Feb. 26, 1929.

1,703,203

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PRESSURE FLUID MOTOR

Filed June 4, 1927

Fig. 1.

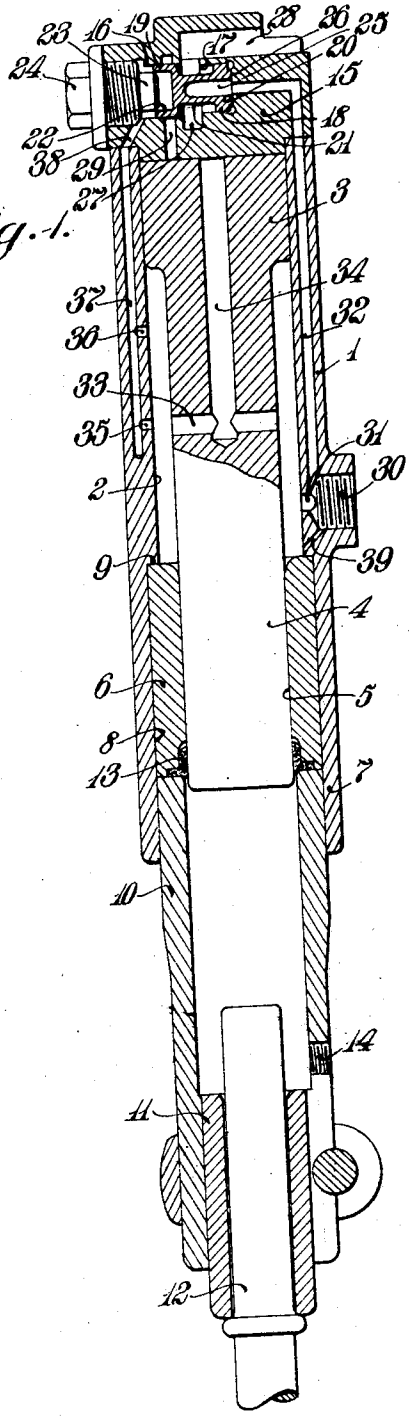
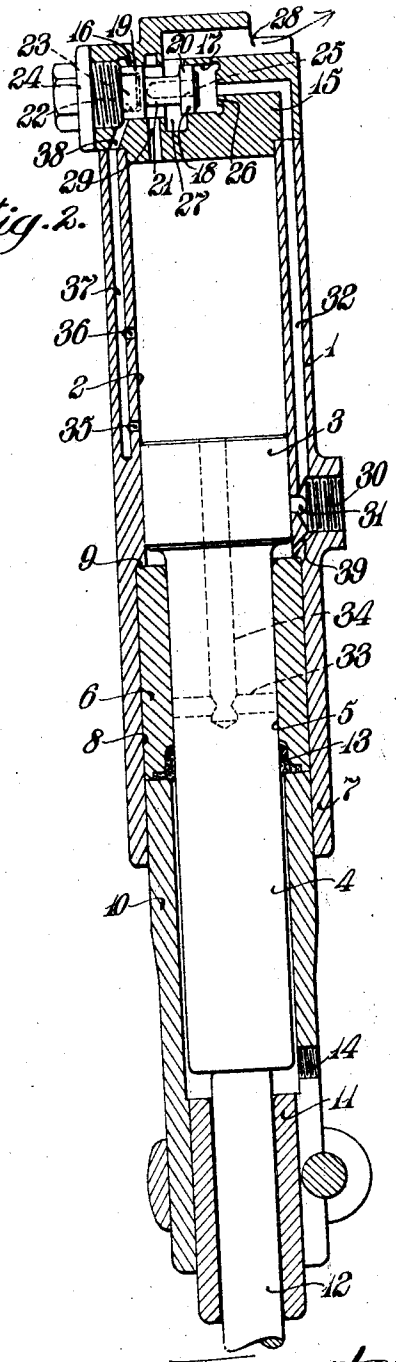


Fig. 2.



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Patented Feb. 26, 1929. 1,703,203

UNITED STATES PATENT OFFICE.

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PRESSURE-FLUID MOTOR.

Application filed June 4, 1927. Serial No. 196,464.

This invention relates to pressure fluid motors and more particularly to pressure fluid motors of the semi-valveless hammer type.

An object of this invention is to provide an improved pressure fluid motor. Another object is to provide an improved pressure fluid motor of the semi-valveless type having improved and simplified fluid distribution means. Still another object is to provide an improved pressure fluid motor having a fluid actuated piston controlled fluid distribution valve of an exceedingly simple form and improved arrangement of the fluid distributing passages controlled thereby whereby the power and efficiency of the motor is materially increased. These and other objects and advantages of this invention will, however, hereinafter more fully appear.

In the accompanying drawing there is shown for purposes of illustration one form which the invention may assume in practice.

In this drawing,—

Fig. 1 is a central longitudinal vertical sectional view of the improved pressure fluid motor.

Fig. 2 is a view similar to Fig. 1 illustrating the fluid distribution valve and hammer piston in a different position.

In this illustrative embodiment of the invention there is shown a pressure fluid motor of the hammer type comprising a cylinder 1 having a bore 2 in which a hammer piston 3 is reciprocably mounted. The hammer piston 3 has formed integral therewith a forwardly projecting striking bar 4 movably mounted in a bore 5 formed within a front buffer ring 6. As shown, the cylinder 1 is provided with a forwardly projecting sleevelike portion 7 having a bore 8 in which the buffer ring 6 is disposed, the rear end of the buffer ring being seated against a shoulder 9 formed at the junction of the cylinder bore 2 and the bore 8. Projecting within the bore 8 and abutting against the forward end of the buffer ring 6 is a front chuck housing 10 carrying at its forward end a usual chuck 11 within which a usual drill steel 12 is loosely mounted. Interposed between the buffer ring 6 and the chuck housing 10 is an expansible cup washer 13 engaging the periphery of the striking bar 4 and this cup washer prevents excessive leakage of pressure fluid from the cylinder bore past the striking bar. However, in case such leakage does occur the interior of the chuck housing 10 is vented to atmosphere through a suitable lateral opening 14. As shown, the rear end of the cylinder bore 2 is closed by a combined head block and valve chest 15. The chuck housing, buffer ring, cylinder, and rear head are held in assembled relation in any suitable and convenient manner.

In the improved construction the valve chest 15 has formed therein a plurality of stepped alined bores 16 and 17 having their axes disposed transversely of the longitudinal axis of the cylinder. Reciprocably mounted within the stepped bores 16 and 17 is a fluid controlled distributing valve 18, herein preferably of the two-spool differential type. The valve 18 is provided with a large end spool 19 and a reduced end spool 20 disposed in the bores 16 and 17 respectively, these spools being connected by a reduced intermediate portion 21. The enlarged spool 19 has formed therein a recess 22 within which a usual buffer plug 23 is adapted to project, this buffer plug being adapted to limit movement of the valve in one direction. As shown, the buffer plug 23 is formed integral with a threaded plug 24 closing the outer end of the bore 16. It will also be noted that the reduced spool 20 and the intermediate reduced portion 21 are made hollow as at 25 for the purpose of reducing the weight of the valve. The inner end of the bore 17 has projecting therein an annular shoulder 26 with which the valve is adapted to engage when in the position shown in Fig. 1, this shoulder limiting movement of the valve in one direction. Formed in the valve chest 15 intermediate the bores 16 and 17 is an annular recess 27 which is connected directly to atmosphere by a transverse exhaust passage 28. A passage 29 connects the bore 16 with the rear end of the cylinder bore 2 and this passage is controlled by the large spool 19 of the distribution valve. Live pressure fluid is continuously admitted to the front end of the cylinder bore through a suitable supply connection 30 and an inlet port 31 extending radially through the cylinder wall. Communicating with the port 31 is a valve throwing passage 32 leading to the bore 17 in the valve chest. Pressure fluid is adapted to be supplied from the front end of the cylinder bore through radial ports 33 formed in the striking bar 4 of the piston and a central longitudinal passage 34 extending rear-

wardly through the rear end of the piston 3. Communicating with the cylinder bore 2 adjacent the center thereof at longitudinally spaced points are ports 35 and 36 which are connected, through a longitudinally extending passage 37 formed in the cylinder 1 and a passage 38 formed in the valve chest 15, with the bore 16. As shown, leading from the supply connection 30 and communicating with the cylinder bore at the extreme forward end thereof is a starting passage 39.

In the operation of the improved pressure fluid motor it will be assumed that the hammer piston 3 is in the position shown in Fig. 2 and is about to be driven rearwardly by pressure fluid continuously supplied through the port 31. However, when the piston is in the position shown, the port 31 is closed by the piston head and at this time pressure fluid leaks through the starting passage 39 building up a pressure within the front end of the cylinder bore 2 and forcing the hammer piston rearwardly until the port 31 is uncovered. The continuous live fluid acting on the front pressure area on the hammer piston forces the latter rearwardly with great velocity. The throwing passage 32 is constantly in communication with the inlet so that pressure fluid is supplied to the bore 17 and continuously acts on the outer surface of the spool 18 and as a result, the distribution valve is held to the left against the buffer plug 23 as shown in Fig. 2. Accordingly the rear end of the cylinder bore is opened to atmosphere through the passage 29, annular recess 27 and exhaust passage 28. As the ports 35 and 36 are also opened to atmosphere through passages 29 and 28 the pressure within the bore 16 at the outer side of the spool 19 is relieved. When the piston 3 is in the position shown in Fig. 2 the passages 33 and 34 are closed by the buffer ring 6, but as the piston 3 moves rearwardly these ports 33 and 34 are opened and consequently live fluid is supplied through the piston to the rear end of the cylinder bore. As the piston moves rearwardly the port 35 is uncovered and live pressure fluid is admitted through passages 37 and 38 to the bore 16, and due to the difference between the areas of the spools 19 and 20 the valve is thrown to the right from the position shown in Fig. 2 to the position shown in Fig. 1, the spool 19 cutting off the flow of exhaust fluid through the passage 29 at that time. The live pressure fluid flowing to the rear end of the cylinder bore through the piston then causes the latter to move forwardly, the pressure fluid acting on relatively large rear area on the piston overcoming the continuous pressure fluid acting on the relatively small front area of the piston. As the piston moves forwardly the passages 33 are cut off, thereby cutting off the supply of fluid to the rear end of the piston. However, the hammer piston continues its forward movement due to expansive action of the fluid and momentum, and as a result, the striking bar 4 imparts a blow to the shank of the drill steel 12. After the supply to the rear end of the cylinder bore is closed the piston head uncovers the port 36 and as a result the pressure within the rear end of the cylinder bore and the pressure within the bore 16 at the left hand end of the valve is materially lessened and consequently the valve is thrown to the left by the continuous fluid flowing through the throwing passage 32 to the bore 17 at the right of the spool 18. The above cycle of operation is repeated during normal operation of the tool.

As a result of this invention it will be noted that an improved pressure fluid motor of the semi-valveless type is provided wherein the fluid distribution means is exceedingly simplified. It will further be noted that due to the improved and simplified arrangement of the distribution passages and the distribution valve an improved pressure fluid motor is provided having increased power and efficiency. These and other advantages of this invention will be clearly apparent to those skilled in this art.

While I have in this application specifically described one form which this invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A pressure fluid motor comprising a cylinder, a piston reciprocable therein, said piston having a reduced forward extension, means for constantly admitting pressure fluid to the forward end of said cylinder to subject the annular area surrounding said reduced portion to constant pressure, a valve for controlling exhaust from the rear end of the cylinder, piston controlled means for throwing said valve, and valveless means for intermittently effecting admission of pressure fluid to the rear end of the cylinder independently of said valve.

2. A pressure fluid motor as set forth in claim 1 wherein said valveless admission means comprises a longitudinally extending passage in said piston opening at its rear end into the rear end of said cylinder and at its forward end through lateral ports in said reduced extension into the front end of said cylinder.

In testimony whereof I affix my signature.

THOMAS OFFICER.