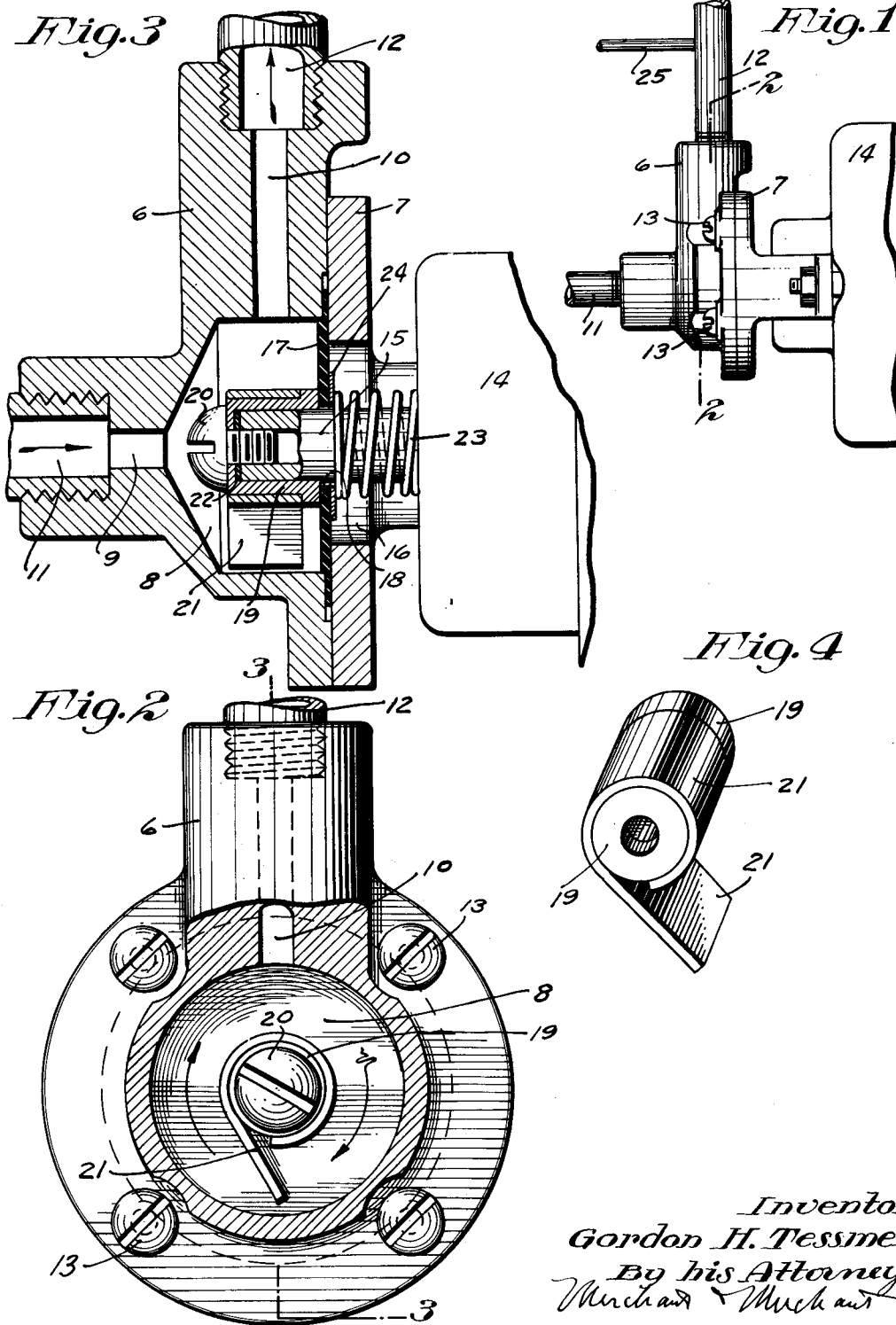
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FLUID PRESSURE PUMP

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FLUID PRESSURE PUMP

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1 Claim. (Cl. 103—103)

My invention provides an extremely simple and highly efficient fluid-pressure pump of the rotary or centrifugal type, having the various improved features of construction and operation hereinafter described and defined in the claim.

The improved pump is capable of being made in various different sizes and put to various different uses, but has been especially designed and particularly adapted for use in centrifugal pumps driven by small electric motors. Self-starting electric motors, as is well known, have relatively low starting torques, and this is especially true in respect to small electric motors.

Leakage between the motor driven pump shaft and the pump casing has hitherto generally been prevented by packings which must engage the pump shaft with very considerable friction to prevent leakage. The friction of such packing has hitherto made necessary the use of an electric motor of greater power than would be required after the motor has once been started.

A major feature of my invention is directed to the provision of a substitute for the ordinary packing, which, while efficient to prevent leakage, will offer but very slight friction to the starting of the motor. This feature is met by the use of a sealing diaphragm through which the pump or motor shaft is passed into the pressure chamber of the pump. The sealing diaphragm and the co-operating contacting elements are of novel construction and arrangement as will presently appear. The various novel features of the invention will be made clear by the concrete illustration of a specific problem for which the invention has been designed and for which it has been commercially employed, and which device is illustrated in the accompanying drawing wherein like characters indicate like parts throughout the several views.

Referring to the drawing:

Fig. 1 is an elevation showing the improved pump and parts of an electric motor for driving the rotary element of the pump;

Fig. 2 is a section taken on the line 2—2 of Fig. 1 showing the parts on a larger scale than in Fig. 1;

Fig. 3 is a vertical section taken through the pump on the line 3—3 of Fig. 2; and

Fig. 4 is a perspective showing in detail the rotary element of the pump.

The pump casing, as shown, is made of two elements, to wit; 6 and 7. The main pump element 6 is formed with a pressure chamber 8 with an intake passage 9 and with a discharge passage 10. The intake passage 9 will be as-

sumed to be connected to a source of liquid supply such as an elevated tank, not shown, by a pipe 11. The outlet passage 10 is connected to an upright stack 12.

The section 7 is in the nature of a head detachably secured to the main section 6 by machine screws 13 or the like. This head 7, in the structure illustrated, is bolted to or otherwise rigidly secured to the casing 14 of an electric motor having an extended armature shaft 15. The head 7 is formed with a large axial passage 16 which may be nearly or about as large as the pressure chamber 8.

A sealing diaphragm 17 is clamped at its outer edge, with a fluid tight joint, between the sections 6 and 7 and is formed with an axial passage 18 through which the armature shaft 15 projects into the pressure chamber 8. Within the pressure chamber 8 the armature shaft 15 is provided with a head which, as shown, is in the form of a cap-like sealing head 19 telescoped on to the same and rigidly secured thereto by a machine screw 20. The cap-like head is provided with a propelling blade 21 that may be variously formed but, as shown, is wrapped around and welded or otherwise rigidly secured to the cap with its blade projecting tangentially therefrom.

The numeral 22 indicates a packing clamped between the inner end of the shaft 15 and the end of the head 19. The large or outer end of the head 19 acts as a sealing surface against the diaphragm and is in the plane that is perpendicular to the axis of the shaft and has direct frictional engagement with the inner portion of the diaphragm 17. The end of the cap-like head 19 is yieldingly held in frictional contact with the diaphragm, by suitable means, such as a coil spring 23 compressed between the motor casing and a pressure washer 24 that directly engages the radially inner portion of the diaphragm.

To permit slight wobbling of the shaft 15 in case that should occur, the axial perforation 18 of the diaphragm is made large enough to amply clear the shaft 15. To permit slight axial movements of the armature shaft and parts carried thereby, if such movement should occur, the diaphragm 17 is made of at least slightly flexible material. The kind of material used in the diaphragm will depend a good deal upon the nature of the liquid that is being used in the pump and should be such as not to be chemically acted upon by such liquid.

In practice I have used this pump for the

pumping of kerosene which requires a very tight joint to prevent leakage; and for the purpose have made the diaphragm of material such as generally known as "Dupreme" but various other materials may be employed.

The tension of the spring of yielding element 23 should be such and only slightly in excess of that required to seal the joint between the diaphragm and the head of the shaft under the maximum pressure that can be produced by the action of the pump. This may be accomplished in several ways. For example, the propeller blade 21 should be of such size and clearance in the pressure chamber that no matter how fast it is rotated by the motor, it cannot produce sufficient pressure to overcome the spring and produce a leaking joint.

For a further illustration of a specific use of the pump for pumping kerosene, a small self-starting electric motor was employed in connection with the pump in which at maximum speed the pump would elevate the kerosene to a maximum of only twelve inches. Then in the column 12, the overflow or relief pipe 25 was at an elevation to permit overflow when the column of fluid reached an altitude of eight inches. The tension of the spring 23 was then set or the spring was so designed that it would keep the flexible diaphragm pressed against the head 19 under pressure of a column very slightly in excess of twelve inches.

With this arrangement, under normal conditions, there would be maintained a column of flowing liquid at an altitude of eight inches, and even if the circulating pipe should be clogged, the diaphragm would not be unseated nor leakage produced. With this arrangement the friction between the head 19 and the diaphragm is reduced to the minimum and will not impede to any great extent the starting of the relatively small motor.

If the pump shaft should, because of wear or

for lack of accurate adjustment, be capable of slight axial movement, that movement would be taken up by the resilience of elasticity of the diaphragm. If the shaft should wobble slightly, the sealing surface of the sealing head 19, in addition to rotating against the diaphragm, would simply slip eccentrically against the face of the diaphragm without producing any material increased friction. The arrangement described accomplishes all of the desirable results above indicated.

From the foregoing it follows that the preferred form of the device illustrated in the drawing is capable of various modifications within the scope of the invention herein described and claimed.

What I claim is:

A fluid pump of the circulator type comprising a casing having a cylindrical pressure chamber open at one end of said casing and being closed at its opposite end by an inwardly recessed casing wall, an inlet port leading axially into said chamber through the recess in said end wall, an outlet leading radially through said casing from the cylindrical wall of said chamber, a flexible diaphragm secured over the open end of said chamber and providing a flexible end wall therefor, a rotary shaft extending through said diaphragm and terminating within said chamber, a hub mounted on said shaft within said chamber and having a radially extending flange in frictional sealing engagement with the inner side of said diaphragm, a propeller of materially less dimensions than said pressure chamber mounted on said hub and spaced from the end walls of said chamber by engagement with one side of said flange, and a cooperating sealing member surrounding said shaft and yieldably engaging the outer side of said diaphragm to maintain a fluid seal between said shaft and diaphragm under relative axial and lateral vibrations of said propeller and casing.

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