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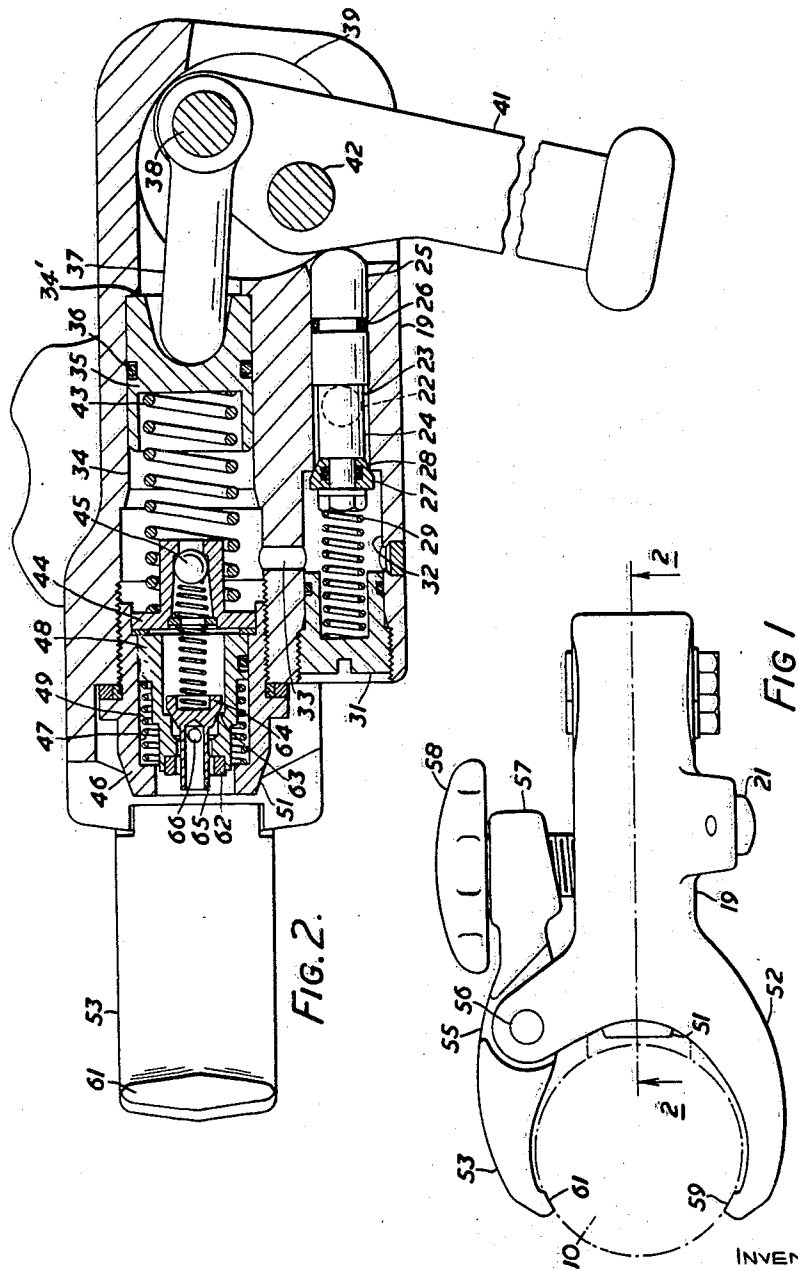
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LIQUID CHARGING DEVICES FOR HYDRAULIC PIT PROPS

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2 Sheets-Sheet 1



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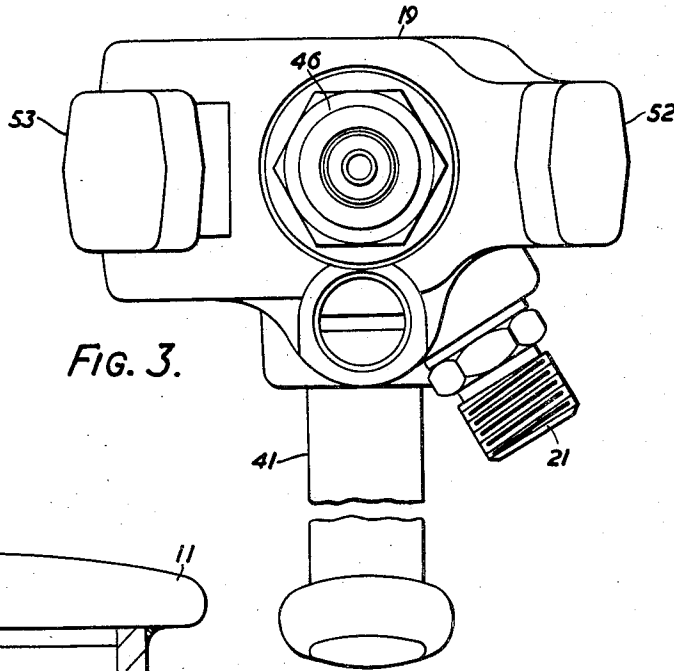


FIG. 3.

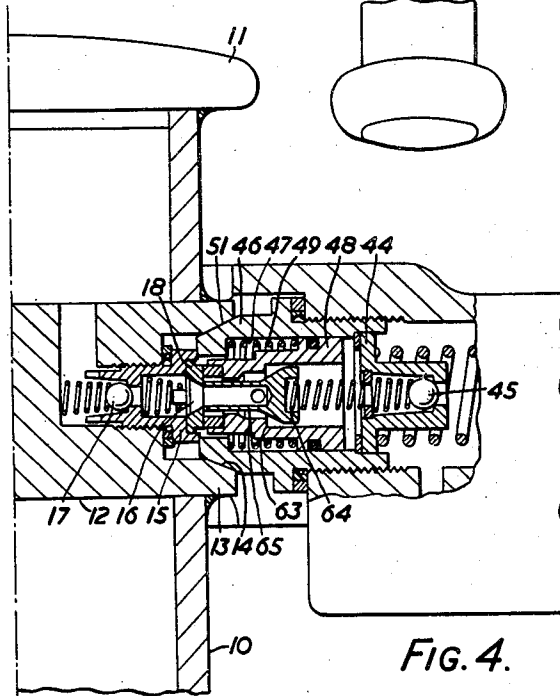


FIG. 4.

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LIQUID CHARGING DEVICES FOR HYDRAULIC PIT PROPS

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This invention relates to liquid charging devices for setting hydraulic props under liquid pressure from an external source. A prop for use with such a device normally comprises telescopic elements together enclosing a liquid receiving pressure chamber, and a valve-controlled inlet in one of the elements through which liquid is admissible to or releasable from the prop.

The invention is particularly, though not exclusively, concerned with props of this character for use with a water main pressure source, and the main object of the invention is to provide an improved charging device for setting props in roof-supporting engagement with adequate force regardless of the pressure which is available in the source of supply.

According to the invention a charging device for setting hydraulic props under liquid pressure from an external source, comprises a pump and valve body having an inlet connector adapted for joining with said external source, attachment means arranged to attach the pump and valve body to a hydraulic prop, a nozzle arranged by said attachment means to engage a valve controlled liquid inlet in the hydraulic prop, a passage in the body leading from the inlet connector to the nozzle, a valve in said passage operable to close and to open the passage to flow of liquid therethrough from the source to the prop, and a pump interposed between the inlet connector and the nozzle, said pump being capable of pumping liquid into the prop at a pressure exceeding that of the source.

One form of charging device constructed in accordance with the invention is illustrated in the accompanying drawings, of which FIGURE 1 is a plan view;

FIGURE 2 is a side view in section on the line 2—2 of FIGURE 1;

FIGURE 3 is an end elevation from the left hand side of FIGURE 2; and

FIGURE 4 is a sectional view of the junction between the charging device and the upper part of a hydraulic prop.

The upper part only of a hydraulic prop is shown in FIGURE 4 comprising a ram tube 10 surmounted by a cap 11 and having a cylindrical element 12 fixed transversely in the ram tube with the outer end 13 forming an inlet socket with a conically flared inner surface 14. A valve housing 15 screwed into the base of the cylindrical element 12 contains two non-return inlet valves 16 and 17 mounted one behind the other, the outer non-return valve 16 being of mushroom shape and, when closed, fitting flush against a valve seat 18 so that the outer surfaces can readily be wiped free from dirt.

The charging device comprises a portable casing or body 19 housing a pump and valve housing and having an inlet connector 21 adapted for connection through a flexible pipe with a source of pressure liquid such as a water main. The inlet connector leads by way of an opening 22, see FIGURE 2, into an inlet valve bore 23 in which a movable closure member 24 is slidably mounted. This member 24 comprises a cylindrical plunger 25 fitted with a sealing ring 26 engaging the bore 23 and a valve head 27 which is engageable with a valve seat 28 at the end of the bore 23 under the load of closure means in the form of a spring 29. The spring 29 is seated in a screw plug 31 which closes an enlarged bore 32 co-axial with the bore

23, and a cross-passage 33 leads from the enlarged bore 32 into a pump cylinder bore 34 which is parallel with the bores 23 and 32. The valve head 27 and valve seat 28 form the inlet valve of a pump which can be operated to supply setting pressure to the hydraulic prop. This pump will now be described.

A pump piston 35 fitted with a sealing ring 36 is reciprocable in the cylinder bore 34 by a connecting rod 37 which is pivoted on a crank pin 38. The crank pin 38 is fixed eccentrically on a crank shaft 39 which is turned in the housing 19 by a handle 41. The handle is fixed to the crank shaft 39 by the crank pin 38 and by a dowel pin 42 off-set from the latter. A spring 43 is interposed between the pump piston 35 and a pump outlet valve housing 44. The spring yieldably retains the piston in a retracted position against an abutment formed by the stepped end 34' of the bore 34, as seen in FIGURE 2. Together, the handle 41 and the rod 37 form a lever which is mounted to engage with each of the piston and the valve plunger 25. When pivoted to the right from the position of FIGURE 2, the handle causes the rod to displace the piston to the left through its pump stroke. When pivoted to the left from such position, the handle displaces the valve plunger to the left and the latter acts as a deactuator for the spring 29 as it lifts the valve control element 27 from the valve seat 28 to allow pressure liquid from the inlet connector 21 to flow past the valve, through the cross passage 33, and into the bore or chamber 34 for flow through the outlet valve 44 to the prop inlet.

To the left of the outlet valve 44 a nozzle 46 is fixed in the pump and valve housing 19 having a cylindrical bore 47 in which a hollow piston 48 is slidably mounted, this piston being urged inwardly towards the outlet valve housing 44 by a spring 49. The nozzle 46 is formed with a conical outer surface 51 shaped to fit the conical inner surface 14 of the inlet socket 13 on the prop and the charging device is arranged to be secured with the nozzle so engaged by means of clamping jaws 52 and 53. One jaw 52 is formed integrally with the pump and valve housing 19 while the other jaw 53 is formed by one arm on a lever 55 which is carried by a pivot pin 56 fixed in the housing 19. The other arm 57 of the lever receives a turn screw 58 which can be tightened against the side of the housing 19 to close the jaw 53 towards the fixed jaw 52. The jaws 52 and 53 respectively have pads 59 and 61 which engage the ram tube at positions spaced approximately 120° apart from the inlet nozzle 51, so that when the turn screw 58 is tightened the pressure pads 59 and 61 draw the housing 19 towards the prop so that the nozzle is clamped tightly in the inlet socket 13.

If the valve head 27 is lifted off the seat 28 when the charging device is attached to the prop, liquid pressure thus admitted through the cross-passage 33 and pump cylinder 34 passes the non-return valve 45 and urges the hollow piston 48 outwardly to the left, assuming that pressure within the prop is less than the supply pressure. A sealing ring 62 in the end of the hollow piston 48 is thereby compressed against the valve seat 18 on the prop to establish a liquid tight seal at the junction.

A safety valve is formed in the hollow piston 48 by a valve seat 63 therein and a spring loaded valve element 64 which normally closes on the valve seat 63 under spring load and under liquid pressure. A hollow stem 65 extends forwardly from the valve element 64 beyond the sealing ring 62 and a cross-drilling 66 opens through the stem 65 on the down-stream side of the valve seat 63. The safety valve 63, 64 prevents improper use of the charging device when not attached to a prop. When the charging device is clamped to the prop and hydraulic pressure urges the piston 48 against the valve seat 18, the valve stem 65 engages the valve seat 18 as shown in FIGURE 4 and lifts the movable valve element 64 clear of

the seat 63 so that liquid communication is established past the element 64, through the cross-drilling 66 and the hollow stem 65. Liquid is then admitted to the prop through the non-return valves 16 and 17.

If liquid is thus admitted to the prop under water main pressure, the prop extends into engagement with the mine roof whereupon liquid pressure builds up in the prop until it is set between the floor and roof of the mine with the liquid pressure of the source acting between the ram tube and cylinder of the prop. It may happen that this pressure is insufficient to set the prop with the desired force and if so the pump handle 41 may be reciprocated until the desired setting load is obtained. Since the inlet valve 27 is substantially hydraulically balanced in this example by the cylindrical plunger 25, it is necessary positively to open the inlet valve by returning the handle 41 fully towards the left end of its idling stroke before commencing each pumping stroke.

Reciprocation of the pump handle 41 may impart high loads at the junction of the device with the prop as pumping pressure increases and the described manner of attaching the device to the prop, therefore, offers a substantial advantage over the normal method of attachment by means of a bayonet type catch on the side of the prop. The employment of jaws 52 and 53 with pressure pads 59 and 61 bearing on the ram tube at positions adequately spaced from the nozzle 51, relieves the inlet socket 13 of the bending moments which it would have to sustain if it provided the sole means of attachment of the charging device to the prop.

I claim as my invention:

1. A hydraulic charging device for interconnection between a source of pressurized liquid and a hydraulic pit prop, comprising a casing defining a chamber having a discharge outlet which is adapted for connection with the prop, and an inlet passage which is adapted for connection with the source of liquid and in communication with the chamber through an opening in the chamber, a valve disposed in the inlet passage at a location adjacent the chamber opening, a valve control member associated with the valve, a valve closure member urging the control member to close the valve against flow into the chamber, a piston which is slidably engaged in the chamber to pump the liquid in the direction of the discharge outlet, for purposes of increasing the pressure in the prop, means operable yieldably to retain the piston in a retracted position in the chamber, means operable to reciprocate the

piston through oppositely directed strokes in the chamber, in one of which strokes the piston is displaced out of its retracted position for the pumping operation, and in the other of which strokes the piston is withdrawn into such position, and means including a movable deactuator member which is connected with the valve closure member and operable after the piston has been withdrawn into its retracted position to deactuate the closure member so that the valve is opened for flow of the liquid through the passage and into the chamber, under the pressure of the source.

2. A hydraulic charging device according to claim 1 wherein the valve closure deactuating means also includes a lever which is pivotally mounted to move the deactuator member for the valve closure deactuating operation.

3. A hydraulic charging device according to claim 2 wherein the lever is mounted to engage with each of the piston and the deactuator member, and adapted to move the piston through its pumping stroke, when pivoted in one direction, and to move the deactuator member through the valve closure deactuating operation, when pivoted in the other direction.

4. A hydraulic charging device according to claim 3 wherein the yieldable piston retaining means includes an abutment in the chamber at the piston's retracted position, and a spring yieldably retaining the piston against the abutment.

5. A hydraulic charging device according to claim 1 wherein the chamber opening is disposed in the wall thereof at a point intermediate the discharge outlet and the piston's retracted position.

6. A hydraulic charging device according to claim 1 wherein the deactuator member takes the form of a plunger having the valve control member at one end thereof.

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