Jan. 19, 1960 K. D. AUMICK 2,921,530

ROTARY POSITIVE DISPLACEMENT PUMP

Filed Dec. 14, 1956 2 Sheets-Sheet 1

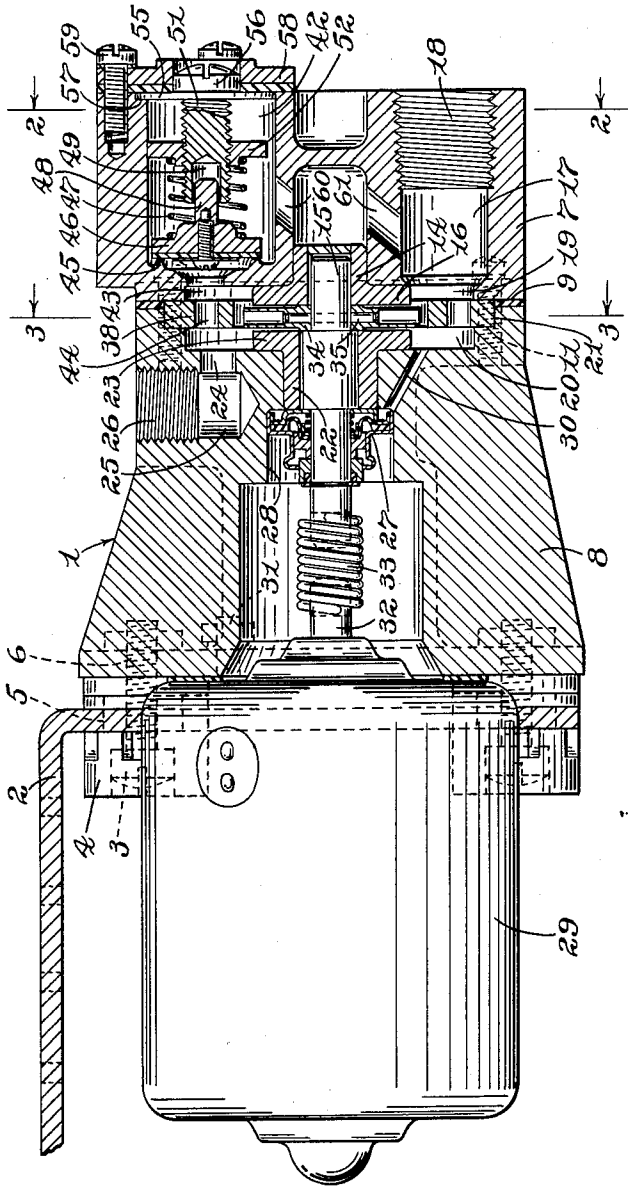


Fig. 1

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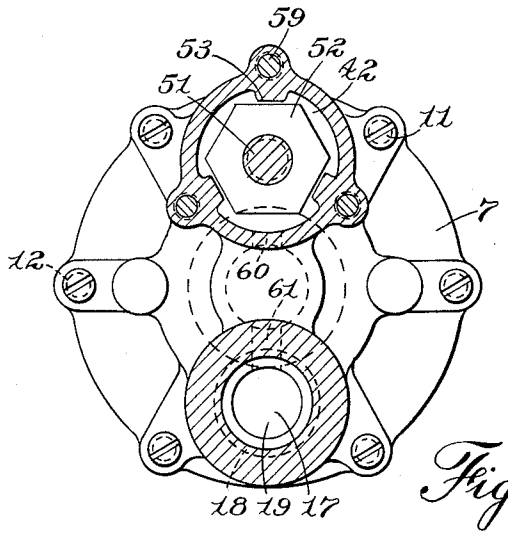


Fig. 2

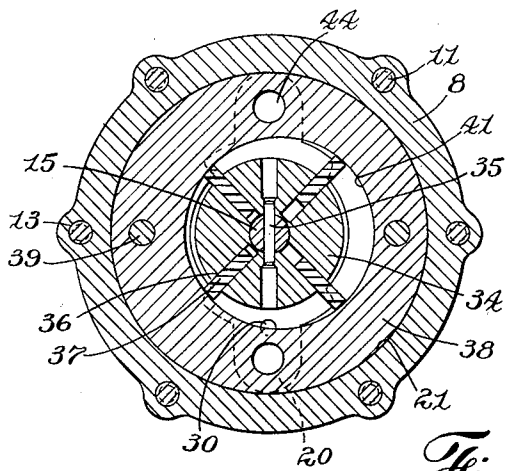


Fig. 3

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ROTARY POSITIVE DISPLACEMENT PUMP

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2 Claims. (Cl. 103—42)

The present invention relates to a rotary positive displacement pump, and more particularly to a vane type pump with built-in adjustable pressure controlling means.

It is an object of the present invention to provide a positive displacement pump which is efficient and reliable in operation, simple in construction and economical to manufacture.

It is another object to provide such a device incorporating an improved built-in output pressure regulating valve.

It is another object to provide such a device in which the moving parts are of simple easily fabricated conformation and readily assembled and disassembled for service or replacement.

It is another object to provide such a device which, when used as an automotive fuel pump, requires no special construction of the fuel tank, but may be conveniently attached to the frame of the vehicle without interference with other structural elements of the chassis or body.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is a side elevation, partly broken away and in section, of a preferred embodiment of the invention;

Fig. 2 is a section taken substantially on the line 2—2 of Fig. 1; and

Fig. 3 is a section taken substantially on the line 3—3 of Fig. 1.

In Fig. 1 of the drawing there is illustrated a frame or casing indicated generally by numeral 1 which is arranged to be conveniently bolted to a channel member 2 of the chassis of the vehicle on which the pump is to be mounted, preferably by means of studs 3 traversing shock absorbing bushings 4 of rubber or the like mounted in openings 5 in the frame member, said studs being threaded into the base of the casing 1 as indicated at 6.

The casing 1 is formed of two sections, 7 and 8, joined at a parting line 9 and clamped together by means of studs 11 traversing the registering openings 12 and 13 (Figs. 2 and 3) in said casing sections. The casing section 7 is formed with a flat surface at the parting plane 9 and has a bearing member 14 centrally located therein for the reception of one end of a drive shaft 15 journalled therein. The bearing member 14 also has a radial flange 16 flush with the parting surface of the casing member.

Casing member 7 is also provided with an inlet chamber 17 threaded as indicated at 18 for the reception of an inlet conduit, said chamber having an opening 19 from the inlet chamber 17 in its contacting face.

The contacting face of the casing section 8 is counterbored or recessed as indicated at 21 to form a disc-shaped chamber which is closed by the casing section 7 when the parts are assembled. Casing section 8 is also provided with a centrally located bearing member 22 rotatably supporting the drive shaft 15 and having a radial flange 23 which is flush with the radial surface of the chamber 21.

Casing section 8 is also provided with an inlet passage 20 communicating with the inlet opening 19, and with an outlet passage 24 leading from the chamber 21 at a point substantially opposite the inlet passage, and communicating with an outlet chamber 25 having a threaded socket 26 for the reception of an outlet conduit.

A sealing gland 27 is mounted in a counterbore 28 in the casing section 8, bearing on the drive shaft 15 and preventing escape of liquid from the bearing 22. A channel 30 is formed in the casing section 8 leading from the gland 27 back to the inlet side of the chamber 21 to return that portion of the liquid which circulates through the bearing for cooling and lubrication.

A motor 29 is mounted on the casing member 8 in any suitable manner as indicated at 31, and its armature shaft 32 is coupled to the driving shaft 15, preferably by an elastic connection as indicated at 33.

A disc-shaped impeller 34 (Fig. 3) is rigidly mounted on the drive shaft 15 as by means of a cross pin 35, and is provided with a plurality of radial axially extending slots 36 in which impeller vanes 37 are slidably mounted. The thickness of the impeller 34 and vanes 37 is such as to have a close bearing fit between the flange 16 of bearing member 14 and the flange 23 of bearing member 22 when the parts are assembled.

A runner ring 38 having the same thickness is nonrotatably mounted in the chamber 21 as by means of dowel pins 39 traversing such runner ring and seating in registering sockets in the two casing sections. The runner ring 38 has a smooth cylindrical interior surface 41 which is eccentric to the impeller 34 on which surface the vanes 37 bears as the impeller is rotated. The impeller vanes are preferably maintained in contact with the interior surface 41 of the runner ring by centrifugal force while the pump is in operation, but of course springs may be employed in the bottoms of the slots 36 for this purpose if deemed desirable.

Means are provided for maintaining a substantially constant output pressure of the pump irrespective of variations in the volume of liquid pumped and/or fluctuations of the voltage of the power circuit for the motor. For this purpose, the casing section 7 is formed with a valve chamber 42 having an opening 43 into the output side of the chamber 21, in registry with an opening 44 traversing the runner ring 38 and communicating with the output passage 24. An annular valve seat 45 is formed in the inner end of the valve chamber 42, and a disc valve member 46 is yieldingly pressed against said seat by a spring 47. The valve member 46 has a stem 48 slidably received in a counterbore 49 in an adjusting screw 51, and a nut 52 is threaded on said screw to form an adjustable abutment for the valve spring 47. The valve chamber 42 is provided with longitudinally extending ribs 52 (Fig. 2) slidably receiving the nut 52 and preventing rotation thereof.

The adjusting screw 51 has a swiveled connection with the casing member 7 which connection forms both a seal for the valve chamber 42 and a means for clamping the screw 51 in adjusted position. For this purpose, a disc or flange member 55 is fixedly mounted in any suitable manner as by brazing on the screw 51 adjacent its head 56. The disc 55 is rotatably received in the end of the valve chamber 42, resting against the ends of the ribs 53 which are reduced in length slightly as indicated at 57 (Fig. 1) for that purpose. A cover 58 is arranged to be clamped on the casing section 7 by means of studs 59 to form a closure for the valve chamber 42 and also to clamp the disc 55 against the ends of the ribs 53 when the studs 59 are tightened up.

In operation, the pump being mounted preferably below the level of the bottom of the fuel tank and connected thereto by a suitable conduit, rotation of the motor 29

transmitted to the driving shaft 15 rotates the impeller 34 whereby liquid is drawn from the inlet chamber 17 by the action of the vanes 37 bearing on the eccentric interior surface 41 of the runner ring 38, and discharged through the passage 24 to the outlet chamber 25 from which a supply conduit conducts the discharged fuel to the engine compartment of the vehicle. The dimensions of the pump elements, in conjunction with the normal speed of rotation of the motor are so selected that the pump will deliver a substantially greater quantity of fuel than the power plant is capable of utilizing under any circumstances. The excess of fuel pumped which is not accepted by the power plant is permitted to escape by raising the valve 46 from its seat 45, thus admitting the excess fuel to the valve chamber 42 from which it returns to the inlet chamber 17 by means of passages 60 and 61. Since there is some escape of fuel past this relief valve at all times, it will be appreciated that the output pressure of the pump may be accurately controlled by adjustment of the valve spring 47. This is accomplished by loosening the cover studs 59 and rotating the screw 51 to suitably adjust the position of the abutment nut 52 thereon. When the proper output pressure has been thus obtained, the studs 59 are screwed down, thus sealing the valve chamber 42 and holding the disc 55 and screw 51 in adjusted position. The liquid which passes around the power shaft 15 past the bearing 14 will be returned to the inlet chamber 17 through the passage 61.

Although but one embodiment of the invention has been shown and described in detail it will be understood that changes may be made in the form and arrangement of the parts without departing from the spirit of the invention.

I claim:

1. A rotary positive displacement pump comprising a casing having an inlet chamber, a centrally located chamber and an outlet chamber, said casing having an opening connecting the inlet chamber to the centrally located chamber and a passage connecting the centrally located chamber to the outlet chamber, a drive shaft journalled in the casing having an impeller disc rotatable in said

centrally located chamber, a runner ring in the centrally located chamber having a smooth cylindrical interior surface eccentrically surrounding the impeller disc and axially coextensive therewith, a plurality of pump vanes mounted for radial sliding movement in the impeller disc and bearing on the interior surface of the runner ring, said casing being formed of two detachable sections a first section providing said centrally located chamber and outlet chamber, and a second section providing said inlet chamber and forming the cover for said centrally located chamber; in which said second section of the casing is provided with a return passage from said centrally located chamber back to the inlet chamber and a calibrated pressure relief valve controlling escape of liquid through said last named passage, and in which the runner ring is traversed by an aperture parallel to its axis, and means for positioning the runner ring and said second section of the casing with respect to said first section of the casing as to locate said aperture in registry with said passage from said centrally located chamber to the outlet chamber and to said return passage.

2. A pump as set forth in claim 1 in which said second section of the casing is provided with a bearing for the drive shaft having a flange forming a lateral bearing for the impeller, said bearing being so located in said second casing section that leakage from the bearing enters said return passage between the control valve and the inlet chamber.

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