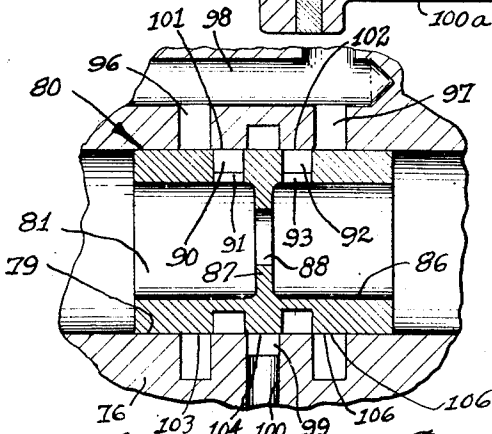
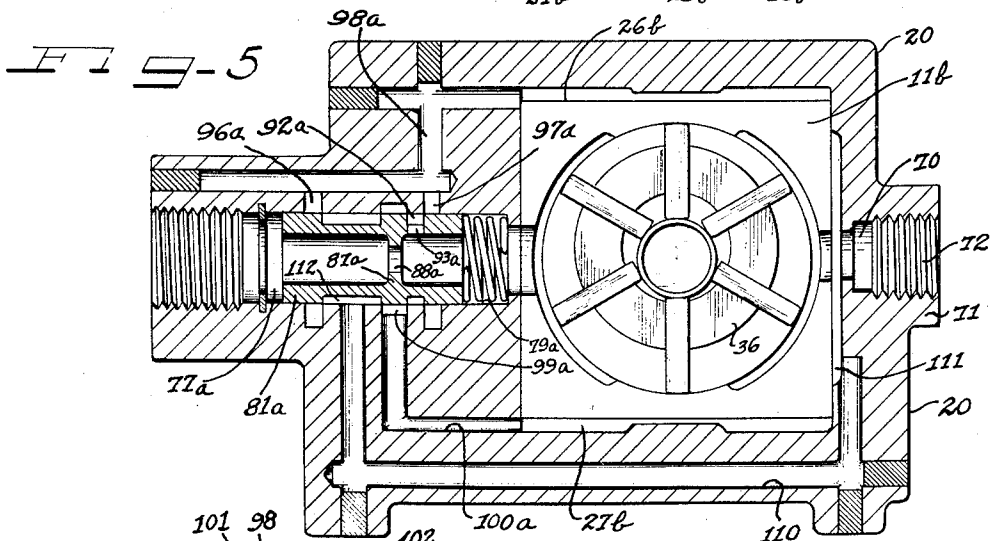
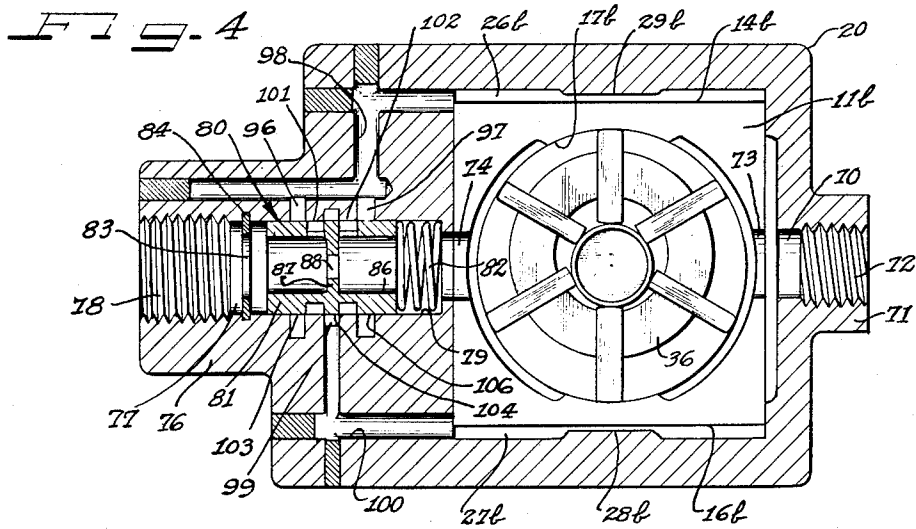


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CONSTANT DELIVERY VARIABLE PRESSURE PUMP

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2 Sheets-Sheet 2



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2,775,946

CONSTANT DELIVERY VARIABLE PRESSURE PUMP

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13 Claims. (Cl. 103—120)

This invention relates generally to a pumping apparatus capable of delivering a constant volume of fluid without cavitation and without regard to wide variation in delivery pressure.

More specifically, the present invention relates to a variable pressure, constant delivery, guided vane pump wherein a rotor providing an annular row of circumferentially spaced slots carries a corresponding plurality of vanes slidably supported in the respective slots for engagement with the cylindrical pumping chamber bore of a regulating block supported in a casing for movement transversely of the rotor axis to adjust the relative eccentricity of the pumping chamber bore and the rotor, the adjustment of the block being effected in response to variations in the effective differential of a pressure drop across an orifice provided in a flow path through the pump and including the inlet and the outlet of the pump.

Although the principles of the present invention are of general utility, a pump embodying the features of the present invention finds a particularly useful application in connection with supplying fluid under pressure to a hydraulic system designed to operate a power booster on motor vehicles for power steering, hydraulically operated windshield wipers, hydraulic seat adjusters and other accessory devices. A pump embodying the features of the present invention is also of great utility on any hydraulic system operable on the so-called open center hydraulic principle. In an open center system, fluid is permitted to flow through the actuating valve and back to a reservoir under no pressure until a demand occurs at which time the actuating valve directs the fluid away from the reservoir towards the power motor where work is done before the fluid can return to the reservoir. Since resistance is encountered in this process, pressure is immediately established and the work is done.

Since great variations are encountered in the rotational speed of an engine driven pump, it is highly desirable that provision be made for a source of fluid energy in a hydraulic system which will be constant in delivery within rather narrow limits. Wide variation in fluid delivery in an open center system results in a loss of sensitivity in the actuating valve or in over heating of the fluid with consequent loss of energy.

In the pumps heretofore provided, provision is sometimes made to starve the inlet of the pump in order to control the flow. In a constant delivery pump this practice produces cavitation with accompanying noise resulting from the hammer of the fluid on the metal components of the pump as the fluid on the delivery side of the pump rushes to fill the vacuum of displacement caused by the inlet starvation.

According to the principles of the present invention, a variable delivery pump is provided in which the inlet is controlled, however, instead of utilizing static pressure variables to control the pump, the pump controlling pressures are determined and established by the flow of the pumping fluid through an orifice and the differential variables or variations in pressure drop across the orifice are utilized for control purposes.

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It will be appreciated that pump control which is effected in response to pressure drop variations will be independent of actual static pressure values and, accordingly, the pressure drop control effected in accordance with the principles of the present invention will be accurate even though the pump is required to be used at different altitudes.

It is an object of the present invention, therefore, to provide a constant delivery variable pressure pump which overcomes the deficiencies of the prior art structures heretofore provided.

Another object of the present invention is to provide a pump wherein volume may be regulated without regard to static pressure values.

A further object of the present invention is to utilize a pump control system wherein the pump controlling pressures are determined and established by the flow of fluid through an orifice and wherein the controlling variable consists of the pressure drop established across the orifice.

Yet another object of the present invention is to provide a pump control which is independent of altitude limitations.

Many other features, advantages and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows and the accompany sheets of drawings in which preferred structural embodiments of pumps constructed in accordance with the principles of the present invention are shown by way of illustrative example only.

On the drawings:

Figure 1 is a cross-sectional view of a constant delivery variable pressure pump provided in accordance with the principles of the present invention;

Figure 2 is a cross-sectional view of a modified embodiment;

Figure 3 is a cross-sectional view taken on a plane generally transverse of Figures 4 and 5 and illustrating additional details of construction of both the Figure 4 and Figure 5 pumps;

Figure 4 is a cross-sectional view of another embodiment provided in accordance with the principles of the present invention;

Figure 5 is a cross-sectional view of a pump generally similar to that shown in Figure 4 but embodying an alternative modification in accordance with the principles of the present invention; and

Figure 6 is an enlarged fragmentary cross-sectional view showing additional details of construction of the control valve provided in the embodiment of Figure 4.

As shown on the drawings:

In order to illustrate the applications of the principles of the present invention, there is shown in the drawings a guided-vane type pump wherein a single rotor revolves in a case. The pumping element consists of multiple blades sliding in slots provided by the rotor and the impeller and the case are eccentric with respect to one another. Centrifugal force or pressure maintains the outer end of the blades in contact with the casing bore and the capacity of the pump is regulated by adjusting the relative eccentricity of the impeller and the case. Although various modified embodiments will be described herein, similar reference numerals will be applied wherever possible in the interest of clarity.

As shown in Figure 1, a constant delivery variable pressure pump is indicated generally by the reference character 10 and comprises a regulator block 11 having flat sides indicated at 12 and 13 respectively, a reactive pressure face 14 is provided on one end of the block 11 and a second reactive pressure face 16 is provided on the opposite end of the block 11.

Between the reactive pressure faces 14 and 16 is formed

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a cylindrical pumping chamber bore indicated at 17, the bore 17 being provided with an annular groove or grooves on diametrically opposite sides thereof forming an inlet relief 18 and an outlet relief 19.

A casing 20 is provided for the pump 10 and includes a hollow cavity bounded by flat internal walls mating with the flat sides of the block 11 to slidably support the block 11 for movement transversely of the axis of the pumping chamber bore 17. More specifically, the casing provides a first flat internal wall 21 slidably engaging the flat side 12 and a second flat internal wall 22 slidably engaging the flat side 13.

The reactive pressure face 14 is spaced from a casing wall 23 and the reactive pressure face 16 is spaced from a casing wall 24 to provide a pressure control chamber 26 and a pressure control chamber 27, respectively, which pressure control chambers 26 and 27 are located on opposite sides of the axis of the pump chamber bore 17.

A boss 28 extends into the pressure control chamber 27 from the wall 24 and forms a stop to engage the reactive pressure face 16 of the block 11.

A boss 29 extends into the pressure control chamber 26 from the wall 23 and forms a stop to engage the reactive pressure face 14 of the block 11.

As shown in Figure 3, the casing 20 is provided with a front member 30 and a back member 31 which are assembled together by a plurality of fasteners 32.

Referring to Figure 3 in connection with Figure 1, the pump rotor is shown as including a rotor shaft 33 having a radially outwardly extending body portion 34 and an annular axially extending ring 36 providing an annular roll of circumferentially spaced slots 37 each receiving a vane 38.

A floating tubular abutment 39 engages the radial innermost ends of the vane 38, the tubular abutment 39 having an outside diameter smaller than the inside diameter of the annular ring 36.

The radial outermost ends of the vane 38 engage the walls of the pumping chamber bore 17.

Although the positioning stops 29 and 28 prescribe the limits of adjustment of the regulating block 11 and hence the capacity limits of the pump, a continuous biasing means is provided between the regulating block 11 and the casing 20 in order to adjust the relative eccentricity of the pump chamber bore 17 and the rotor ring 36 so as to maintain a minimum eccentric pumping position. In the preferred embodiment herein described, the continuous biasing means takes the form of a coil spring 40 having one end bottomed against the reactive pressure face 14 and having the other end bottomed against a plug 41 threaded into the open end of an aperture 42 extending through the boss 29.

A fluid flow path is provided through the pump 10 and in the embodiment of Figure 1, the fluid flow path includes an inlet 43 extending through a boss 44 providing a threaded aperture 46 adapted to receive in threaded assembly a suitable conduit means (not shown).

The flow path further includes an outlet 47 extending through a boss 48 having a threaded aperture 49 adapted to receive in threaded assembly therewith suitable conduit means (not shown).

As indicated in Figure 1, the casing 20 is provided with an outlet relief 55 formed as a recess in the wall 21.

In accordance with the principles of the present invention, a passageway 50 extends through the block 11 between the pressure control chamber 26 and the pressure control chamber 27.

The block 11 is further provided with a passageway 51 extending between the pressure control chamber 26 and the pumping chamber bore 27, the passageway 51 intersecting the inlet relief 18.

An outlet passageway 52 is formed in the block 11 intersecting the outlet relief 19 formed in the walls of the pumping chamber bore 17 and communicating with the outlet relief 55 and the outlet 47 formed in the casing 20.

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An orifice 53 of predetermined size is located in the passageway 50 and is utilized to establish a discrete pressure drop in the flow path through the pump 10. More specifically, the restriction provided by the orifice 53 affords a pressure differential acting on the respective reactive pressure faces 14 and 16 to regulate the volumetric capacity of the pump in response to the pressure drop variations across the orifice 53.

In other words, because the orifice 53 provides a restriction in the flow path between the pressure control chamber 27 communicating with inlet 43 and the pressure control chamber 26 communicated to the inlet side of the pumping chamber bore 17, there will be a pressure differential between the pressure control chamber 27 and the pressure control chamber 26 which will tend to actuate the regulator block 11 against the continuous biasing force exerted by the coil spring 40 so that the relative eccentricity of the pumping chamber bore 17 and the rotor ring 36 will be reduced.

By selecting the spring 40 to exert a predetermined continuous biasing force, and by properly proportioning the size of the restriction afforded by the orifice 53, the volume flow of the pump 10 will be closely controlled within desired limits.

In the embodiment of Figure 1, the maximum pressure drop across the orifice 53 will be atmospheric. In the embodiment of Figure 2, the structure and function of the pump is similar to that described in connection with the embodiment of Figure 1, however, the pressure drop is produced by pressurized discharged fluid flowing through an orifice located on the outlet side of the pump, thereby affording greater flexibility in selecting a desirable pressure drop for control purposes.

In the embodiment of Figure 2, an inlet is provided as at 56 extending through a boss 57 having a threaded aperture 58 adapted to be connected to suitable conduit means.

The regulating block 11a is formed with an inlet passage 59 communicating the inlet 56 with the inlet relief 18a formed in the walls of the pumping chamber bore 17a.

An outlet 60 extends through a boss 61 having a threaded aperture 62 adapted to be connected to suitable conduit means.

A passageway 63 is formed in the regulating block 11a and extends between the pressure control chamber 26a and the pressure control chamber 27a.

An outlet passage 64 communicates the pumping chamber bore 17a with the pressure control chamber 27a, the passage 64 intersecting the outlet relief 19a formed in the walls of the pumping chamber bore 17a.

An orifice 66 providing a restriction of predetermined size is located in the passage 63 and affords a pressure differential between the pressure control chamber 27a and the pressure control chamber 26a which is effective to act on the respective reactive pressure faces 14a and 16a on the block 11a, thereby to regulate the relative eccentricity of the pumping chamber bore 17a and the annular ring 36 of the rotor in response to the pressure drop variations across the orifice 66.

It will be appreciated that any desirable pressure drop may be effectively utilized in connection with the embodiment of Figure 2 and the pressure drop selected will not be affected by variations of pressure due to altitude changes. Moreover, it will be appreciated that any pressure variations in the outlet line due to variations in demand will be instantly transmitted through the regulating block 11a and will not detrimentally affect the eccentricity control provided in accordance with the principles of the present invention since the regulation of the block 11a is effected by the pressure differential afforded by the pressure drop across the orifice 66 and not by a variable static pressure.

In the embodiments of Figures 1 and 2, the pressure differential afforded by the pressure drop across an ori-

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fice in the fluid flow path through the pump is communicated to the eccentricity regulating means by passageways formed in the regulating block, per se. It will be recognized that those versed in the art that the principles of the present invention can also be applied to a positive displacement pump by means of a separate valving mechanism constructed to respond to pressures on opposite sides of a control orifice.

In the embodiment of Figure 4, a modified embodiment of a pump constructed in accordance with the principles of the present invention utilizes such a separate valving mechanism.

In the embodiment of Figure 4, no biasing spring is utilized between the casing 20 and the regulating block 11b, the stop 29b extending into the pressure control chamber 26b and engageable with the reactive pressure face 14b to prevent the relative eccentricity of the pumping chamber bore 17b and the annular ring 36 of the rotor from ever becoming zero. Thus, the pump is always ready to deliver fluid upon rotation of the rotor. Preferably the stop 29b is so located as to determine the stop position at which the highest possible rotational speed of the rotor will occur. Correspondingly, the position determined by the stop 28b will correspond to an idling position.

In the embodiment of Figure 4, an outlet 70 is provided in the flow path extending through a boss 71 having a threaded aperture 72 adapted to be connected to a suitable conduit means. The outlet 70 communicates with an outlet passageway 73 formed in the regulating block 11b, an inlet passageway 74 being provided in the regulating block 11b on the opposite side thereof.

The casing 20 in the Figure 4 embodiment is provided with an enlarged portion 76 having an inlet passageway 77 extending therethrough and opening at one end in registry with the inlet passage 74 formed in the regulating block 11b. The other end of the inlet passage 77 is threaded as at 78 and is adapted to be connected to a suitable conduit means.

Along the length of the inlet passageway 77 is provided a cylindrical bore 79 forming a housing for the separate valving mechanism indicated generally at 80.

A movable valve spool 81 of cylindrical configuration is axially reciprocable in the cylindrical bore 79 and is normally biased toward a so called neutral position by a continuous biasing means taking the form of a coil spring 82. The spring 82 is bottomed at one end in the casing 20 and has its opposite end engaging the valve spool 81 to urge the valve spool 81 in upstream direction. A retainer ring 83 is seated in an annular recess 84 provided along the length of the inlet passage 77 to limit upstream movement of the valve spool 81.

A tubular bore 86 extends through the valve spool 81 and is interrupted by a radially inwardly extending rib 87 which is medially located and which provides an orifice 88 providing a restriction of predetermined size in the flow path through the pump.

On the external peripheral surface of the valve spool 81 a pair of spaced apart annular grooves are provided, a first groove 90 communicating with the inlet passage 77 on the upstream side of the orifice 88 through a suitable opening 91, and a second groove 92 communicating with the inlet passage 81 downstream of the orifice 88 through a suitable opening 93.

The cylindrical bore 79 is also provided with spaced apart annular grooves forming passageways communicating with the pressure control chambers 26b and 27b and controlled by movement of the valve spool 81. A first annular groove 96 is located adjacent the upstream end of the cylindrical bore 79 and spaced away therefrom in downstream direction a second annular groove 97 is provided. Both of the annular grooves 96 and 97 communicate with the pressure control chamber 26b through a passageway 98 formed in the enlarged portion 76 of the casing 20.

A medial annular groove 99 is provided in the cylin-

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dricul bore 79 between the grooves 96 and 97 and communicates with the pressure control chamber 27b by means of a passageway 100 formed in the enlarged portion 76 of the casing 20.

By virtue of the spacing relationship between the grooves 96, 97 and 99, there is provided therebetween spaced lands indicated at 101 and 102 which cooperate with the annular grooves 90 and 92 formed in the peripheral surface of the valve spool 81. In like manner, the valve spool 81 provides spaced lands 103, 104 and 106 respectively which cooperate with the grooves 96, 97 and 99.

In operation, the orifices 88 will pass rated flow through the inlet passage 77 at a predetermined pressure drop, the spring 82 normally maintaining the valve spool 81 in an axial neutral position in the cylindrical bore 79 corresponding to that position resulting when a correct pressure drop across the orifice 88 is achieved.

Should the rotational speed of the pump change, the pressure in the first inlet passage 77 will also change, thereby varying the pressure differential or pressure drop across the orifice 88.

Since the spool 81 is movably mounted and is physically interposed in the flow path so that the flow of fluid through the inlet passage 77 will tend to move the spool 81 against the bias of the spring 82, it will be manifest that a change in the pressure drop across the orifice 88 will result in a movement of the valve spool 81 and, consequently, the pressure control chambers 26b and 27b will be selectively subjected to the pressures in the tubular bore 86 of the movable valve spool 81 on either the upstream side of the orifice 88 or the downstream side of the orifice 88 thus producing the same pressure drop between the pressure control chambers 26b and 27b and communicating the effective differential of the pressure drop to the reactive pressure faces 14b and 16b. This effective pressure differential will tend to movably adjust the regulating block 11b to change the relative eccentricity of the pumping chamber bore 17 and the annular ring 36 of the rotor so that the volume of fluid passing through the pump will be so regulated as to restore pump inlet pressure to predetermined design value, whereupon the movable valve spool 81 will be returned by the spring 82 to a neutral position.

It may be noted that when the valve spool 81 is in a neutral position, the grooves 90, 92, 96, 97, 99 and the cooperating lands 101, 102, 103, 104, 106 seal the passageways 98 and 100 to the respective pressure control chambers 26b and 27b so that the regulating block 11b will be hydraulically locked. Any movement of the regulating block 11b due to leakage will be corrected as if the rotational speed of the pump had varied because a movement of the regulating block 11b will produce the same effect on the flow of fluid along the flow path through the pump as a speed variation would produce.

The embodiment of Figure 5 is very similar in structure and operation to the structure described in connection with Figure 4, however, in the embodiment of Figure 5 operating fluid is conducted from the outlet of the pump to the valve, thereby utilizing pump discharge as a reference pressure instead of atmospheric pressure.

In the embodiment of Figure 5, the casing 20 is provided with a passageway 110 communicating with the pump outlet 70 as at 111.

The movable valve spool 81a is provided with an annular peripheral groove 112 located in spaced relation to the orifice 88a formed in the radially inwardly extending rib 87a and on the upstream side thereof.

An annular groove 92a is formed in the peripheral surface of the valve spool 81a and communicates with the inlet passage 77a on the downstream side of the orifice 88a through suitable openings 93a. Passage 98a communicates with the pressure control chamber 26b and with spaced annular grooves 96a and 97a formed in the bore 79a.

An annular groove 99a formed in the cylindrical bore 79a of the inlet passage 77a communicates with the pressure control chamber 27b through a passageway 100a.

Since the orifice 88a is located downstream of the annular groove 112 communicating with pump discharge through the passageway 110, a minimum pressure will be provided for conditions where such minimum pressure might not exist in the pump outlet 70. It should be noted that this outlet pressure has no effect on the movable valve spool 81a, but simply passes through the valve mechanism and acts to move the regulating block 11b when called upon to do so by the change in the pressure drop across the orifice 88a. The use of outlet pressure for control operation is only necessary where the available pressure drop across the orifice 88a is not sufficient to control movement of the block 11b.

Although various minor structural modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A variable pressure, constant delivery, guided vane pump, comprising a casing providing a hollow cavity having a pair of flat internal walls on opposite sides thereof, a rotor providing an annular row of circumferentially spaced slots, a corresponding plurality of vanes slidably supported in the respective slots, a floating abutment in said rotor engaging the inner ends of said vanes, and a regulator block providing a cylindrical pumping chamber for receiving said vanes and having flat sides slidably supported by said internal walls in said casing for movement transversely of the rotor axis to adjust the relative eccentricity of the pumping chamber bore and the rotor, said casing having a pair of pressure control chambers formed therein on opposite sides of said rotor axis, said regulating block having a reactive pressure face in each respective pressure control chamber, passageway means forming an inlet on one side of said rotor and an outlet for said pump on the opposite side of said rotor and communicating with said pumping chamber bore, an orifice in said passageway means through which all pump operating fluid flows with a pressure drop across the orifice, and means communicating variations in the effective differential of said pressure drop to said reactive pressure faces to regulate the volumetric capacity of said pump in response to pressure drop variations across the orifice.

2. A pump as defined in claim 1, wherein said orifice is provided by a control valve having a movable valve spool member in said inlet moved in downstream direction by the fluid inlet pressure and being adapted to pass rated flow of all of the pumping fluid at a predetermined quantitative value of pressure drop, and biasing means urging said spool in upstream direction to a position corresponding to a neutral position at said predetermined quantitative value of pressure drop, said control valve including passages communicating pump operating fluid with said regulating means and controlled by said valve spool member for the purposes set forth.

3. A pump as defined in claim 1, said orifice being located in the inlet portion of said passageway means, a control valve including passages communicating with said regulating means and said inlet and selectively opened and closed by a movable valve member, means operatively subjecting said movable valve member to pump inlet pressure on the upstream side of said orifice and to a pressure less than inlet pressure on the downstream side of said orifice to regulate said member in response to the pressure drop across said orifice resulting from the flow of pumping fluid therethrough.

4. A pump as defined in claim 2 and including passageway means conducting operating fluid from said pump to said valve for use as a reference pressure.

5. A pump as defined in claim 1 wherein said orifice

is located in the inlet portion of said passageway means.

6. A pump as defined in claim 1 wherein said orifice is located in the outlet portions of said passageway means.

7. A pump comprising a casing providing a hollow cavity having flat walls on opposite sides thereof, a rotor providing an annular row of circumferentially spaced slots, a corresponding plurality of vanes slidably supported in the respective slots, a regulating block providing a cylindrical pumping chamber bore receiving said vanes and having flat sides slidably supported by said flat walls and said casing for movement transversely of the rotor axis to adjust the relative eccentricity of the pumping chamber bore and the rotor, said casing having a pair of pressure control chambers formed therein on opposite sides of the rotor axis, said regulating block having a reactive pressure face in each respective pressure control chamber, an inlet in said casing communicating with one of said pressure control chambers, a passageway in said block between said pressure control chambers and having an orifice therein through which all pump operating fluid passes, an inlet passageway in said block between said pressure control chambers and said pumping chamber bore, an outlet in said casing, and an outlet passageway in said block communicating said casing outlet with said pumping chamber bore, the restriction provided by said orifice affording a pressure differential acting on the respective reactive pressure faces resulting from the pressure drop across said orifice to regulate the volumetric capacity of said pump in response to pressure drop variations across said orifice.

8. A pump comprising a rotor providing an annular row of slidable vanes, a casing, means providing guideways in said casing, and a regulating block providing a cylindrical pumping chamber bore receiving said vanes and having flat sides slidably supported on said guideways in said casing for movement transversely of the rotor axis to adjust the relative eccentricity of the pumping chamber bore and the rotor, said casing having a pair of pressure control chambers formed therein on opposite sides of said rotor axis, said regulating block having a reactive pressure face in each respective pressure control chamber, an inlet in said casing, an inlet passageway in said block communicating said pumping chamber bore with said casing inlet, an outlet passageway in said block communicating said pumping chamber bore with one of said pressure control chambers, a passageway in said block between said pressure control chambers and having an orifice therein through which all pump operating fluid flows, and an outlet passageway in said casing communicating with the other of said pressure control chambers, the restriction provided by said orifice affording a pressure differential acting on the respective reactive pressure faces resulting from pressure drop across said orifice to regulate the volumetric capacity of said pump in response to pressure drop variations across said orifice.

9. A pump, comprising, a guided vane rotor, a casing, and a regulating block providing a cylindrical pumping chamber bore receiving said rotor, means providing sliding guideways between said block and said casing slidably supporting said block in said casing for movement transversely of the rotor axis to adjust the relative eccentricity of the pumping chamber bore and the rotor, said casing having a pair of pressure control chambers formed therein on opposite sides of the rotor axis, said regulating block having a reactive pressure face in each respective pressure control chamber, continuous biasing means between said regulator block and said casing biasing said block in one direction to maintain minimum eccentricity of said pumping chamber bore and said rotor, passageway means forming an inlet and an outlet for said pump and communicating with said pumping chamber bore, an orifice in said passageway means through which all pump fluid passes with a pressure drop, and means communicating variations in the effective differential of said pressure drop to said reactive pressure faces

to regulate the volumetric capacity of said pump in response to pressure drop variations by moving said regulator block against the bias of said continuous biasing means.

10. A pump, comprising, a guided vane rotor, a casing, a regulating block providing a cylindrical pumping chamber bore receiving said rotor, and means between said casing and said block providing relatively slidable support surfaces guiding said block for movement transversely of the rotor axis to adjust the relative eccentricity of the pumping chamber bore and the rotor, said casing having a pair of pressure control chambers formed therein, said regulator block having a reactive pressure face in each respective pressure control chamber and located on opposite sides of said rotor axis, a coil spring between said block and said casing normally biasing said block in one direction to maintain minimum eccentricity of said pumping control chamber and said rotor, said casing having means providing a fluid flow path therethrough, said block having a passageway extending between said pressure control chambers, an orifice formed in said passageway, and through which all pump fluid passes, additional passageways in said block placing said pumping chamber bore in communication with one of said pressure control chambers and with said flow path, and the other of said pressure control chambers communicating with said fluid flow path, the restriction provided by said orifice affording a pressure differential resulting from the pressure drop across the orifice and acting on the respective reactive pressure faces to regulate the volumetric capacity of said pump in response to pressure drop variations across said orifice by moving said regulator block against the continuous biasing means.

11. A pump comprising a guided vane rotor, a casing, a regulator block providing a cylindrical pumping chamber bore receiving said rotor and being slidably supported in said casing for movement transversely of the rotor axis to adjust the relative eccentricity of the pumping chamber bore and the rotor, said casing having a pair of pressure control chambers formed therein, said regulating block having a reactive pressure face in each respective pressure control chamber and located on opposite sides of said rotor axis, said casing having means providing a fluid flow path therethrough, said block having a passageway extending between said pressure control chambers, an orifice formed in said passageway and through which all pump fluid passes, additional passageways in said block placing said pumping chamber bore in communication with one of said pressure control chambers and with said flow path, and other of said pressure control chambers communicating with said flow path, the restriction provided by said orifice affording a pressure differential resulting from the pressure drop across the orifice and acting on the respective reactive pressure faces to regulate the volumetric capacity of said pump in response to pressure drop variations across said orifice.

12. A pump comprising, a block having flat sides and providing a reactive pressure face on opposite ends thereof, a cylindrical pumping chamber bore formed in said block between said reactive faces, a hollow casing having

mating flat internal walls slidably supporting said block for movement transversely of the axis of said pumping chamber bore, said reactive pressure faces on said block being spaced from adjoining walls of said casing to provide pressure control chambers, a guided vane rotor journaled in said casing having vanes rotatable in said pumping chamber bore, passageway means forming an inlet and an outlet for said pump and communicating with said pumping chamber bore, and flow responsive means communicating pressure to said pressure control chambers as a function of the flow rate of pump operating fluid for subjecting said reactive pressure faces to a flow differential to regulate the relative eccentricity of said rotor and said bore to regulate the capacity of said pump, comprising an orifice in said passageway means, and means operatively subjecting one of said pressure control chambers to the pressure on the upstream side of said orifice and the other of said pressure control chambers to the pressure on the downstream side of said orifice, thereby to regulate the capacity of said pump in response to the pressure drop variations across said orifice.

13. A pump comprising a block having flat sides and providing a reactive pressure face on opposite ends thereof, a cylindrical pumping chamber bore formed in said block between said reactive faces, a hollow casing having flat internal walls mating with said flat sides of said block and slidably supporting said block for movement transversely of the axis of said pumping chamber bore, said reactive pressure faces on said block being spaced from adjoining walls of said casing to provide a pair of pressure control chambers, a guided vane rotor journaled in said casing having vanes rotatable in said pumping chamber bore, passageway means forming an inlet and an outlet for said pump and communicating with said pumping chamber bore, said casing having means providing a fluid flow path therethrough, said block having a passageway extending between said pressure control chambers, an orifice formed in said passageway through which all pump operating fluid passes, additional passageways in said block placing said pumping chamber bore in communication with one of said pressure control chambers and with said flow path, and the other of said pressure control chambers communicating with said flow path, the restriction provided by said orifice affording a pressure differential acting on the respective reactive pressure faces to regulate the volumetric capacity of said pump in response to pressure drop variations across said orifice.

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