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2,254,084

FLUID PUMP

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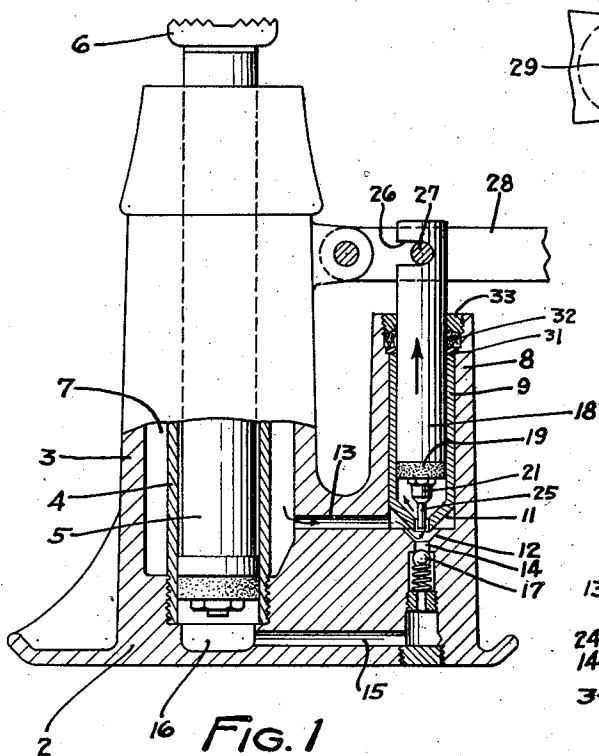


FIG. 1

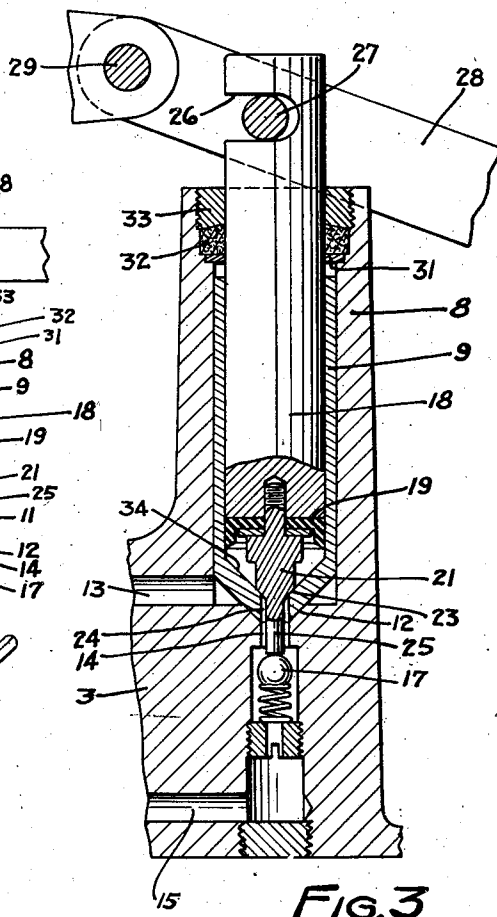


FIG. 3

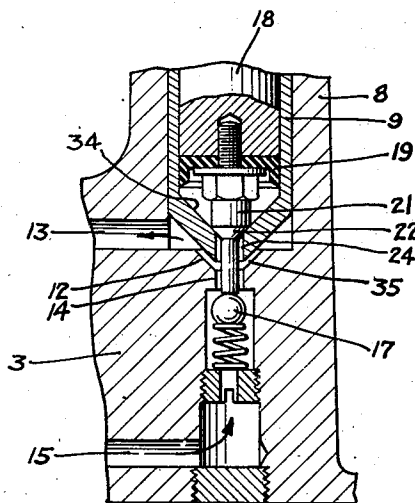


FIG. 4

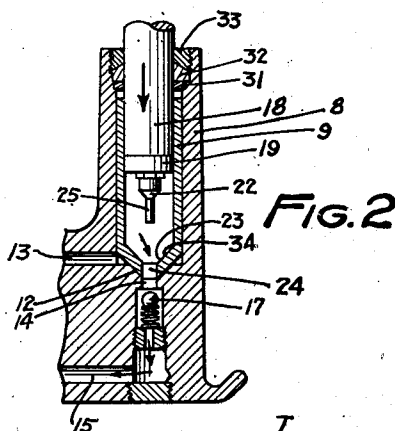


FIG. 2

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FLUID PUMP

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5 Claims. (Cl. 103-41)

This invention relates to new and useful improvements in fluid pumps, generally, and more particularly to such a device which readily lends itself for use in connection with hydraulic jacks and other structures wherein a ram or plunger is mounted for reciprocal movement to engage a load or other member to be actuated.

An object of the present invention is to provide a fluid pump comprising comparatively few parts, all of which are arranged in axial alignment, whereby the operation of assembling the parts is greatly facilitated.

A further object is to provide a fluid pump comprising a cylinder and a piston having an elongated tubular member associated therewith and functioning as a check valve to prevent return flow of the fluid from the cylinder to the source of fluid supply, when the piston is moved in a direction to force the fluid from the cylinder or tubular member through a discharge port to a device to be operated.

A further object is to provide a fluid pump comprising a cylinder having a sleeve member mounted therein for limited sliding movement, and a piston being mounted within the sleeve member adapted to pump fluid from a reservoir into the sleeve, when the piston is moved in one direction, and said sleeve member being adapted to be moved into engagement with a seat to prevent return flow of the fluid to the reservoir, when the piston is moved in a direction to force the fluid from the interior of the sleeve member through a discharge port to the device to be operated.

A further object is to provide a fluid pump comprising a cylinder having an intake connecting it to a source of fluid supply or a reservoir and having a discharge opening provided with a suitable check valve, and a sleeve member being fitted within the cylinder and adapted for limited sliding movement therein, said sleeve member having a conical end adapted to engage a seat surrounding the discharge opening, and said conical end being provided with a central opening, and a piston being mounted for reciprocal movement within the sleeve member and having one end projecting from the apparatus to facilitate operating it, said sleeve member being adapted, upon movement of the piston in one direction, to move out of engagement with said seat, whereby fluid is drawn from the reservoir into the interior of the sleeve member through the opening provided at one end thereof, and said sleeve member being adapted to be moved into engagement with said seat, when the piston is moved in the oppo-

site direction, whereby the fluid drawn into the sleeve member is forced through the opening in said sleeve member and through the discharge opening of the cylinder to the device to be operated.

Other objects of the invention reside in the provision of a fluid pump comprising a sleeve member which, in effect, serves as a cylinder and check valve, and a piston being operable within the sleeve member and having a stem secured to one end thereof adapted to be moved into engagement with a check valve provided in the discharge opening of the pump, whereby when the piston is moved downwardly to a predetermined position, the check valve is opened, and the sleeve member may then be positioned to permit the pumped fluid to return through the discharge opening and intake of the pump to the reservoir or source of fluid supply; in the provision of an apparatus of the class described, comprising a cylinder having an intake and a discharge, and a suitable spring-actuated check valve being provided in the discharge opening, and a sleeve member being mounted within the cylinder, which is movable by fluid pressure into engagement with a seat, thereby to prevent return flow of the fluid to the reservoir, when the piston is moved in a direction to force fluid through the discharge opening to the device to be operated; and, in the provision of a fluid pump which is extremely simple and inexpensive in construction, whereby it may be manufactured at small cost.

Other objects of the invention will appear from the following description and accompanying drawing and will be pointed out in the annexed claims.

In the accompanying drawing there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawing:

Figure 1 is an elevational view, partially in section, showing the invention applied to a hydraulic jack, the pump piston being shown as when drawing fluid from the reservoir into the sleeve member;

Figure 2 is a view showing the position of the sleeve member, when the piston is moved in a direction to force fluid through the discharge port;

Figure 3 is a view on an enlarged scale, showing the sleeve member engaged with its seat, and

also showing the stem on the piston engaged with the check valve in the discharge passage; and

Figure 4 is a view similar to Figure 3, but showing the piston and sleeve member partially retracted, or elevated, whereby it will be noted that the check valve and sleeve member are disengaged with their seats, whereby the pumped fluid may return to the fluid supply source or reservoir.

In the selected embodiment of the invention here shown, there is illustrated in Figure 1, for purposes of disclosure, a hydraulic jack comprising a suitable base 2 having a casing 3 arranged thereon. A cylinder 4 is shown mounted within the casing 3, and has a plunger or ram 5 mounted for reciprocal movement therein. The upper end of the ram projects from the cylinder 4, and is shown provided with a lifting head 6. The wall of the cylinder or tubular member 4 is spaced from the wall of the casing 3 to provide an annular fluid chamber or reservoir 7, as clearly illustrated in Figure 1. The structure above described, forms no part of the present invention, and is shown merely for illustrative purposes, and it is therefore thought necessary to further describe the same in detail.

An important feature of the present invention resides in the provision of a novel pumping means for circulating fluid to and from the lower end of the cylinder 4 to control the operation of the ram or plunger 5. The means provided for thus circulating the fluid to and from the cylinder 4, is shown comprising a cylinder 8, shown secured to the casing 3. For convenience, it may be integrally formed therewith, as shown in Figure 1, but it is to be understood that the cylinder 8 and its associated parts may be formed independently of the jack or casing 3, without departing from the scope of the invention.

A sleeve member 9 is fitted within the cylinder 8 and has a conical end portion 11 adapted to engage a seat 12 provided directly therebeneath. An intake port 13 connects the reservoir 7 with the cylinder 8, and a discharge passage 14 leads from the bottom of the cylinder 8 to a passage 15 which, as shown in Figure 1, may establish communication between the discharge passage 14 and a chamber 16, provided at the lower end of the jack cylinder 4. A suitable spring-actuated check valve 17 is provided in the discharge passage 14.

A suitable piston 18 is mounted for reciprocal movement within the sleeve member 9, and is provided at its lower end with a suitable packing 19, which may serve as a piston head. The packing 19 is shown secured to the lower end of the piston 18 by a valve member 21, having a threaded extension received in threaded engagement with the threaded socket provided in the piston 18, as best shown in Figures 3 and 4. The member 21 has a cone-shaped valve face 22 adapted to engage a conical seat 23 provided in the lower portion of the sleeve member 9. The seat 23 surrounds a fluid passage 24 provided in the lower end of the sleeve member 9.

The valve member 21 is shown provided with a depending stem 25 which is relatively smaller in diameter than the passage 24 in the lower end of the sleeve member 9, whereby it may pass freely through said opening and through the discharge port 14, into engagement with the check valve 17, thereby to unseat said valve, as shown in Figures 3 and 4. The diameter of the discharge passage 14 is preferably sub-

stantially the same as the diameter of the fluid passage 24 provided in the bottom of the sleeve member 9.

The overall length of the sleeve member 9 is slightly less than the overall length of the interior of the cylinder 8, and is adapted for limited sliding movement therein, as best shown in Figures 1, 2, and 3.

The upper or projecting end portion of the piston 18 is shown provided with a notch or recess 26 adapted to receive a pin 27, shown provided in an operating handle 28, which may be pivotally secured to the casing 3 of the jack, as shown in Figure 1.

In the operation of this novel jack, the reservoir 7 is provided with a quantity of inelastic fluid, such for example, as oil. This oil is pumped from the reservoir into the chamber 16 below the plunger 5 of the jack, whereby the plunger or ram 5 is moved upwardly in the cylinder 4. The circulation of the fluid to and from the chamber 16 is accomplished entirely by manipulation of the pump handle 28.

When the pump handle 28 is moved upwardly, the sleeve member 9 is moved upwardly as a result of its frictional engagement with the piston 18, particularly the packing 19, until its upper end engages an abutment 31 provided at the upper end of the pump cylinder 8. A suitable packing 32 and packing nut 33 are shown provided at the upper end of the pump cylinder 8 to prevent leakage of the fluid around the upper end of the piston 18. When the sleeve member 9 is moved upwardly into engagement with the abutment 31, as above stated, its lower end moves out of engagement with the seat 12 and the stem 25 of the piston valve member 21 is then also withdrawn from the fluid passage 24 in the lower end of the sleeve member 9. Continued upward movement of the piston 18 creates a vacuum in the intake passage 13, whereby fluid is drawn from the reservoir 7 through the intake passage 13 and fluid passage 24 in the sleeve member 9, and into the interior of the sleeve member.

When the movement of the pump piston 18 is reversed, the fluid within the sleeve member is put under pressure, whereby the pressure exerted against the inner conical surface 34 of the sleeve member 9 and the seat 23 thereof will cause the sleeve member to move downwardly. Such downward movement of the sleeve member may also be assisted by the frictional engagement of the packing 19 of the pump piston 18, with the wall of the sleeve member.

Thus, upon initial reverse or downward movement of the pump piston 18, the lower end of the sleeve member 9 moves into engagement with the valve seat 12, and thereby prevents the fluid drawn into the sleeve member from returning to the reservoir 7. The fluid within the sleeve member is then forced through the fluid passage 24 in the sleeve member, and through the discharge passage 14 into engagement with the check valve 17, whereby said check valve is unseated, as shown in Figure 2, thereby permitting the pumped fluid to flow through the passage 15 and into the chamber 16 below the plunger or ram 5 of the jack, whereby said plunger is elevated. Upon the up-stroke of the pump piston 18, the vacuum created within the sleeve 9, assisted by the frictional engagement of the packing 19 of the pump piston 18 with the wall of the sleeve member 9, will cause the latter to

move upwardly with the pump piston, until the upper end thereof engages the abutment 31. The check valve 17 then engages its seat, whereupon fluid is again drawn into the sleeve member through the intake port 13, as hereinbefore described. It will thus be seen that the sleeve member 9 serves as a check valve to prevent the fluid drawn into the sleeve member from returning to the reservoir 7, during the down stroke of the pump piston 18, and also as a cylinder for the pump piston 18.

To release the fluid from the jack cylinder 4 to permit the lifting head 6 to return to its normal lowered position, the pump piston 18 is moved downwardly to the position shown in Figure 3. When in this position, the check valve 17 is unseated, because of its engagement with the stem 25 of the valve member 21. When thus positioned, the valve face 22 of the member 21 is engaged with the valve seat 23 within the sleeve member 9, whereby the fluid within the discharge passage 14 of the pump, which fluid is under pressure as a result of the weight of the load, when the check valve 17 is open, cannot enter the interior of the sleeve member 9. The operator then slowly retracts or raises the pump cylinder 18, by manipulation of the operating handle 28, until the sleeve member 9 reaches substantially the position shown in Figure 4, or, in other words, until a small gap 35 is provided between the valve seat 12 and the lower end of the sleeve member 9, as shown in Figure 4. When the sleeve member 9 is thus positioned, the fluid in the chamber 16 is released and returns to the reservoir 7 through the passages 15 and 14, as will readily be understood. It will thus be seen that the entire operation of the pump is controlled by manipulation of the operating handle 28, which greatly simplifies the operation of operating the jack or other device to be operated.

In the accompanying drawing, I have shown the invention as applied to a conventional form of hydraulic jack, but it is to be understood that it may be applied to various other devices and apparatus, where applicable, without departing from the scope of the invention.

I claim as my invention:

1. A fluid pump comprising a cylinder having an intake, a reservoir connected with the intake, said cylinder also having a discharge passage provided at one end with a seat, a spring-actuated check valve normally closing the opposite end of said passage, a sleeve mounted in the cylinder and adapted for limited axial movement therein, one end of said sleeve being adapted to engage said seat to close the intake, a piston operable within the sleeve and adapted to move said sleeve out of engagement with said seat upon the suction stroke of the piston, said sleeve having an opening in one end whereby fluid drawn from the reservoir through the intake is drawn into the sleeve upon each suction stroke of the piston, said sleeve being movable into engagement with said seat when the piston commences its pressure stroke, whereby fluid in the sleeve is forced therefrom through the discharge passage, and means carried by the piston adapted to engage and unseat the check valve when the piston approaches the bottom of its stroke, said sleeve and piston being so related that when the piston has been moved to the bottom of its stroke to unseat the check valve and its movement is slightly reversed, the sleeve member is moved out of engagement with said seat, whereby the fluid may return from the discharge pas-

sage to the reservoir without entering the sleeve member.

2. A fluid pump comprising a cylinder having an intake, a fluid reservoir in connection with the intake, said cylinder also having a discharge passage provided at one end with a conical seat, a spring-actuated valve normally closing the opposite end of said passage, a sleeve member mounted for limited sliding movement within the cylinder and having a conical end adapted to engage said seat, thereby to close the intake, said conical end having an opening therein aligned with said discharge passage, a valve seat surrounding said opening, a piston operable within the sleeve and having a valve member secured thereto and adapted to engage the valve seat in the sleeve member, said valve member having a stem adapted to engage and unseat the check valve when the piston is at the limit of its pressure stroke and whereby said valve member will engage the seat within the sleeve to prevent the entrance of fluid into the sleeve member when the check valve is actuated to permit the pumped fluid to return to the reservoir, said sleeve member being adapted to be moved out of engagement with said seat upon initial return movement of the piston and before the check valve engages its seat, whereby the discharge passage may be opened to the intake to permit the fluid under pressure in the discharge passage to return to the reservoir without entering the sleeve member.

3. A fluid pump comprising a cylinder having an intake, a reservoir connected with the intake, said cylinder also having a discharge passage, a check valve in the discharge passage, a sleeve mounted for limited sliding movement in the cylinder and having a fluid passage at its lower end, a piston operable in the sleeve to draw fluid through the intake into the sleeve upon the suction stroke of the piston, said sleeve being actuable to close the intake upon the pressure stroke of the piston, whereby the fluid drawn into the sleeve is forced through the discharge passage, a valve carried by the piston adapted to close the fluid passage in the sleeve when the piston is at the bottom of its pressure stroke, said valve having a stem adapted to be projected through the fluid passage in the sleeve and to engage and unseat the check valve, when the piston is at the bottom of its pressure stroke, said piston and sleeve being so related that when the movement of the piston is slightly reversed, after the check valve has been unseated, the sleeve is operated to open the intake without unseating said valve, whereby the pumped fluid may return to the reservoir without entering the sleeve member.

4. In a device of the class described, a cylinder having an intake, a reservoir connected with the intake, said cylinder also having a discharge passage, a check valve in the discharge passage, a sleeve member mounted for axial movement in the cylinder and having a conical end portion adapted to close the intake when the sleeve is at one end of its stroke, the conical end of said sleeve member having a fluid passage therein adapted to communicate with the discharge passage when the sleeve member is positioned to close the intake, a piston movable within the sleeve member and having a valve adapted to close the fluid passage in the bottom of the sleeve when the piston is at the bottom of its pressure stroke, said valve having a stem adapted to engage and unseat the check valve when the piston

is at the bottom of its stroke, and the frictional connection between the piston and said sleeve member being such that when the piston is positioned to open the check valve and is slightly reversed, the sleeve member is operated to open the intake without unseating said valve, whereby the pumped fluid may return to the reservoir without entering the sleeve member.

5. A fluid circulating pump comprising a cylinder having an intake, a reservoir connected with the intake, said cylinder also having a discharge passage axially aligned with the cylinder, said discharge passage having a seat at one end, a check valve normally closing the opposite end of said passage, a sleeve mounted for limited

axial movement in the cylinder and having a fluid circulating passage in its lower end, a piston in the sleeve, the lower end of said sleeve being adapted to engage said seat and close the intake upon the pressure stroke of the piston, whereby fluid in the sleeve may be pumped through the valve controlled discharge passage, and valve means carried by the piston adapted to engage and unseat the check valve to permit return flow of the fluid to the reservoir, said valve means also operating to close the fluid circulating passage in the sleeve to prevent the pressure fluid from entering the sleeve during return flow of the fluid to the reservoir.

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