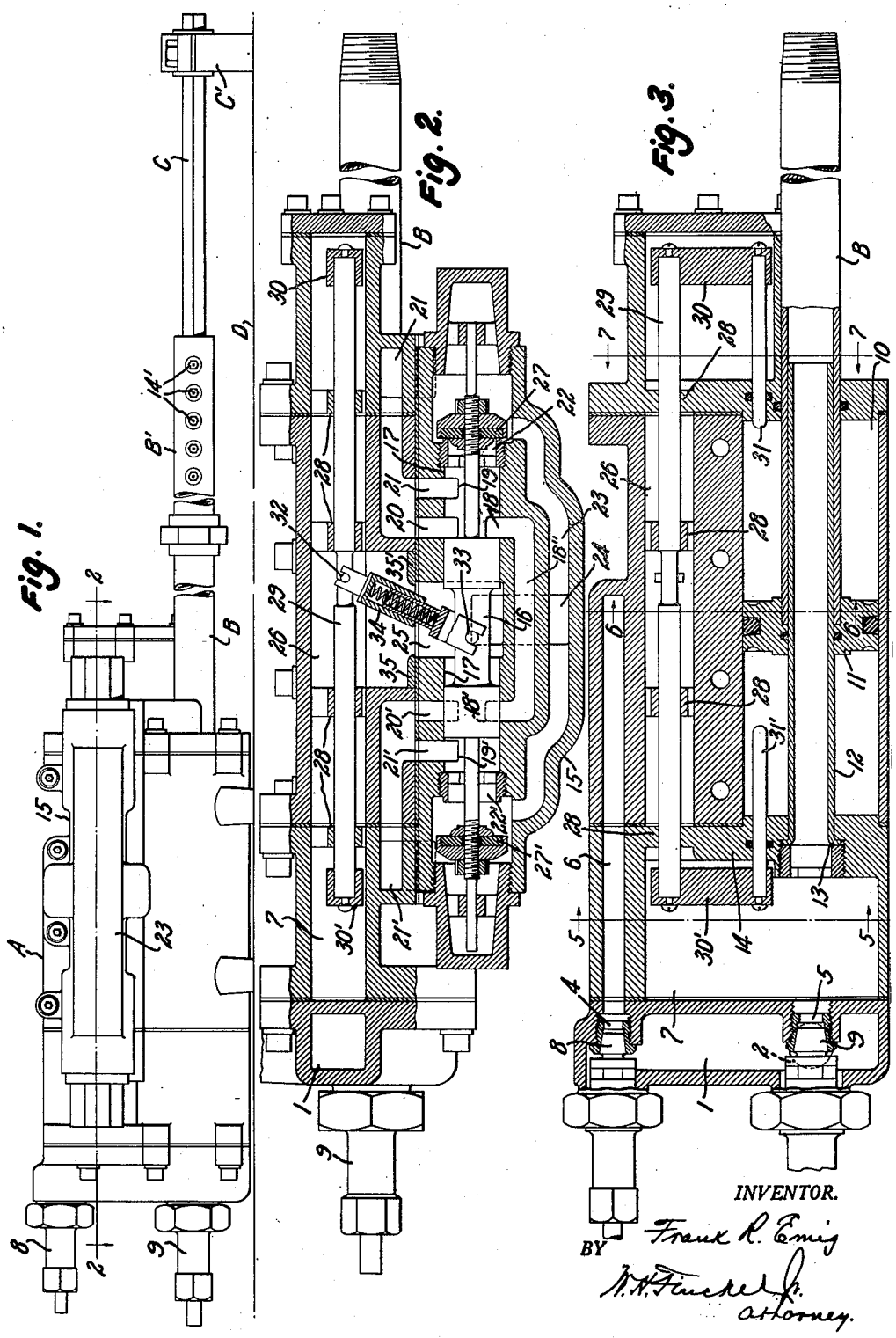
May 19, 1953 F. R. EMIG 2,638,877

FLUID MOTOR

Filed Nov. 8, 1949 2 Sheets-Sheet 1



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FLUID MOTOR

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Fig. 6.

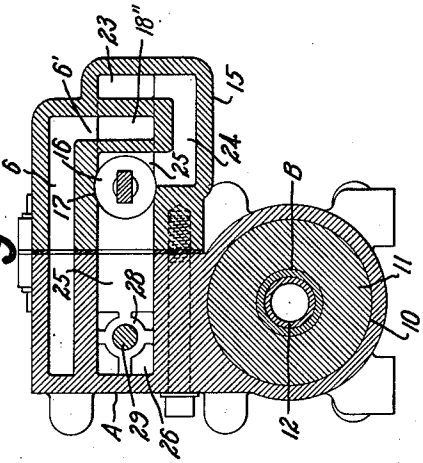


Fig. 8.

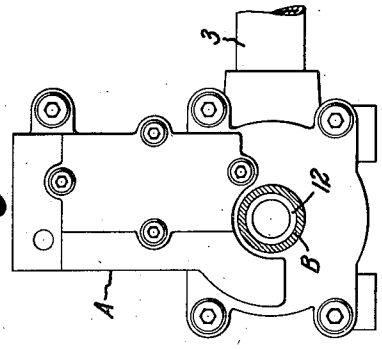


Fig. 5.

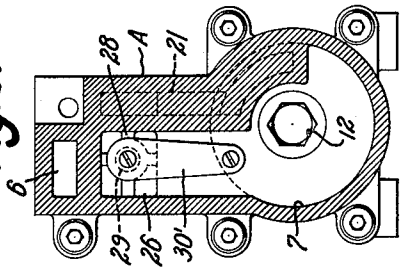


Fig. 7.

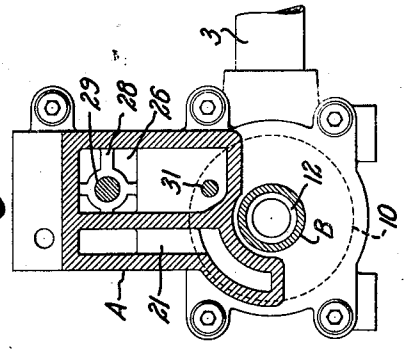
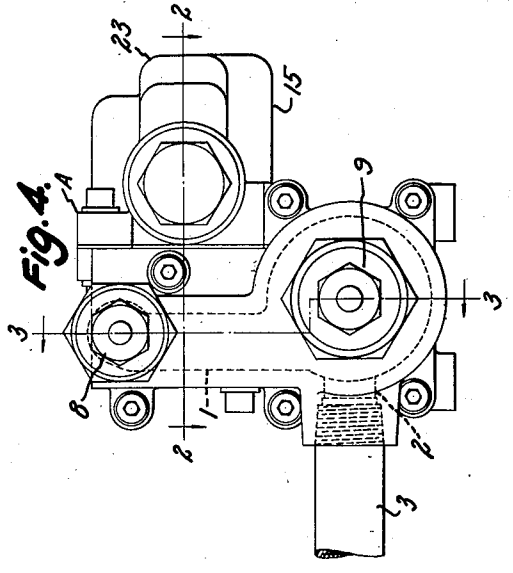


Fig. 4.



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FLUID MOTOR

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5 Claims. (Cl. 121—164)

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This invention relates to a fluid motor, particularly a water motor, especially designed for the operation of shower apparatus, and specifically shower apparatus for use with paper-making machines and adapted to project sprays of relatively high pressure water upon the felts, cylinders or wires thereof, and so operable that the spray pipe of the shower apparatus may be reciprocated axially and water automatically supplied under relatively high pressure to the spray nozzles of such spray pipe.

In spray apparatus for paper-making machines it is desirable to provide relatively simple mechanism capable of operation for extended periods of time without attention, and it is also desirable to conserve both power for its operation and the water used.

One object of the invention is, therefore, to provide a fluid operated motor, specifically a water motor, for imparting reciprocation to the shower spray pipe of such simple and rugged construction that it is capable of continuous and unattended operation over long periods of time.

Another object is to provide a motor which is capable of efficient operation by water simultaneously supplied to it and to the shower spray pipe, and which, in the interest of water conservation, has its exhaust of water conducted to the shower spray pipe.

A further object is to simplify installation of the apparatus for operation with respect to a paper-making machine, and to this end only one water connection is required, water therefrom being conducted to the motor to furnish motive fluid, and to the shower spray pipe, respectively, under the control of suitable valves mounted in and forming parts of the apparatus.

The invention comprises a fluid motor, specifically a water motor for paper-making machine shower apparatus, and including a casing or body chambered to provide a power cylinder and fluid passages communicating with such cylinder, valve means for controlling said passages, a piston reciprocable in the power cylinder under the influence of fluid (water) admitted to and exhausted from such cylinder through the valve controlled passages, said piston being capable of connection with and for reciprocating a spray pipe provided with spray nozzles to reciprocate the same, valves for controlling, respectively, the admission of water under pressure to the valve controlled passages as a motive fluid for said piston and to the shower spray pipe for spray purposes; and the invention comprises, also, various structural details and combinations and arrangements of parts including means for accomplishing

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effective actuation of the valve means for said passages, thereby to insure proper automatic and trouble-free operation of the apparatus, all as will be explained hereinafter more particularly and finally claimed.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated,

Fig. 1 is a side elevation of the apparatus of the invention with associated shower spray pipe and means for supporting and guiding its outer end during reciprocation, parts of the shower spray pipe being broken away,

Fig. 2 is an enlarged longitudinal horizontal section of the fluid or water motor taken on the lines 2—2 of Figs. 1 and 4,

Fig. 3 is a vertical longitudinal section of the motor taken on the line 3—3 of Fig. 4,

Fig. 4 is an end view of the apparatus as seen from the left of Figs. 1 to 3,

Figs. 5, 6 and 7 are vertical transverse sections taken on the lines 5—5, 6—6 and 7—7, respectively, of Fig. 3, and

Fig. 8 is an end view of the apparatus as seen from the right of Figs. 1 to 3, the shower spray pipe being shown in section.

The apparatus, in its combination with a shower spray pipe comprises the motor A, the shower spray pipe B, B' and cooperating guide means C, C', for supporting and guiding the shower spray pipe B, B' during its reciprocation. The parts may be mounted and secured in appropriate relation to a paper-making machine upon some available part of the machine or upon a prepared bracket, as indicated by the broken line D, Fig. 1.

The motor A has a body, preferably of multipart form for ease of assembly, suitably chambered to accommodate the working parts of the motor and providing a water manifold 1 (Figs. 3 and 4) having a single water inlet port 2 connected by a pipe 3 (Figs. 4, 7 and 8) with a source of water under suitable pressure. The inner wall of this manifold has ports 4 and 5 communicating, respectively, with an inlet passage 6 and a fluid (water) cavity 7, and controlled by valves 8 and 9, respectively, whereby the flow of water may be manually controlled at the two ports.

Also within the body A of the motor is a power cylinder 10 having a reciprocable piston 11 in sliding sealed engagement with a tubular guide member 12 secured at one end 13 in the inner wall 14 of the cavity 7 and having its other end adapted to be telescoped within the shower spray pipe B which is fixedly connected with the piston 11 for reciprocation therewith. Thus the tubu-

lar guide member 12 will provide a passageway between the cavity 7 and the reciprocable shower spray pipe B to furnish a constant supply of water under suitable pressure from the valved port 5 of the cavity 7 to the spray nozzles 14' of the spray pipe B'.

Within the lateral extension 15 of the body is a double-ended master or reversing valve 16 reciprocable in a complemental valve cylinder 17 and having at its opposite ends, under control of the reversing valve, fluid inlet ports 18, 18' and exhaust ports 19, 19'. The inlet ports 18, 18' communicate through a manifold 18'' and appropriate connecting passage 6' (Fig. 6) with the inlet passage 6 and, upon alternate strokes of the reversing valve 16, through passages 20, 20' and 21, 21' with the opposite ends of the power cylinder 10. The exhaust ports 19, 19' also communicate through the passages 21, 21' with the opposite ends of the power cylinder 10, and through openings 22, 22', a manifold 23 and connecting passages 24, 25 and 26 with the cavity 7 which, as stated, will be in communication with the shower spray pipe B through the tubular guide member 12. The openings 22, 22' are controlled by check valves 27, 27' mounted upon rods carried by and reciprocable with the reversing valve 16.

Mounted in spider bearings 28 in the passage 26 is a slide rod 29 fitted at its ends with offstanding arms 30, 30' which carry striker pins 31, 31' extending through the head walls of the power cylinder 10 and adapted to be contacted and moved by the power piston 11 adjacent to the ends of its stroke in opposite directions, the striker pins 31, 31', through the arms 30, 30', thus being capable of imparting reciprocatory movement to the slide rod 29.

Connected with the slide rod 29 and reversing valve 16, midway of their length, by yoke and pin connections 32, 33, respectively, is a telescopic, spring loaded toggle member 34 adapted upon movement of the slide rod 29 to find a fulcrum upon one or the other of two fixed abutment members 35, 35'.

The operation of the apparatus, particularly in its adaptation as a motor for a shower spray pipe, is substantially as follows: Assuming that the motive fluid (water) is supplied under adequate pressure (say 100 p. s. i.) through the pipe 3 and inlet 2 to the water manifold 1, and that the valves 8 and 9 have been given a preliminary setting which is thought to be proper for desired operation, it will be seen that, with the parts of the motor in the positions shown in Figs. 2 and 3, the water will enter and fill the inlet passage 6 through the port 4 under control of its valves 8 and at a pressure (say 100 p. s. i.) adequate to operate the motor. Also, the water will enter the cavity 7, under control of the valve 9 at substantially lower pressure (say 80 p. s. i.) due to its relatively unrestricted flow by reason of the large area of the valve opening and free communication of the cavity 7 with the tubular guide member 12 and spray pipe B, B', and will fill the passages connected therewith, and also fill the shower spray pipes B, B' and issue in jets from the nozzles 14'.

The relatively high pressure fluid in the inlet passage 6, 6' enters the manifold 18'', and by reason of the port 18' being closed by the left-hand portion of the reversing valve 16, and the check valve 27 closing off the opening 22, will issue from the valve cylinder 17 through the ports 18 and 19 and the passageways 20 and 21 into the

right-hand end of the power cylinder 10 thus to cause the power piston 11 to move to the left, carrying with it the shower spray pipes B, B'. Meanwhile water trapped in the left-hand end of the power cylinder will exhaust through the passageway 21', exhaust port 19' and opening 22' to the manifold 23, from which it finds its way through connecting passages 24, 25 and 26 to the cavity 7 wherein it mingles with the water admitted to the cavity through the inlet port 5 thereof controlled by the valve 9, and enters the shower spray pipe thus commingled. It will be apparent, therefore, that both sides of the piston 11 are subjected to water under considerable pressure, but that the pressure of the water serving to move the piston is, of course, greater than that being exhausted into the cavity 7 (say 100 p. s. i. and 80 p. s. i. respectively).

Obviously, as the power piston moves to the left in the power cylinder 10 it will strike pin 31' causing it to move to the left and carry with it the slide rod 29. The reversing valve 16 is meanwhile held against movement to the right by pressure difference as applied to its opposite ends (say 100 p. s. i. at the right-hand end and 80 p. s. i. at the left-hand end), and by a predetermined difference in effective area of the two faces of the valve 27, the smaller of which is subjected to the relatively high pressure water (say 100 p. s. i.) in the right-hand end of the valve cylinder 17, and the larger to relatively lower pressure (say 80 p. s. i.) from the manifold 23. Thus, by a predetermined differential of pressures acting upon the two ends of the valve 16, and upon the two different effective areas of the opposite faces of the valve 27, the sum of the net forces is a greater force acting to the left. Also, the retention of the valve 16 in its left-hand position is augmented by the angular force exerted against it by the spring toggle member 34 until this member passes dead center. With the valve 16 thus held to the left, the movement of the slide rod 29 to the left will cause the toggle member 34 to pivot around its yoke and pin connection 33 on the reversing valve 16, whereby the spring of the toggle member will be compressed and its loading thereby increased, and when the toggle member 34 strikes against the left-hand abutment member 35 it will find a fulcrum against which it can act as a lever to cause movement of the reversing valve to the right which, although slight, is enough to unseat the valve 27, whereupon, with pressure in the cylinders 17 and 10 relieved, the spring loaded toggle member 34 will cause the reversing valve to quickly move, with a snap action, to the right, closing inlet port 18 and opening inlet port 18', and bringing valve 27' to its seat while valve 27 is meanwhile fully opened. A sequence of operations similar to those described will now function to operate the power piston 11 and other mechanism in opposite sense, and this reversal of operations, and consequent reciprocation of the shower spray pipe B, B' will continue automatically until the manually actuated valves 8 and 9 are closed. The speed of operation of the motor, and hence the rapidity of reciprocation of the shower spray pipe B, B', can be regulated by suitable adjustment of the valve 8, and the volume of water added to that exhausted from the motor for spray purposes may be regulated by adjustment of the valve 9.

Various changes and modifications are considered to be within the principle of the invention and the scope of the following claims.

What I claim is:

1. A fluid actuated motor having a body provided with a power cylinder, a power piston reciprocative in said cylinder and to which means to be reciprocated may be connected, and means for controlling the flow of motive fluid alternately to and from the opposite ends of said cylinder, said controlling means including inlet and exhaust ports in said body and communicating with the cylinder at opposite ends thereof and with a source of motive fluid and with an exhaust cavity in said body, respectively, a reversing valve cooperatively associated with said ports and reciprocable relatively thereto and subjected to fluid pressure serving normally to hold it immovable, means operable in response to reciprocation of said power piston for mechanically imparting preliminary movement to said reversing valve in opposition to the holding effect of said fluid pressure, and including means for thereafter automatically biasing said reversing valve to complete its movement alternately in one or the other direction of its reciprocation, and pressure relief valve means mechanically actuated by said reversing valve during its preliminary movement and serving to relieve the fluid pressure acting upon said reversing valve to thereby permit substantially instantaneous operation of said biasing means.

2. A fluid actuated motor having a body provided with a power cylinder, a power piston reciprocative in said cylinder and to which means to be reciprocated may be connected, means for controlling the flow of motive fluid alternately to and from the opposite ends of said cylinder, said controlling means including inlet and exhaust ports in said body and communicating respectively with said cylinder at opposite ends thereof and with a source of motive fluid and with an exhaust cavity in said body, a reversing valve cooperatively associated with said ports and reciprocable relatively thereto and subjected to fluid pressure serving normally to hold it immovable, means operable in response to reciprocation of said piston for imparting preliminary movement to said reversing valve in opposition to the holding effect of said fluid pressure, and including means for thereafter automatically biasing said reversing valve to complete its movement alternately in one or the other direction of its reciprocation, valve means mechanically actuated by said reversing valve during its preliminary movement and serving to relieve fluid pressure acting upon said reversing valve to thereby permit substantially instantaneous operation of said biasing means, and means for permitting motive fluid exhausted from said power cylinder to enter said exhaust cavity.

3. A fluid actuated motor having a body provided with a power cylinder, a power piston reciprocative in said cylinder and to which means to be reciprocated may be connected, an exhaust cavity in said body, a tubular member fixed in a head wall of said cylinder and communicating with said exhaust cavity, said piston being slidable upon said tubular member and said means to be reciprocated being connected with said piston and in telescoping engagement with said tubular member, means for controlling the flow of motive fluid alternately to and from the opposite ends of said cylinder, said controlling means including inlet and exhaust ports in said body and communicating respectively with said cylinder at opposite ends thereof and with the source of motive fluid and with said exhaust cavity, a reversing valve cooperatively associated with said ports and reciprocable relatively thereto and subjected to fluid pressure serving normally to hold it immovable, means operating in response to reciprocation of said piston for imparting preliminary movement to said reversing valve in opposition to the holding effect of said fluid pressure, and including means for thereafter automatically biasing said reversing valve to complete its movement alternately in one or the other direction of its reciprocation, valve means mechanically actuated by said reversing valve during its preliminary movement and serving to relieve the fluid pressure acting upon said reversing valve to thereby permit substantially instantaneous operation of said biasing means, and means permitting motor fluid exhausted from said power cylinder into said exhaust cavity to enter said means to be reciprocated through said tubular member.

4. A fluid actuated motor having a body provided with a power cylinder, a power piston reciprocative in said cylinder and to which means to be reciprocated may be connected, means for controlling the flow of motive fluid alternately to and from opposite ends of said power cylinder, said controlling means including inlet and exhaust ports in said body and communicating respectively with said power cylinder at opposite ends thereof and with a source of motive fluid and with an exhaust cavity in said body, a piston like reversing valve cooperatively associated with said ports and reciprocable relatively thereto and subjected to fluid pressure serving normally to hold it immovable, a cylinder for said reversing valve, means operable in response to reciprocation of said power piston for imparting preliminary movement to said reversing valve in opposition to the holding effect of said fluid pressure, and including means for thereafter automatically biasing said reversing valve to complete its movement alternately in one or the other of its directions of reciprocation, openings at opposite ends of said valve cylinder in communication with said exhaust cavity, and check valves carried at opposite ends of and movable with said reversing valve and functioning to control said openings to relieve pressure in the valve cylinder upon the preliminary movement of said reversing valve whereby said biasing means may be capable of substantially instantaneous operation.

5. A fluid actuated motor having a body provided with a power cylinder, a power piston reciprocative in said cylinder and to which means to be reciprocated may be connected, and means for controlling the flow of motive fluid alternately to and from the opposite ends of said power cylinder, said controlling means including inlet and exhaust ports in said body and communicating with said power cylinder at opposite ends thereof and with a source of motive fluid and with an exhaust cavity in said body, respectively, a reversing valve cooperatively associated with said ports and reciprocable relatively thereto and subjected to pressure fluid serving normally to hold it immovable, a slide rod reciprocable in said body and carrying striker pins extending into said power cylinder for engagement with and movement by said power piston adjacent to opposite ends of its reciprocation, a spring loaded toggle member connected at its opposite ends with said reversing valve and said slide rod, fixed fulcrum means in said body for abutting cooperation with said toggle

member whereby movement of said slide rod in response to movement of said power piston will through cooperation of said toggle member with said fulcrum means cause a partial movement of said reversing valve in opposition to the holding effect of said fluid pressure, and valve means actuated by said reversing valve upon such partial movement to release the fluid pressure normally acting to hold said valve immovable and thereby permit the spring loading of said toggle member to complete movement of the valve.

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