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VARIABLE VOLUME ROTARY VANE PUMP

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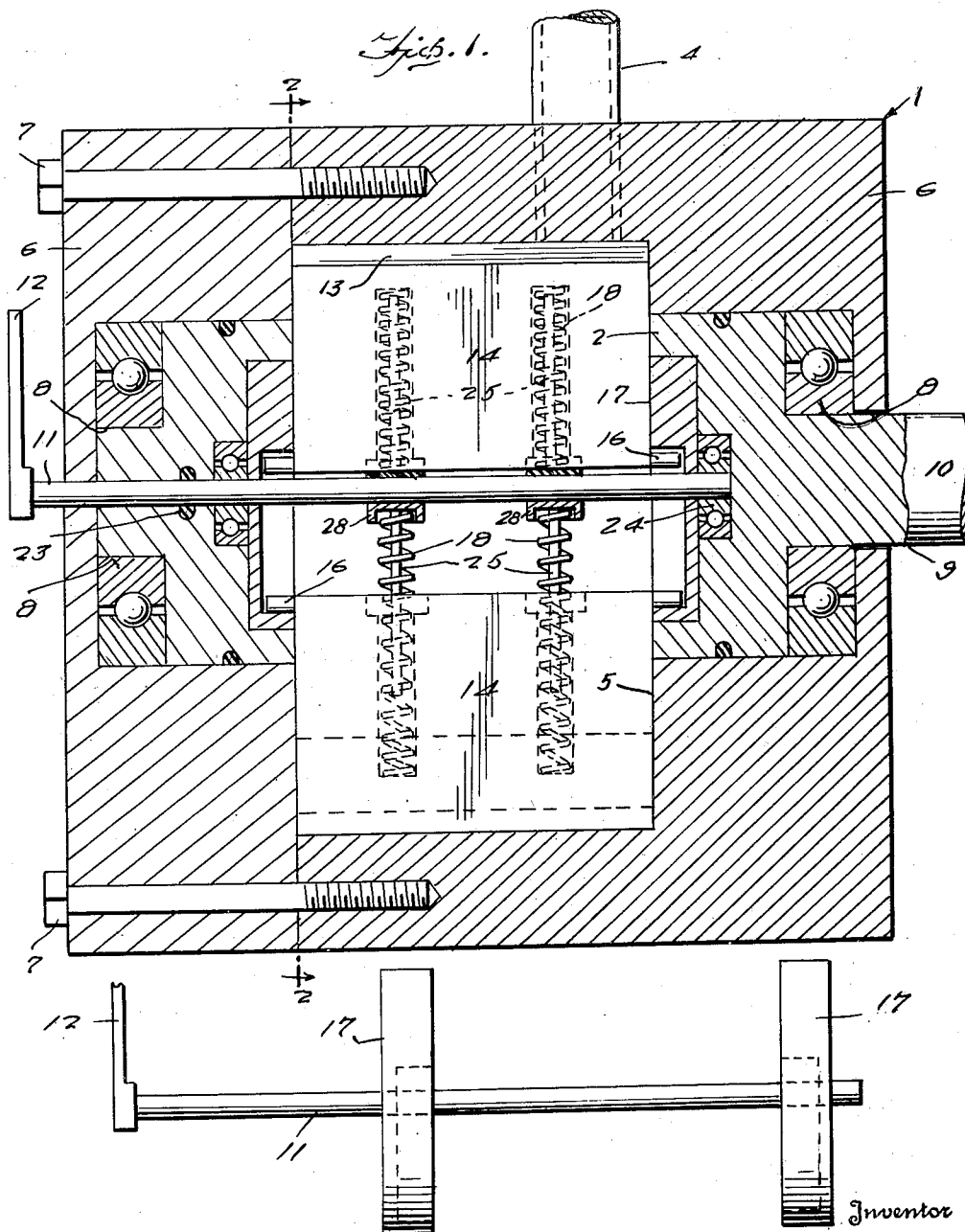


Fig. 3.

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VARIABLE VOLUME ROTARY VANE PUMP

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3 Claims. (Cl. 103—120)

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This invention relates to rotary pumps of the single or plural reciprocating vane type. Said vanes alternately obtruding and receding during each cycle of the rotor.

The primary object of my invention is to provide a mechanism of simple design and construction for the control of the fluid volume discharge, manually or automatically, of rotary pumps, thus eliminating the necessity of the conventional bypass valve system or volume relief valves used in conjunction with rotary pumps.

This invention eliminates the normal procedure of throttling pump discharge valves which creates a back pressure in the pump and consequently a power loss in that excess power is required to operate a rotary pump under said back pressure in relation to the volume output.

A further object of my invention is to provide a suitably designed cam or cams manually or mechanically operated to, with the greatest possible abruptness terminate or regulate the power cycle or compression stroke of the vanes.

Still a further object is to provide a pump which can be easily operated and of simple construction of parts which are capable of withstanding the strain placed on them.

Other objects and advantages of my invention will be apparent from the following description and claims taken in conjunction with the attached drawings wherein like parts are indicated by the reference characters and in which:

Figure 1 is a sectional view of the invention taken approximately along the vertical center line 2—2 of Figure 2.

Figure 2 is a vertical sectional view of a typical rotary pump embodying my invention.

Figure 3 is a fragmentary side elevational view of the rotor showing the cam control shaft.

Figure 4 is a fragmentary side view of the vanes showing the beveled edge and the cam follower pins.

The device of my invention consists of a hollow pump casing or stator 1 of generally circular configuration equipped with a suction and a discharge port, 4 and 3, respectively located at respective ends of the crescent-shaped power chamber 5, and comprises two separable heads 6 secured together by means of stud bolts 7. The casing heads have bearing recesses therein in which are disposed anti-friction bearings 8 eccentric with the cylindrical interior of the casing 1 and in axial alignment with each other in which the rotor 2 is concentrically journaled.

Vane-receiving slots 13 are provided in the main body of the rotor. Each of these slots has

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a reciprocating piston or vane 14 mounted therein. Said vanes are generally oblong in shape, the outer ends of which are beveled, substantially as shown at 21, and conform to the arc of the inner periphery 15 of the casing 1. The inner terminals of the vanes are equipped with pins or cam followers 16 which protrude through the ends of the rotor and are guided by the cams 17. The rotor may be slotted at the outer ends of the vane slots therein to receive suitable lubricant for the vanes. The vanes are held in a protruding position from the slots by means of helical springs 18 which encircle vane mounting pins 25, and impinge against the inner ends of the vanes to force the outer ends of said vanes against the inside periphery 15 of the pump casing 1.

The cams 17 are rotatably mounted in the hollow rotor 2 concentrically therewith and have respective, eccentric, circular recesses therein which receive the corresponding vane pins 16, the pins being held in contact with the annular walls of these recesses by the aforementioned helical springs 18. The springs 18 are supported at their inner ends on shoes 28 which bear on control shaft 11.

The cams 17 are secured in spaced-apart relationship on a control shaft 11 which passes concentrically through the rotor and is journaled in the pump casing, one end of this shaft extending out of the pump casing on the side of the latter opposite the rotor drive shaft 9. Grommets 23 of suitable packing material surround the shaft at opposite ends of the rotor and act as sealing rings and an operating handle 12 is secured on the outer end of this shaft outside of the pump casing. The cam control shaft is journaled in anti-friction bearings 24, and when in operation, the rotor rotates around this shaft in a counter-clockwise direction as indicated by the arrow 26 adjacent to Figure 2.

Referring particularly to Figure 2, with the cams in the position therein illustrated, the intake stroke of the pump is from point 20 adjacent the inlet passage 4 to point 22 which is diagonally opposite a point midway between inlet passage 4 and outlet passage 3 and at which the rotor 2 contacts the inner wall of casing 1. The compression or discharge stroke of the pump is from point 22 to a point 19 adjacent the outlet fitting. In this case each vane contacts the internal casing wall throughout each entire revolution of the rotor, the discharge stroke is substantially equal in length to the intake stroke, and the capacity of the pump is at the maximum.

If shaft 11 and cams 17 now be rotated from the position shown in Figure 2 in a counter-clockwise direction or in the same direction as that in which the rotor 2 rotates, the vanes will be held out of contact with the inner wall of the casing until their ends have passed the point 22 thereby shortening the discharge stroke of the pump and reducing the pump capacity. The pump capacity can thus be manually regulated between maximum and zero by rotating shaft 11 and cams 17 through an angle somewhat less than 180° in the direction of rotor rotation.

It is apparent from my foregoing description that this variable volume pump is dependent upon the cam mechanism so controlled by a shaft, and the vane mechanism with its controlled arc power or compression stroke. The cams embodied in this invention may be placed at either or both ends of the rotor.

It is to be understood that a rotary pump as set forth in this specification merely serves as an illustrative example, as such a device may be embodied in engine fluid drives under suitable conditions, etc.

It is apparent that many modifications and changes can be made without departing from the spirit of my invention, and therefore I do not wish to limit my invention to the specific examples set forth in this specification.

What I claim is:

1. In a rotary pump having a hollow casing provided with a cylindrical inner wall and closed ends, and an inlet and an outlet passage extending through the wall thereof, a hollow cylindrical rotor smaller than the hollow interior of said casing eccentrically journaled in said casing to contact said interior casing wall between said inlet and outlet passages and having radially-extending, angularly-spaced, longitudinal slots therein, vanes slidably mounted one in each of said slots, and spring means urging said vanes outwardly of said rotor to resiliently maintain the outer edges of said vanes in contact with said casing inner wall, capacity adjusting means for said pump comprising a shaft extending concentrically through said rotor and journaled in said casing, a handle on one end of said shaft outside said casing, a pair of cams secured on said shaft and positioned within said rotor, one at each end of the latter, each of said cams having an eccentric circular recess therein, and means on the inner edge of each vane extending into said circular cam recesses whereby the outer edges of said vanes may be held out of contact with said casing inner wall at the beginning of the pump discharge stroke by rotating said cams in the direction of rotor rotation, to shorten said intake stroke and thereby variably reduce the capacity of the pump.

2. In a rotary pump having a hollow casing provided with a cylindrical inner wall and closed ends, and an inlet and an outlet passage extend-

ing through the wall thereof, a hollow cylindrical rotor smaller than the hollow interior of said casing eccentrically journaled in said casing to contact said interior casing wall between said inlet and outlet passages and having radially-extending, angularly-spaced, longitudinal slots therein, vanes slidably mounted one in each of said slots, and spring means urging said vanes outwardly of said rotor to resiliently maintain the outer edges of said vanes in contact with said casing inner wall, capacity adjusting means for said pump comprising a shaft extending concentrically through said rotor and journaled in said casing, a shaft rotating handle on one end of said shaft outside of said casing, and cam means on said shaft within said rotor operatively engaging said vanes to adjustably vary the length of the discharge stroke of said pump upon rotation of said shaft by withdrawing the outer edges of said vanes from said casing inner wall at the beginning of the pump discharge stroke of each vane.

3. In a rotary pump having a hollow casing provided with a cylindrical inner wall and closed ends, and an inlet and an outlet passage extending through the wall thereof, a hollow cylindrical rotor smaller than the hollow interior of said casing eccentrically journaled in said casing to contact said interior casing wall between said inlet and outlet passages and having radially-extending, angularly-spaced, longitudinal slots therein, vanes slidably mounted one in each of said slots, and spring means urging said vanes outwardly of said rotor to resiliently maintain the outer edges of said vanes in contact with said casing inner wall, capacity adjusting means for said pump comprising a shaft extending through said rotor and journaled in said casing, and cam means on said shaft operatively engaging said vanes to control the contact of the outer edges of said vanes with said casing inner wall upon rotation of said shaft.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,437,706	Beardslee	Dec. 5, 1922
1,538,075	Wingquist	May 19, 1925
1,698,235	Mathis	Jan. 8, 1929
1,855,708	Dilg	Apr. 26, 1932
2,054,207	Staats	Sept. 15, 1936

FOREIGN PATENTS

Number	Country	Date
542,945	France	May 24, 1922
733,547	France	Oct. 7, 1932
843,908	France	July 12, 1939