April 27, 1965 F. TOWN 3,180,093

HYDRAULIC PROPS

Filed July 2, 1963 3 Sheets-Sheet 1

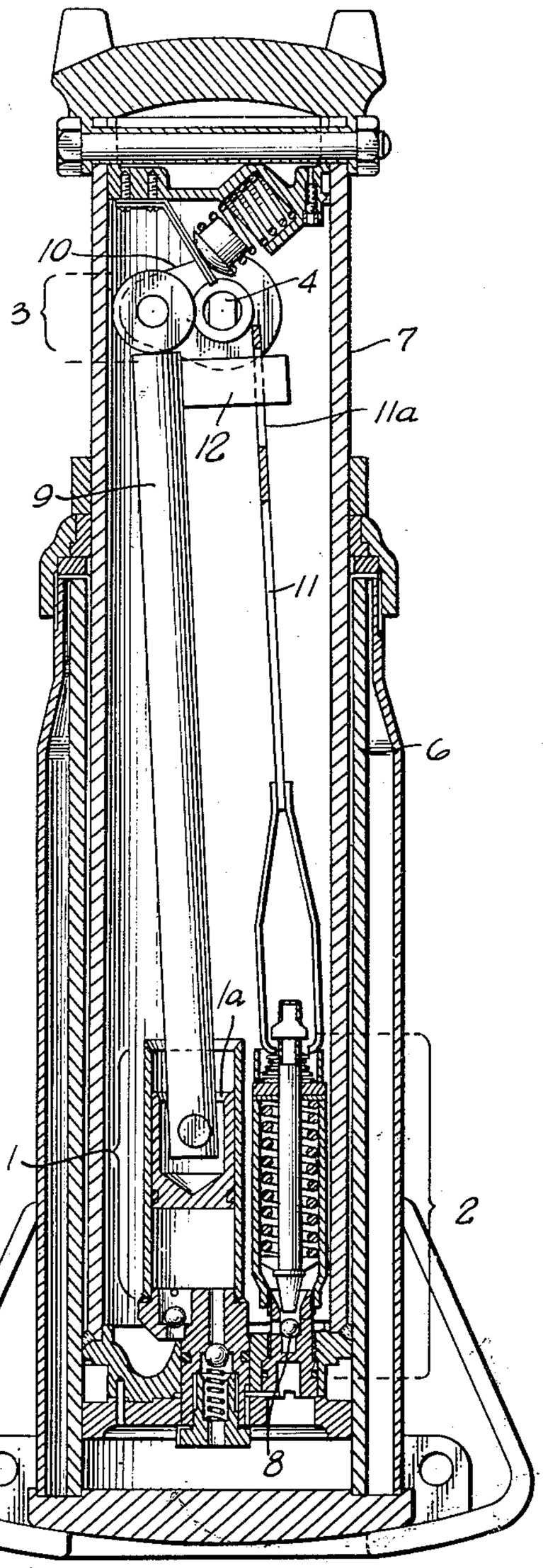

Fig. 1

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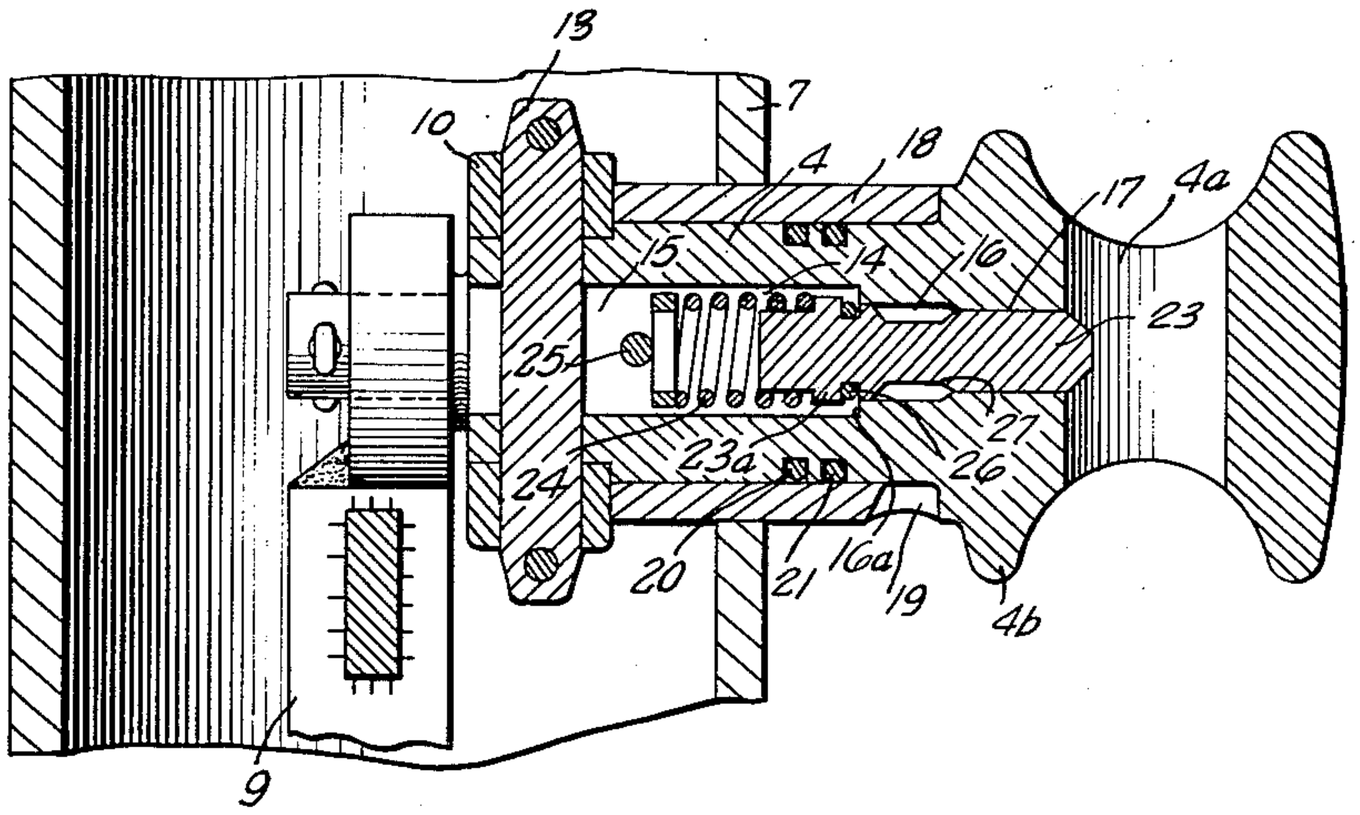

Fig. 2

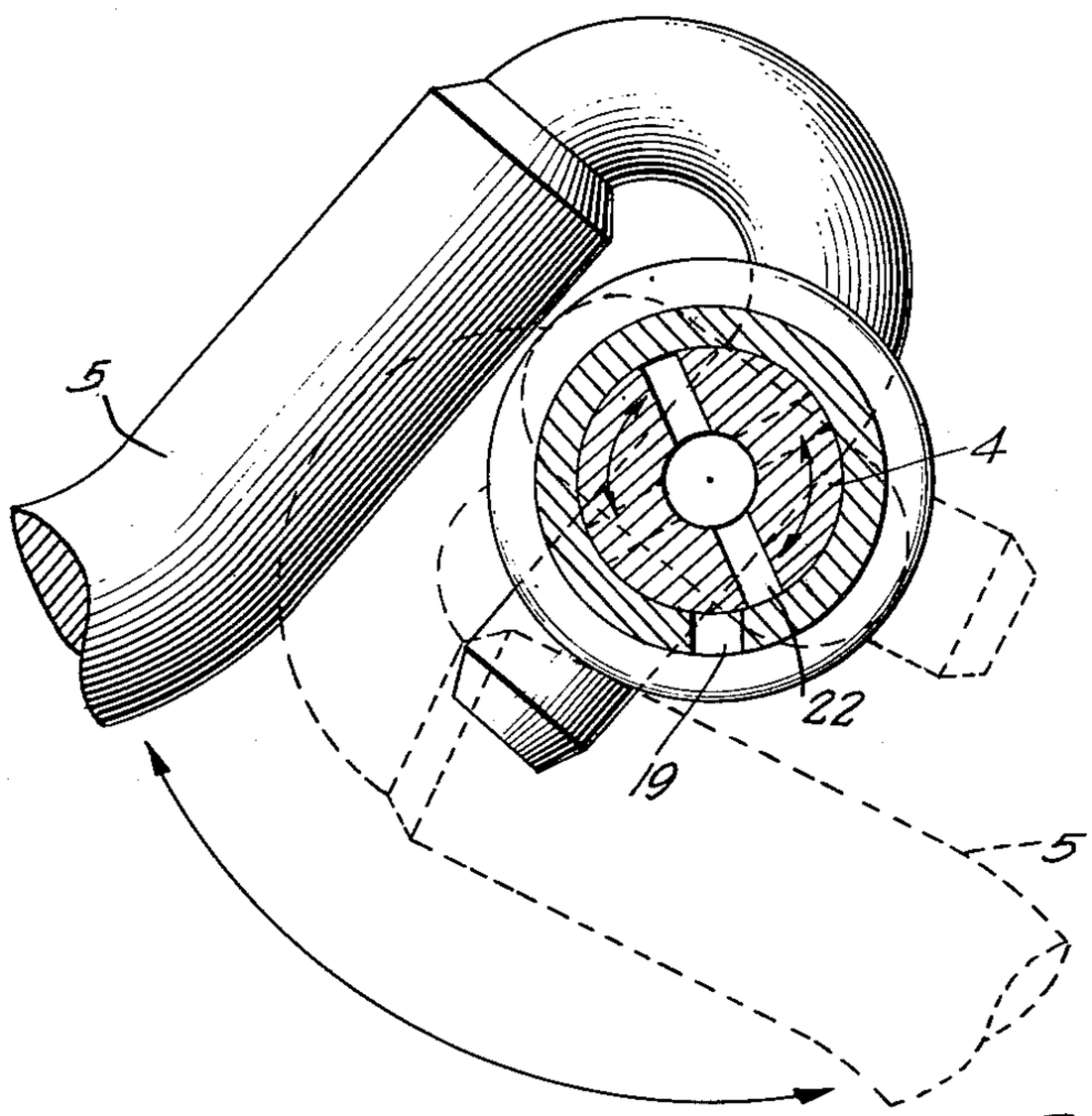

Fig. 3

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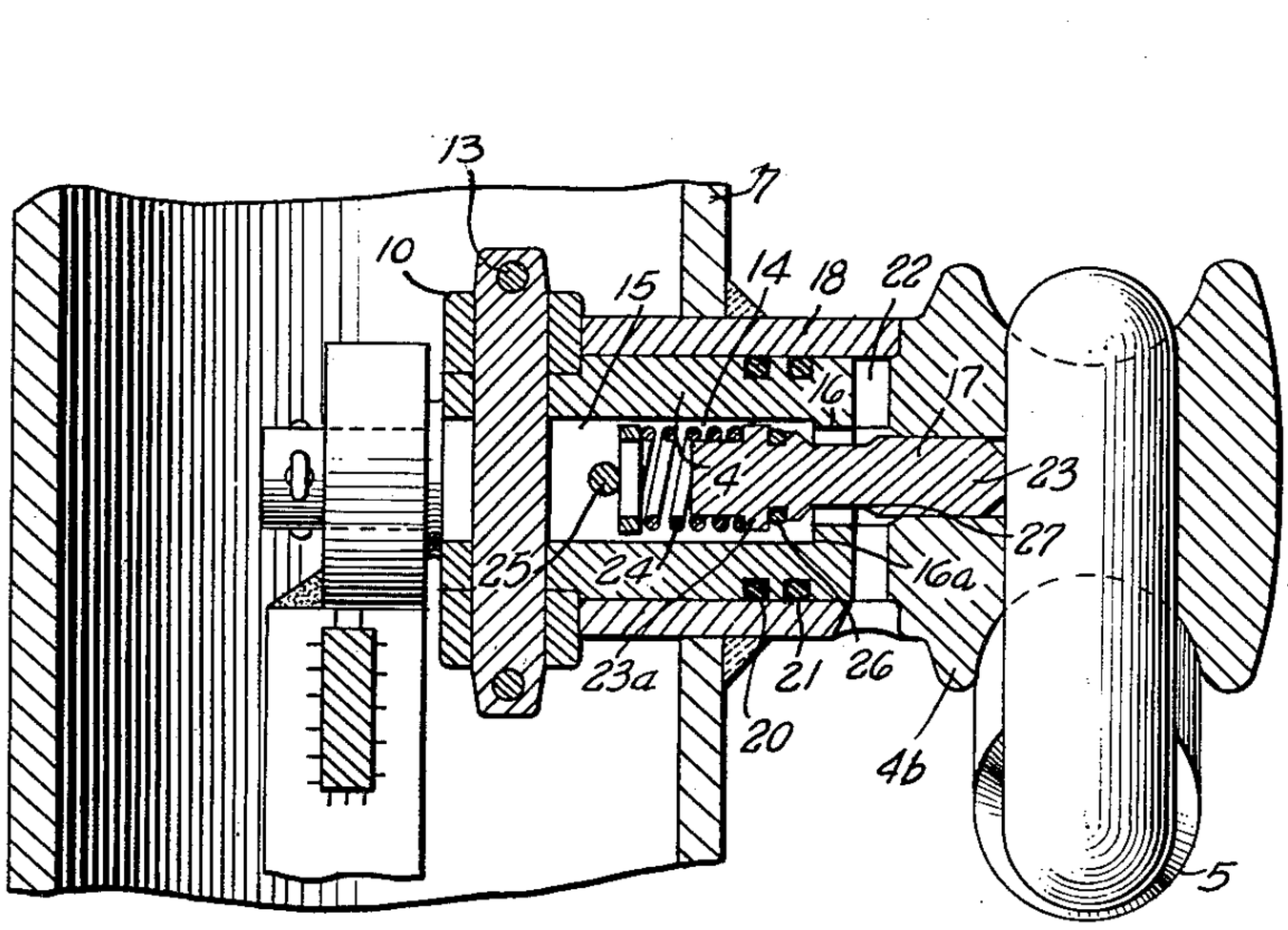

Fig. 4

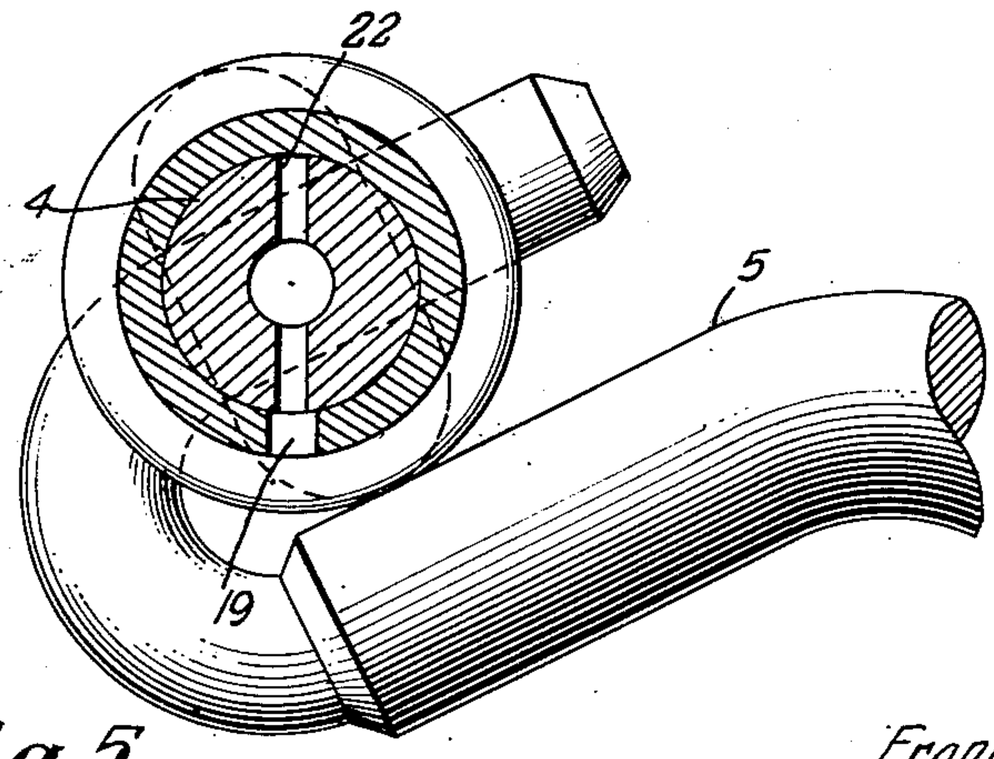

Fig. 5

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United States Patent Office

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HYDRAULIC PROPS

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Filed July 2, 1963, Ser. No. 292,274
Claims priority, application Great Britain, July 31, 1962, 29,288/62
3 Claims. (Cl. 60—52)

This invention relates to a hydraulic pit prop of the type having a crank-operated internal pump and release valve and, more particularly, where the crank mechanism has a pump handle which requires one arcuate movement for operating the pump and a second arcuate movement for operating the release valve.

It is known to provide an air valve for supplying air during the extension of the prop by operation of the pump and releasing air during contraction of the prop by operation of the release valve. However, prior art air valves have not been entirely satisfactory, since they are subject to the entry of foreign matter, which reduces their efficiency. This is especially true when the prop is laid down—as when it is not in use.

An object of the invention is to provide the prop with improved air valve means whereby the prop is able to operate efficiently for a long period.

Other objects and advantages of the invention may be seen in the description and operation of a specific embodiment, which is described with reference to the accompanying drawings, in which—

FIG. 1 is a general sectional view of a hydraulic pit prop equipped with air valve means according to the invention;

FIG. 2 is a side sectional view in enlarged scale of an upper part of the prop showing the air valve means;

FIG. 3 is a cros-sectional view through the air valve means with the valve parts in the position they adopt during pumping up of the prop;

FIG. 4 is a similar view to FIG. 2 showing a pump handle fitted and the valve parts in the position they adopt during fluid valve release contraction of the prop; and

FIG. 5 is a view similar to FIG. 3 but with the valve parts in the position of FIG. 4.

Referring to FIG. 1, the hydraulic prop shown is of the type referred to having an internal pump 1 and release valve 2 which are operable by a crank mechanism indicated generally 3. The crank 3 includes a crank axle 4 which, at its outwardly-projecting end (see FIG. 2), is formed with a transverse hole 4*a* for insertion of a pump handle 5 (FIGS. 3–5). The pump handle 5 goes through a predetermined arc of movement to operate the pump 1 and a second arc of movement to operate the release valve 2.

More specifically, the prop comprises a lower pressure cylinder 6 and an upper, reservoir-forming, hollow ram 7. The pump 1 is housed in the lower end of the ram 7 and has an associated check valve 8 through which fluid can be pumped from the ram 7 into the cylinder 6. The pump piston 1*a* is connected by a rod 9 to a crank 10 secured to the crank axle 4.

The release valve 2 is also housed in the lower end of the ram 7 and is connected by a rod 11 to a projection 12 on the rod 9 by means of a lost motion slot 11*a*.

As shown in FIG. 2, the crank axle 4 is connected by a collar 13 to the crank 10. Further, the axle 4 has a central bore 14 forming at its inner end an air chamber 15 open to the interior of the ram 7. The bore 14 also has an intermediate reduced diameter bearing part 16 and an outer end further reduced diameter bearing part 17 open to the transverse hole 4*a*.

The crank axle 4 is mounted in a bearing sleeve 18 which is secured by welding to the ram 7. The sleeve 18

has an outwardly projecting part formed with an outer air outlet 19 immediately behind an enlarged diameter part 4*b* of the crank axle 4. Sealing rings 20, 21 are provided for sealing between the crank axle and the bearing sleeve 18.

There is also formed in the crank axle 4 (see FIG. 4) a radial air communication passage 22 in the same transverse plane as that of the outer air outlet 19.

In the bore 14 there is a plunger 23 which is biased, by a spring 24 between a shoulder 23*a* on the plunger and a pin 25 across the bore 14, to partly project into the transverse hole 4*a*.

The intermediate reduced diameter bearing part 16 of the bore 14 provides a shoulder 16*a* against which sealing is effected by a sealing ring 26 on the plunger 23 behind the shoulder 23*a*.

The plunger 23 is also formed with an annular air passage 27 substantially in the same general transverse or radial plane as that of the transverse air communication passage 22 and the outer air outlet 19.

When the prop is not in use, the crank axle 4 and air valve parts are as shown in FIG. 2, i.e., before the pump handle is fitted, so that the plunger 23 partly projects into the transverse hole 4*a*, the sealing ring 26 seals against the shoulder 16*a*, and the outer air outlet 19 is cut off from the annular air passage 27. With the parts in this position, there is little or no possibility of foreign matter passing from the outer air outlet 19 into the interior of the valve. Even when the prop is laid on the ground, the outer air outlet 19 is guarded to some extent by the enlarged part 4*b* of the crank axle 4, and should foreign matter enter the outer air outlet 19, it cannot pass into the interior of the valve. Further, dirt can be readily cleared out of the outer air outlet 19 before the prop is put into use. By this means the air valve has a desirably long and efficient working life.

Operation

When the prop is in use, the pump handle 5 is fitted so that the plunger 23 is pressed in, as shown in FIG. 4. Thereupon, the sealing ring 26 becomes spaced from the shoulder 16*a*, and the annular air passage 27 provides communication between the transverse air communication passage 22 and the air chamber 15. However, at this stage, as illustrated in solid line in FIG. 3, the transverse air communication passage 22 does not register with the outer air outlet 19. Instead, as shown in FIG. 3, during the time that the pump handle 5 is operated in its predetermined arc of movement to operate the pump 1, the transverse air communication passage 22 is carried around with the crank axle 4 through an arc of movement during which it is out of registry with the outer air outlet 19. This pumping action causes a comparatively small displacement of the fluid and consequently small displacement of air takes place by passage of air between the plunger 23 and the crank axle bore 14.

When it is required to contract the prop, the pump handle is moved through a second arc of movement during which it operates the release valve 2, and during this movement, as shown in FIG. 5, the handle 5 turns the crank axle 4 to a position in which the transverse air communication passage 22 registers with the outer air outlet 19. Therefore in this position of the parts, the comparatively large displacement of fluid is accompanied by similar large displacement of air which is drawn into the prop. The air drawn into the prop flows through the crank axle bore 14, the annular air passage 27, the transverse air communication passage 22, and the registering outer air outlet 19.

After contraction of the prop and if it is not required for immediate reuse, the handle is turned back to the initial pumping position where the transverse air com-

munication passage 22 is again moved out of registry with the outer air outlet 19, thereby preventing the possibility of foreign matter entering into the valve.

What I claim is:

1. A hydraulic jack, comprising a cylinder, a reservoir-providing ram mounted in said cylinder, a pump and release valve mounted in said ram, passage means coupling said pump and ram, and second passage means coupling said ram and said reservoir, said release valve being positioned in said second passage means, a bearing sleeve fixed to and extending through the wall of said reservoir, a crankshaft journaled in said sleeve and having a crank portion within said reservoir coupled to said pump and release valve, said crankshaft having a portion outside said reservoir adapted to receive a pump handle, said shaft having an axial bore in the shaft portion intermediate the outside and crank portions thereof and communicating with said reservoir, said intermediate shaft portion being adapted to pass air from said reservoir to the outside thereof, a seat in said bore, a slide valve in said axial bore adapted to be engaged and unseated by said handle when said handle is received in said shaft outside portion, said intermediate shaft portion being equipped with a transverse passage communicating with said bore outward of the seat of said slide valve, said sleeve being equipped with a transverse passage located so as to align with said shaft transverse passage only during the release valve opening position of said shaft.

2. The structure of claim 1 in which said shaft outside portion is equipped with an integral annular enlargement projecting radially beyond said sleeve transverse passage whereby said sleeve transverse passage is protected against entry of dirt.

3. A hydraulic jack, comprising a cylinder, a reservoir-providing ram mounted in said cylinder, a pump and release valve mounted in said ram, passage means coupling said pump and ram, and second passage means coupling said ram and said reservoir, said release valve being positioned in said second passage means, a crank-equipped shaft rotatably mounted in said reservoir and projecting exteriorly thereof, said crank including means for coupling said shaft to said pump and release valve to actuate said pump during a predetermined arc of rotation of said shaft and thereafter operate said release valve upon further shaft rotation, said shaft being equipped with a bore extending generally axially at least partway therethrough and communicating with said reservoir, slide valve means in said bore, said shaft, in the portion thereof projecting exteriorly of said reservoir, being equipped with a handle-receiving slot, said slot and slide valve means being so arranged that insertion of a handle in said slot actuates said slide valve means, and rotary valve means operably associated with said shaft and so arranged therewith that movement of said shaft for actuating said release valve also actuates said rotary valve means.

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