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Bosch

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[54] **SLIDE BLOCK CONTROL MEANS FOR RADIAL PISTON MACHINES**

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[51] **Int. Cl.²** **F01B 13/06**

[58] **Field of Search** 91/472, 485, 492, 497, 91/498

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[57] **ABSTRACT**

A radial piston machine wherein the slide block is movable radially of the cylinder block to thereby change the strokes of pistons in the cylinder bores of the cylinder block by means of a control system which employs a differential piston mounted in the housing for the cylinder block so as to be movable axially in parallelism with one end face of the slide block. The means for transmitting motion from the differential piston to the slide block constitutes a pin which is secured to the differential piston and extends into an endless groove in the one end face of the slide block or a lever which is pivotably mounted in the housing and is pivoted by the differential piston to thereby change the radial position of the slide block by way of a U-shaped entraining element. During radial movement, the slide block rolls along one of two parallel internal guide surfaces of the housing. Two rotary piston machines can be mounted adjacent and in mirror symmetry with respect to each other and their cylinder blocks can be driven by or drive a single shaft which is connected with one of the cylinder blocks in such a way that the respective housing can be pivoted away from the other housing.

16 Claims, 6 Drawing Figures

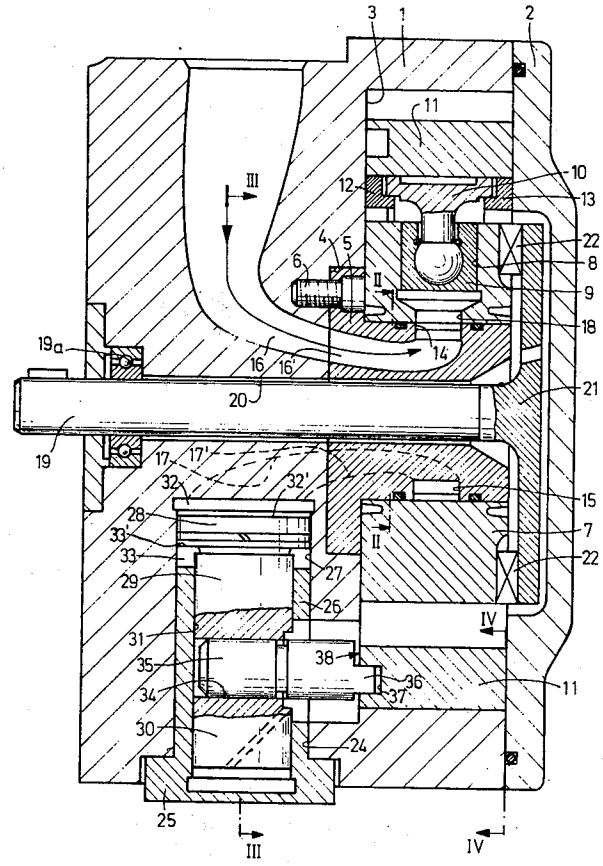

Fig.1

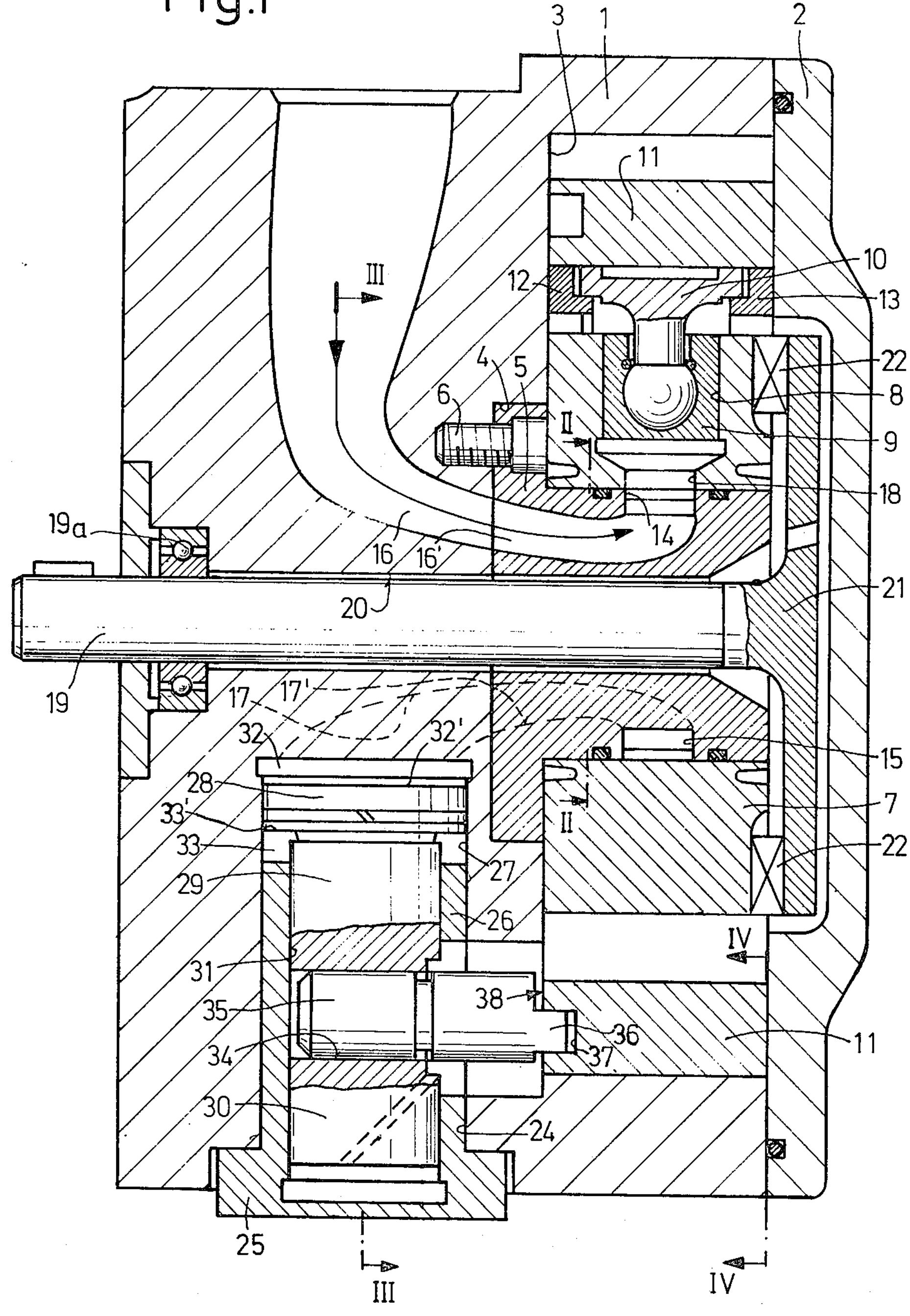
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Fig.2

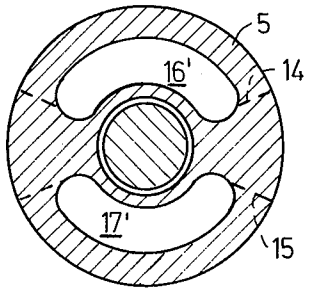

Fig.3

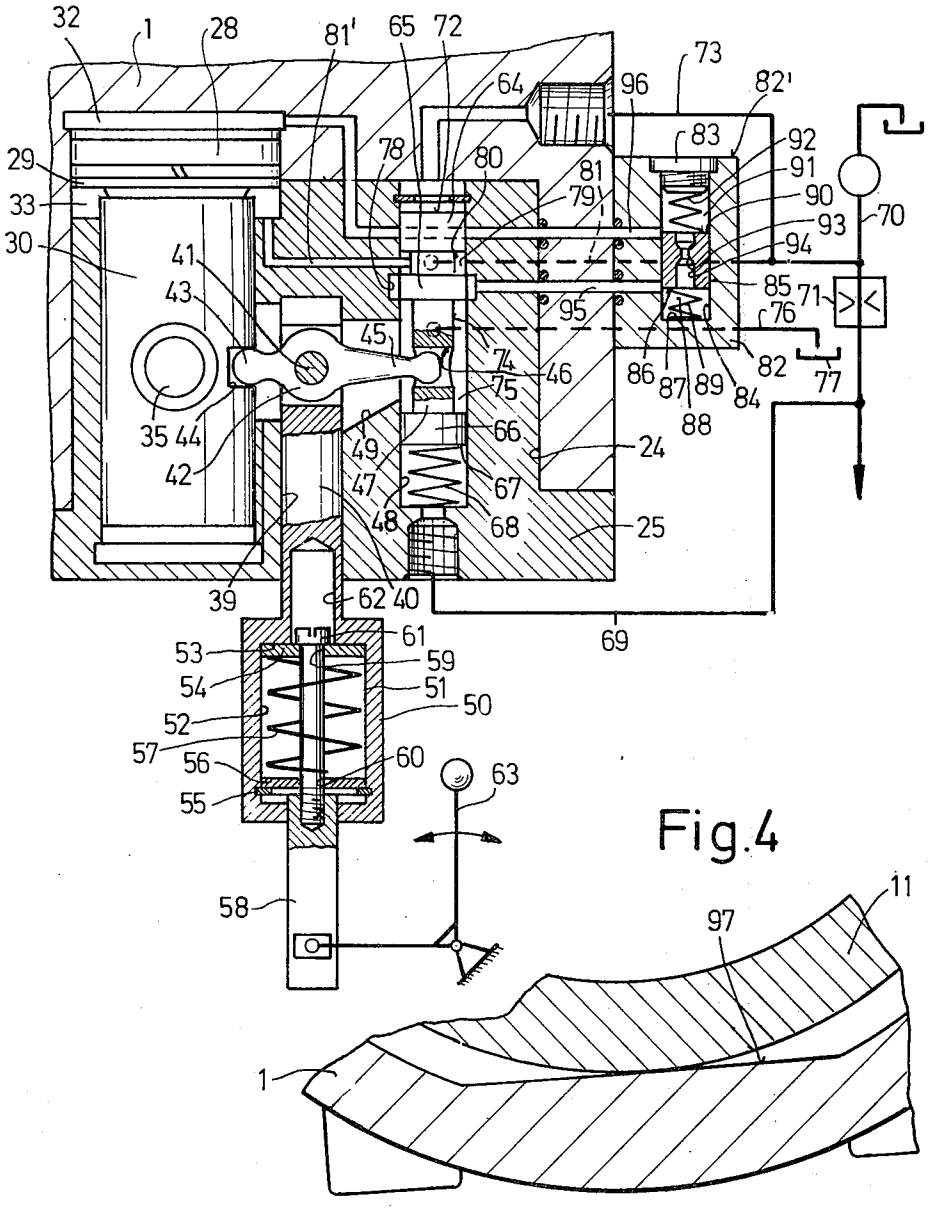

Fig.4

Fig.5

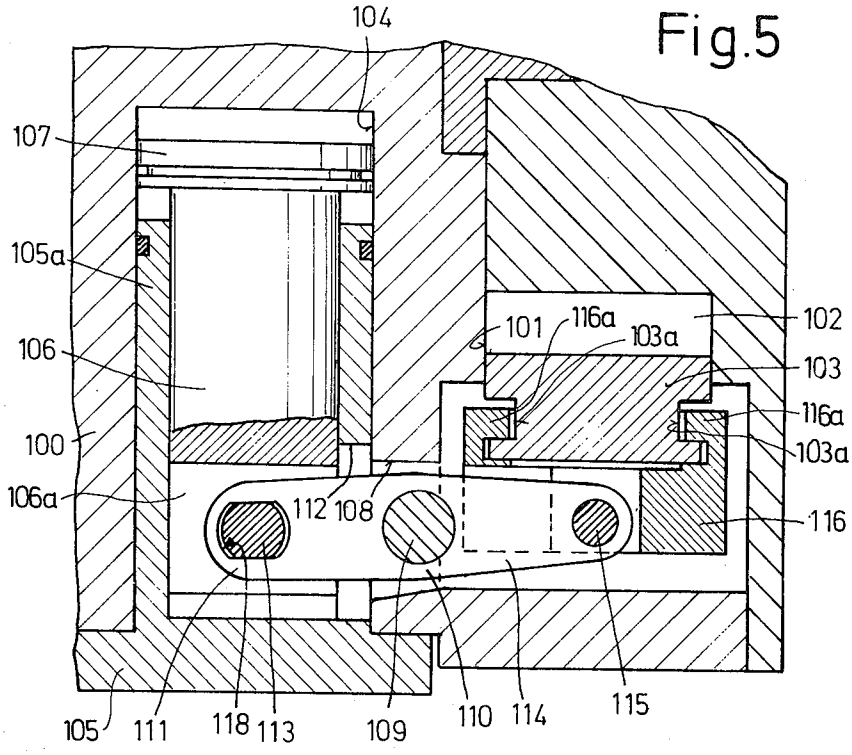
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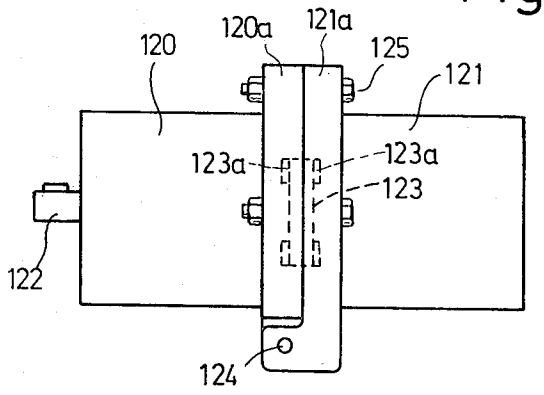
Fig.6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SLIDE BLOCK CONTROL MEANS FOR RADIAL PISTON MACHINES

BACKGROUND OF THE INVENTION

The present invention relates to radial piston machines in general, and more particularly to improvements in radial piston machines of the type wherein an annular slide block surrounds the cylinder block and can be moved radially of the cylinder block to thereby change the strokes of pistons which are reciprocable in radial bores of the cylinder block.

It is already known to move the slide block relative to the cylinder block to thereby change a characteristic of the fluid stream flowing into and from the radial piston machine by resorting to two pistons which are mounted in the housing of the radial piston machine in such a way that one thereof is located diametrically opposite the other with reference to the axis of the customary pintle on which the cylinder block rotates. A drawback of such control systems is that they contribute excessively to the dimensions of the radial piston machine, especially as considered radially of the cylinder block. This is highly undesirable, especially in view of the fact that, by its very nature, a radial piston machine occupies a relatively large amount of space, as considered in the radial direction of the cylinder block and pintle. Therefore, such radial piston machines cannot be used as pumps or motors in many instances where they could be employed with considerable advantage if they would occupy less room.

SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved radial piston machine which can be used, either alone or in combination with a similar machine, as a superior substitute for presently known radial piston machines as well as in many instances where the conventional machines failed, especially in view of their bulkiness and/or complexity.

Another object of the invention is to provide a radial piston machine wherein the control means for changing the position of the slide block relative to the cylinder block occupies only a fraction of the space which is required by conventional control means.

A further object of the invention is to provide novel and improved control means for moving the slide block of a radial piston machine relative to the cylinder block.

An additional object of the invention is to provide a novel housing for a radial piston machine which embodies the improved control means.

Still another object of the invention is to provide a radial piston machine whose housing need not extend appreciably beyond the slide block, as considered in the radial direction of the cylinder block.

The invention is embodied in an arrangement which includes one or more radial piston machines and wherein each radial piston machine comprises a housing; a cylinder block rotatably mounted in the housing and having a plurality of preferably equidistant radial cylinder bores, pistons which are reciprocably installed in the cylinder bores and extend radially outwardly from the cylinder block (each piston may be provided with a swivelling shoe which extends radially beyond the cylinder block), and an annular slide block surrounding the cylinder block with clearance and being movable radially or substantially radially of the cylinder block to thereby change the strokes of the pistons and hence at least one characteristic of the fluid stream which flows into and from the housing when the cylinder block rotates relative to a stationary pintle which is secured to the housing and has high-pressure and low-pressure chambers located adjacent to the path of the inner end portions of cylinder bores in the cylinder block.

In accordance with a feature of the invention, at least one of the radial piston machines comprises novel and improved control means for moving the slide block relative to the respective cylinder block. The control means comprises a displacing piston (preferably a differential piston) which is movable axially in a further cylinder bore provided therefor in the housing of the respective machine and motion transmitting means (such as a pin or a lever) for moving the slide block relative to the cylinder block in response to axial movement of the displacing piston. In order to reduce the dimensions of the respective housing, the displacing piston is movable axially in substantial or exact parallelism with an end face of the slide block and is preferably adjacent to the end face. Such mounting of the displacing piston insures that the control means need not extend appreciably beyond the slide block, as considered in the radial direction of the cylinder block.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved radial piston machine itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an axial sectional view of a radial piston machine wherein the control means for the slide block is constructed and assembled in accordance with a first embodiment of the invention;

FIG. 2 is a transverse sectional view of the pintle of the radial piston machine, substantially as seen in the direction of arrows from the line II—II of FIG. 1;

FIG. 3 is a fragmentary sectional view as seen in the direction of arrows from the line III—III of FIG. 1;

FIG. 4 is a fragmentary sectional view substantially as seen in the direction of arrows from the line IV—IV of FIG. 1;

FIG. 5 is a fragmentary axial sectional view of a radial piston machine which embodies modified control means for the slide block;

FIG. 6 is a schematic elevational view of a twin radial piston machine which can embody the control means of FIGS. 1 and 3 or FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. 1, there is shown a radial piston machine which can be used as a pump or as a motor and comprises a hollow housing 1 including a cover or lid 2. The internal space of the housing 1 is bounded in part by a surface 3 which is provided with a recess 4 for a flange of a stationary valve or pintle 5 secured to the housing 1 by threaded fasteners 6. The cylindrical external surface of the pintle 5 is surrounded with minimal clearance by a cylindrical internal surface sur-

rounding the axial bore of a cylinder block 7 having a set of equidistant radially extending cylinder bores 8 for reciprocable pistons 9. Each piston 9 is provided with a swiveling shoe 10 which extends radially outwardly beyond the cylinder block 7 and engages the cylindrical internal surface of an annular slide block 11 adapted to move radially of the pintle 5 to thereby change the strokes of the pistons 9 and hence a characteristic of a fluid stream which flows through the machine when the cylinder block rotates. The pistons 9 are reciprocable in the respective cylinder bores 8 with minimal clearance. Two retaining rings 12, 13 which are provided on the slide block 11 serve to hold the shoes 10 against movement radially of and away from the internal surface of the slide block.

The pintle 5 is provided with elongated control chambers 14 and 15 which extend in the circumferential direction of the pintle and register with the smaller-diameter inner end portions or ports 18 of successive cylinder bores 8 in the cylinder block 7 when the latter rotates on the pintle. The chambers 14, 15 respectively communicate with fluid-conveying channels 16, 17 of the housing 1 by way of substantially kidney-shaped holes 16', 17' (see FIG. 2). The channel 16 supplies hydraulic fluid to and the channel 17 conveys hydraulic fluid from the radial piston machine, or vice versa. As shown in FIG. 1, there is provided a gradual and smooth transition from the holes 16', 17' into the respective control chambers 14 and 15.

One of the control chambers 14, 15 is a high-pressure chamber and the other control chamber is a low-pressure chamber. Each of the holes 16', 17' has a portion which extends in substantial parallelism with the axis of the cylinder block 7 and terminates at the left-hand axial end of the pintle 5, as viewed in FIG. 1. The holes 16', 17' are preferably machined into the pintle 5 in accordance with an electrochemical process.

The cylinder block 7 is rigid with a shaft 19 which drives the cylinder block when the machine operates as a pump and is driven by the cylinder block when the machine operates as a motor. The right-hand end portion of the shaft as viewed in FIG. 1, is provided with a flange 21 having torque transmitting claws 22 which engage complementary claws or extend into matching sockets at the right-hand axial end of the cylinder block 7. The shaft 19 extends through a bore 20 of the housing 1 and through an axial bore of the pintle 5. The reference character 19a denotes an antifriction bearing which is provided for the shaft 19 in the housing 1 and is spaced apart from the flange of the pintle 5 in the recess 4.

The control means for the slide block 11 is installed in part in an insert 25 which is received in a recess 24 of the housing 1. The inner end portion 27 of the recess 24 constitutes a cylinder bore for the cylindrical enlarged portion or head 28 of a displacing piston 29 here shown as a differential piston. The shank 30 of the differential piston 29 is slidably guided in the blind bore 31 of a cylindrical sleeve 26 of the insert 25. The axis of the differential piston 29 is normal to the common axis of the pintle 5, cylinder block 7 and shaft 19. The larger surface 32' of the head 28 faces a first chamber 32 which is defined by the head 28 and housing 1 and constitutes the innermost portion of the cylinder bore 27. The smaller surface 33' of the head 28 is adjacent to an annular second chamber 33 extending between the surface 33' and the inner end face of the sleeve 26. The head 28 is slidable in the bore 27 with minimal clearance. The insert 25 can be considered as constituting a component part of the housing 1.

The shank 30 of the differential piston 29 is provided with a diametrically extending bore 34 for a motion transmitting pin 35 which is rotatable in the bore 34 and whose axis is normal to the axis of the shank 30. A projection 36 of the motion-transmitting pin 35 extends into an endless circular groove 37 machined into one end face 38 of the slide block 11. The recess 24 is rather closely adjacent to the end face 38 and the insert 25 projects only slightly beyond the outer end of the recess 24 so that it does not contribute appreciably the the dimensions of the machine, as considered in the radial direction of the cylinder block 7.

Additional details of the control means for the slide block 11, and more particularly the regulating means for moving the differential piston 29 axially in parallelism with the end face 38 of the slide block, are illustrated in FIG. 3. The insert 25 is formed with a bore 39 whose axis is parallel to the axis of the differential piston 29. The bore 39 receives a portion of a reciprocable plunger 40. The plane including the axes of the differential piston 29 and the plunger 40 is normal to the axis of the shaft 19 (not shown in FIG. 3). The plunger 40 carries a pivot member 41 for a two-armed lever 42 having a shorter arm 43 and a longer arm 45. The shorter arm 43 extends into a transverse groove or notch 44 which is machined into the periphery of the shank 30. The rounded end of the arm 45 extends into a diametrically extending slot 46 provided therefor in a control piston 47. The control piston 47 is reciprocable in a bore 48 machined into the insert 25 adjacent to the plunger 40 and having an axis located in the common plane of the axes of the shank 30 and bore 39. The insert 25 has a cutout 49 which receives portions of the arms 43 and 45 so that the lever 42 has sufficient freedom of pivotal movement with or about the pivot member 41.

The outer end portion 50 of the plunger 40 constitutes a hollow cylinder and the plunger 40 has an internal chamber 51 including a larger-diameter portion 52 in the end portion 50 and a smaller-diameter portion 62 in the adjacent (median) portion of the plunger 40. The portion 52 of the chamber 51 receives a first disk-shaped retainer 54 which normally abuts against an internal shoulder 53 of the portion 50, a second disk-shaped retainer 56 which normally abuts against a stop 55 here shown as a split ring received in an internal groove of the end portion 50, and resilient means in the form of a helical spring 57 which is disposed between the retainers 54, 56. A shifter member 58 is connected with a bolt 61 whose stem extends through coaxial holes 59, 60 of the retainers 54, 56. The shifter member 58 extends from the end portion 50 of the plunger 40 and is articulately connected with a shifter lever 63 which is accessible to the operator. The head of the bolt 61 extends into the smaller-diameter portion 62 of the chamber 51 in the plunger 40.

The control piston 47 has three cylindrical peripheral surfaces 64, 65, 66 which are slidable in the bore 48 of the insert 25, and an end face 67 engaged by one end convolution of a helical spring 68 which reacts against an internal annular shoulder of the insert 25 and urges the control piston 47 upwardly, as viewed in FIG. 3. The end face 67 of the control piston 47 is further acted upon by hydraulic fluid which is admitted into

the bore 48 by a conduit 69 connected to the high-pressure outlet line 70 of the radial piston machine (which is assumed to operate as a pump). The conduit 69 receives fluid from the outlet line 70 by way of a flow restrictor 71. The other end face 72 of the control piston 47 is subjected to the full pressure of fluid in the outlet line 70 by way of a conduit 73. It will be noted that the conduits 69 and 73 respectively communicate with the outlet line 70 downstream and upstream of the flow restrictor 71. The space 75 surrounding an annular groove 74 of the control piston 47 between the cylindrical surfaces 65 and 66 communicates with a tank 77 by way of a conduit 76. The interior of the tank 77 is maintained at atmospheric pressure.

The insert 25 has an annular groove 78 which can communicate with the bore 48 but is sealed from the latter by the cylindrical surface 65 of the control piston 47 when the latter assumes the neutral position shown in FIG. 3. A second annular groove 80 of the control piston 47 between the cylindrical surfaces 64, 65 is surrounded by a space 79 and communicates with the annular chamber 33 by way of a bore 81' in the insert 25. The space 79 further communicates with the outlet line 70 of the radial piston machine by way of a conduit 81. Thus, the pressure in the chamber 33 equals the pressure of fluid in the outlet line 70.

The housing 1 of the radial piston machine carries the body 82 of a fluid flow rate regulating valve 82' (hereinafter called metering valve). The body 82 has a blind bore 84 the open end of which is sealed by a threaded plug 83 and which receives with minimal clearance a reciprocable cylinder valve member 85. A chamber 88 between the lower end face 86 of the valve member 85 and the bottom surface 87 in the blind bore 84 receives a helical spring 89 which biases the valve member 85 toward the plug 83. A second chamber 91 between the plug 83 and the upper end face 90 of the valve member 85 receives a second helical spring 92. The chambers 88 and 91 communicate with each other by way of an axial bore 94 of the valve member 85. The median portion 93 of the bore 94 has a reduced diameter and constitutes a flow restrictor. The chamber 91 is in communication with the chamber 32 above the head 28 of the differential piston 29 by way of a channel 96. When the valve member 85 assumes a neutral position, its upper portion throttles the flow of fluid between the chamber 91 and channel 96. The lower chamber 88 is connected with the groove 78 by a further channel 95. The lower portion of the valve member 85 partially obstructs the flow of fluid between the chamber 88 and channel 95 when the valve member 85 assumes its neutral position.

The manner in which the slide block 11 is mounted in the housing 1 is illustrated in FIG. 4. The housing 1 has a flat internal guide surface 97 which is parallel to the axis of the differential piston 29 and to a second internal guide surface (not shown). The slide block 11 is disposed between the two guide surfaces in such a way that it rolls along one of these guide surfaces in response to axial displacement of the differential piston 29.

The adjustment in the length of strokes performed by the pistons 9 in the bores 8 of the cylinder block 7 is effected by way of the shifter lever 63. If the lever 63 is moved clockwise, as viewed in FIG. 3, the shifter member 58 moves deeper into the outer end portion 50 of the plunger 40. The member 58 lifts the retainer 56 whereby the spring 57 stores energy and causes the retainer 54 to bear against the shoulder 53 so that the plunger 40 penetrates deeper into the bore 39 of the insert 25. The differential piston 29 is assumed to dwell in its neutral or idle position so that the arm 43 cannot move lengthwise of the sleeve 26. Consequently, as the plunger 40 penetrates deeper into the bore 39, the lever 42 pivots counterclockwise about the free end of the arm 43 in the transverse groove 44 of the shank 30 whereby the arm 45 of the lever 42 moves the control piston 47 upwardly, as viewed in FIG. 3 to reduce the stress upon the resilient element 68. The outlet of the conduit 81 remains in communication with the space 79 between the cylindrical surfaces 65 and 64 of the control piston 47, i.e., the surface 65 does not obstruct the flow of fluid from the outlet line 70, through the conduit 81 and into the space 79 so that the pressure of fluid in the chamber 33 below the head 28 of the differential piston 29 continues to match the pressure of fluid at the outlet of the radial piston machine. As the control piston 47 moves upwardly, its cylindrical surface 65 allows the groove 78 to communicate with the space 75 whereby the fluid can flow from the chamber 32 above the head 28 of the differential piston 29 by way of the channel 96, chamber 91, axial bore 94 of the valve member 85, chamber 88, channel 95, space 75 and conduit 76 which discharges into the tank 77.

The fluid flowing into the chamber 33 acts against the surface 33' of the head 28 so that the differential piston 29 moves upwardly, as viewed in FIG. 3, whereby the head 28 causes the fluid to flow from the chamber 32 and into the tank 77. The outflowing fluid establishes a pressure differential between the two ends of the flow restrictor 93 in the bore 94 of the valve member 85 so that the valve member 85 moves upwardly and stresses the spring 92 while simultaneously throttling the flow of fluid from the channel 96 into the chamber 91. This reduces the rate of outflow of fluid from the chamber 32 and hence the speed of the differential piston 29. The shank 30 entrains the motion transmitting pin 35 which, in turn, changes the position of the slide block 11 relative to the cylinder block 7. The slide block 11 rolls along one of the guide surfaces 97 in the housing 1. The eccentricity of the slide block 11 increases so that the volume of the fluid which is displaced by the pistons 9 also increases.

As the differential piston 29 moves relative to the insert 25, the lever 42 pivots about the axis of the member 41 (because the plunger 40 is then at a standstill) whereby the arm 45 displaces the control piston 47 against the opposition of the resilient element 68 so that the control piston reassumes its neutral position. The cylindrical surface 65 seals the groove 78 from the spaces 74 and 79 to interrupt the outflow of fluid from the chamber 32. This terminates the inward movement of the differential piston 29.

If the shifter lever 63 is moved in a counterclockwise direction, as viewed in FIG. 3, the shifter member 58 causes the bolt 61 to move downwardly so that the retainer 54 bears against the spring 57 and the plunger 40 moves outwardly. The plunger 40 thereby pivots the lever 42 about the free end of the arm 43 in the groove 44 of the shank 30 (the differential piston 29 is stationary) so that the lever 42 pivots clockwise and its arm 45 causes the control piston 47 to move downwardly and to thereby stress the resilient element 68. The cylindrical surface 65 of the control piston 47 allows fluid

to flow between the space 79 and the annular groove 78 so that the chamber 32 above the head 28 of the differential piston 29 is connected with the outlet line 70 by way of the channel 95, chamber 88, bore 94 of the valve member 85, chamber 91 and channel 96. Since the area of the surface 32' exceeds the area of the surface 33' on the head 28, the differential piston 29 moves downwardly, as viewed in FIG. 3, whereby the head 28 expels fluid from the chamber 33 by way of the bore 81', channel 95, chamber 88, bore 94 of the valve member 85, chamber 91 and channel 96. Thus, the fluid simply flows from the chamber 33 into the chamber 32. The speed of axial movement of the differential piston 29 is again regulated by the valve member 85 due to a pressure differential between the ends of the flow restrictor 93 in the bore 94.

As the differential piston 29 moves downwardly, the motion transmitting pin 35 displaces the slide block 11 whereby the slide block rolls along one of the guide surfaces 97 in the housing 1 while the projection 36 of the motion transmitting pin 35 slides in the endless groove 37. The eccentricity of the slide block 11 relative to the cylinder block 7 decreases so that the pistons 9 displace smaller quantities of fluid.

The differential piston 29 further pivots the lever 42 counterclockwise about the pivot member 41 (the plunger 40 is at a standstill). The arm 45 thereby gradually shifts the control plunger 47 so that the cylindrical surface 65 seals the groove 78 from the spaces 75 and 79. This terminates the axial movement of the differential piston 29 because the flow of fluid from the chamber 33 into the chamber 32 is interrupted.

It will be noted that the control means of FIGS. 1 and 3 is a follow-up control means.

The radial piston machine of FIG. 5 comprises modified means for transmitting motion from the displacing piston 107 to the annular slide block 103. The housing 100 of the radial piston machine is provided with an internal space 102 which receives the annular slide block 103 in such a way that one end face of the slide block is adjacent to a surface 101 of the housing 100. The housing 100 is further provided with a recess 104 for an insert 105 having a sleeve-like portion 105a for the shank 106 of the displacing piston 107 which again constitutes a differential piston. The outer end portion of the insert 105 extends only slightly beyond the adjacent portion of the peripheral surface of the housing 100. This contributes to compactness of the radial piston machine. The insert 105 can be considered as forming part of the housing 100.

The housing 100 is further provided with a cutout 108 for a two-armed motion-transmitting lever 110 replacing the pin 35 of FIG. 3. The motion-transmitting lever 110 is turnable about the axis of a pivot member 109 which is mounted in the housing 100. The effective lengths of both arms 111, 114 of the lever 110 are the same. The arm 111 extends through the cutout 108 and through a cutout 112 of the sleeve 105a and has an elongated slot 118 for a pin 113 of the shank 106. To this end, the shank 106 has a diametrically extending slot 106a and the pin 113 extends across the slot 106a. The pin 113 has two flats and is turnable in the shank 106 so as to enable the motion transmitting lever 110 to pivot when the differential piston 107 moves axially. The slot 118 thereby moves lengthwise along the flats of the pin 113.

The other arm 114 of the lever 110 is coupled to a U-shaped entraining element 116 by means of a pivot pin 115. The entraining element 116 has two claws 116*a* which entend into annular grooves 103*a* provided in the respective end faces of the slide block 103. It will be noted that the entraining element 116 is movable axially of the slide block 103 but is mounted thereon without any or with negligible freedom of radial movement. This insures that the eccentricity of the slide block 103 relative to the cylinder block (not shown) changes when the differential piston 107 moves axially. The regulating means of the control means for moving the slide block 103 is identical with or analogous to the regulating means described in connection with FIG. 3.

Each of the housings 1, 100 may receive two or more displacing pistons for the respective slide block 11, 103.

FIG. 6 illustrates a twin radial piston machine which comprises two mirror symmetrical units 120 and 121. The two units comprise a common shaft 122 corresponding to the shaft 19 of FIG. 1. The disk-shaped flange 123 of the shaft 122 is connected with the cylinder blocks (not specifically shown) of both units. It is preferred to provide the flange 123 with torque transmitting claws 123a which enter complementary recesses or sockets of the cylinder blocks, or vice versa. The housings of the units 120 and 121 have flanges 120a, 121a which are pivotally connected to each other by means of one or more hinges 124 and are normally fixedly secured to each other by means of screws 125 or analogous fasteners. Otherwise, the construction of each of the units 120, 121 is the same as described in connection with FIGS. 1–4 or FIG. 5.

When the fasteners 125 are removed, the unit 121 can be pivoted about the pintle of the hinge 124 to a position in which an attendant can gain access to the interior of each unit for the purposes of inspection, cleaning, repair and/or replacement of parts. In such position of the unit 121, the flange 123 is disconnected from the cylinder block of the unit 121 but remains coupled to the cylinder block of the unit 120.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In an arrangement including at least one radial piston machine, a combination comprising a housing; a cylinder block rotatably mounted in said housing and having a plurality of radial cylinder bores; pistons reciprocably installed in said cylinder bores and extending radially outwardly from said cylinder block; an annular slide block surrounding said cylinder block in said housing and being engaged by said pistons said slide block having an end face provided with an endless groove and being movable substantially radially of said cylinder block to thereby change the strokes of said pistons; and control means for moving said slide block relative to said cylinder block, including at least one displacing piston axially movable in said housing in substantial parallelism with said end face of said slide

block, and motion transmitting means for moving said slide block relative to said cylinder block in response to axial movement of said displacing piston, said motion transmitting means comprising a pin secured to said displacing piston and having a portion extending into said endless groove of said slide block.

2. In an arrangement including at least one radial piston machine, a combination comprising a housing; a cylinder block rotatably mounted in said housing and having a plurality of radial cylinder bores; pistons reciprocably installed in said cylinder bores and extending radially outwardly from said cylinder block; an annular slide block surrounding said cylinder block in said housing and being engaged by said pistons, said slide block having an end face and being movable substantially radially of said cylinder block to thereby change the strokes of said pistons; a pintle secured to said housing and extending into an axial bore of said cylinder block; a shaft rotatably mounted in said housing and connected for rotation with said cylinder block, said pintle having an axial bore for a portion of said shaft; and control means for moving said slide block relative to said cylinder block, including at least one displacing piston axially movable in said housing in substantial parallelism with said end face of said slide block, and motion transmitting means for moving said slide block relative to said cylinder block in response to axial movement of said displacing piston.

3. A combination as defined in claim 2, wherein said housing has an internal space for said cylinder block, said pintle and said slide block, said internal space including a recess and said pintle having a flange which is received in said recess.

4. In an arrangement including at least one radial piston machine, a combination comprising a housing; a cylinder block rotatably mounted in said housing and having a plurality of radial cylinder bores; pistons reciprocably installed in said cylinder bores and extending radially outwardly from said cylinder block; an annular slide block surrounding said cylinder block in said housing and being engaged by said pistons, said slide block having an end face and being movable substantially radially to thereby change the strokes of said pistons; and control means for moving said slide block relative to said cylinder block, including at least one displacing piston axially movable in said housing in substantial parallelism with said end face of said slide block and motion transmitting means between said displacing piston and said slide block for positively moving said slide block relative to said cylinder block in either of two diametrically opposite directions in response to a corresponding axial movement of said displacing piston.

5. A combination as defined in claim 4, wherein said displacing piston is adjacent to said end face of said slide block.

6. A combination as defined in claim 4, wherein said housing is provided with two parallel internal guide surfaces and said slide block is disposed between said guide surfaces and rolls along one of said guide surfaces in response to axial movement of said displacing piston.

7. A combination as defined in claim 4, further comprising a shaft coaxial with said cylinder block and torque transmitting means connecting said shaft with said cylinder block.

8. A combination as defined in claim 7, wherein said shaft comprises a flange adjacent to one axial end of said cylinder block and said torque transmitting means comprises at least one claw provided on said flange and extending into a complementary socket of said cylinder block.

9. A combination as defined in claim 4, wherein said motion transmitting means comprises a lever pivotably mounted in said housing and having a first arm and a second arm, means for articulately connecting said first arm to said displacing piston so that said lever is pivoted in response to axial movement of said displacing piston, and entraining means coupling said second arm to said slide block so that the latter moves substantially radially of said cylinder block in response to pivoting of said lever.

10. A combination as defined in claim 9, wherein said slide block is rotatable in said housing and said entraining means comprises an element which is coupled to said slide block against radial movement but allows said slide block to rotate with respect thereto.

11. A combination as defined in claim 4, further comprising a second housing, a second cylinder block and a second slide block in said second housing, second pistons reciprocable in the cylinder bores of said second cylinder block, and means for articulately connecting one of said housings to the other of said housings so that said one housing is movable relative to said other housing to a position in which the interior of each of said housings is accessible.

12. A combination as defined in claim 11, further comprising a shaft rotatably mounted in said first mentioned housing and torque transmitting means connecting said shaft with said cylinder block so that said shaft rotates in response to rotation of said cylinder blocks or vice versa, said torque transmitting means being arranged to allow the cylinder block in said one housing to become disengaged from said shaft in response to movement of said one housing to said position.

13. A combination as defined in claim 11, wherein said means for articulately connecting said one housing to said other housing comprises at least one hinge.

14. A combination as defined in claim 1, further comprising a pintle fixed to said housing and extending into an axial bore of said cylinder block, said pintle having a peripheral surface provided with a high-pressure chamber and a low-pressure chamber and said cylinder bores of said cylinder block being arranged to communicate alternately with said high-pressure chamber and said low-pressure chamber in response to rotation of said cylinder block, said pintle further having first and second substantially kidney-shaped holes respectively communicating with said high-pressure chamber and said low-pressure chamber.

15. A combination as defined in claim 14, wherein each of said holes comprises a portion which is substantially parallel to the axis of said cylinder block.

16. A combination as defined in claim 15, wherein each of said holes is machined into said pintle in accordance with an electrochemical process.

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