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UNIDIRECTIONAL FLUID PRESSURE MECHANISM

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Fig. 1.

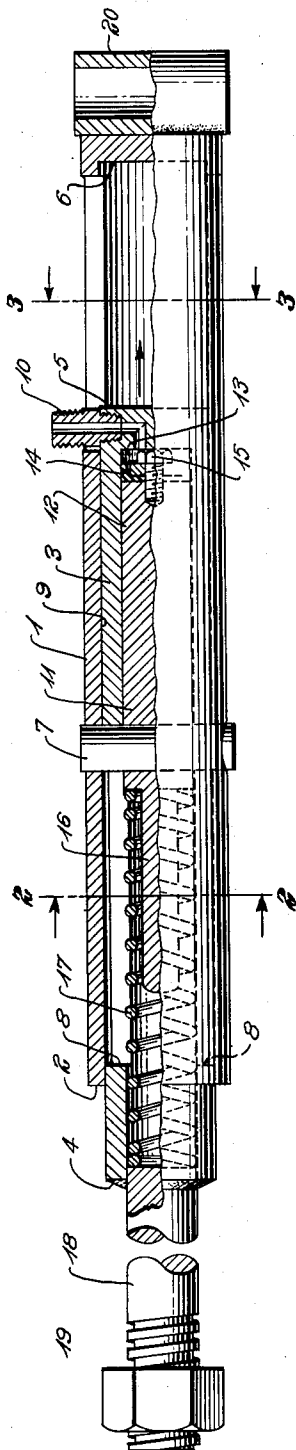


Fig. 3.

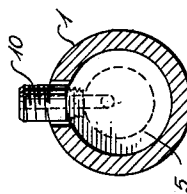
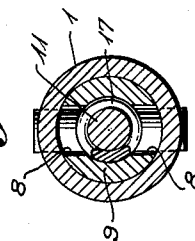


Fig. 2.



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UNIDIRECTIONAL FLUID PRESSURE MECHANISM

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7 Claims. (Cl. 121—38)

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This invention relates to fluid pressure mechanisms and more particularly to a unidirectional fluid pressure mechanism.

The primary object of the invention is to provide an improved fluid pressure mechanism capable of exerting large effort in one direction.

Another object of the invention is to provide fluid pressure mechanism in which the mechanism contracts as a unit under load, enabling it to exert large effort within relatively small confines.

Another object of the invention is to provide a fluid pressure mechanism wherein the fluid chamber is separated from the housing cylinder, whereby effort is exerted by variation in the volume of the chamber without change in the dimensions of the cylinder.

An additional object of the invention is to provide a fluid pressure mechanism wherein the over-all length of the mechanism is decreased or increased by reaction of a hollow sliding piston against a fixed ram which it encircles, whereby there is obtained a compact mechanism of high efficiency.

Other objects and advantages of the invention will appear hereinafter in the detailed description, be particularly pointed out in the appended claims and illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a preferred embodiment of the fluid pressure mechanism of the present invention;

Figure 2 is a cross-sectional view, taken along the lines 2—2 of Figure 1; and

Figure 3 is a cross-sectional view, taken along the lines 3—3 of Figure 1.

Referring now in detail to the drawings in which like reference characters designate like parts, the improved fluid pressure mechanism of the present invention, while capable of exerting effort in either pull or push, has been shown for purposes of illustration, as a pulling mechanism. In its illustrated embodiment, the mechanism is comprised of a cylinder, jacket or housing 1, which may be open at one or its inner end 2. Within this cylinder is slidably or reciprocally mounted a sleeve or hollow piston 3, closed at both ends, the outer end 4 of which normally extends through the open end 2 of the housing, and the opposite end 5 of which is normally spaced in-

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wardly of the closed end 6 of the housing, this spacing being determined by the maximum stroke desired of the mechanism. The sleeve is slidably connected to the housing by a pin or key 7, extending transversely through the housing and riding or sliding in opposed slots 8 formed in the longitudinal or axial wall 9 of the sleeve, the slots extending axially or longitudinally of the sleeve and permitting displacement of the sleeve relative to the key 7, in accordance with the aforementioned maximum stroke of the mechanism. Extending through the wall of the sleeve adjacent its outer end confronting the closed end 6 of the housing, is a threaded nipple 10 connected through a hose or other conduit (not shown) to a suitable source of fluid pressure, usually hydraulic.

The third major component of the mechanism is a ram, reaction member or block 11 which slidably engages and is axially movable relative to the sleeve 3. When the cylinder unit is assembled, as in Figure 1, the ram is fixed in position axially of the housing 1 by the key 7, such that the sleeve 3 is slidable therebetween. The ram slidably engages the sleeve 3 through a head 12 which confronts the inner, closed end 5 of the sleeve and is normally spaced axially therefrom sufficiently to permit fluid to be injected into the axially expansible chamber, cavity or recess 13 therebetween through the nipple 10. The fit between the head and the wall 9 of the sleeve is made fluid-tight by a gasket 14 attached to the end of the head by suitable means such as the illustrated washer-encircled bolt 15. The end portion of the ram opposite its head is formed as a restricted neck or throat 16 encircled by a return spring 17, the spring acting between the confronting or outer end 4 of the sleeve and the base of the head 12.

With the above construction, the introduction of fluid into the chamber 13 between the ram and the sleeve will cause the adjacent end of the sleeve to move away from the head of the ram toward the closed end of the housing against the yieldable or resilient force of the return spring 17, this movement continuing on continued application of fluid pressure, with corresponding increase in the volume or axial dimension of the fluid chamber, until the sleeve has reached the end of its stroke. On release of the fluid pressure, the return spring 17, compressed substan-

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tially solid during this stroke, returns the sleeve to its normal or initial position, in process forcing the fluid from the cavity through the nipple 10.

To utilize the force, obtained by the fluid pressure unit above described, for pull, there is welded or otherwise rigidly connected to the outer end 4 of the sleeve a threaded rod 18 carrying a nut or other means 19 by which the effective stroke of the sleeve may readily be adjusted. The opposite end of the mechanism may, in turn, be anchored or connected to a support or other member (not shown) by a clevis or other connecting means 20, the illustrated clevis being fixed to the closed end 6 of the housing by welding 15 or other suitable means.

In utilizing the mechanism for push, the end connections would, of course, be reversed, the rod 18 then being connected to the inner end 5 of the sleeve and projecting through the adjacent end of the housing, and the opposite end of the housing being anchored to a suitable support. While obtainable with the illustrated housing, this modification to adapt the mechanism for pushing would usually be accomplished either by a reversal of the open and closed ends of the housing or by closing both ends, at least one removably.

In assembling the mechanism, the ram 11 is inserted in the sleeve 3 through its outer end 4, which is then left open for that purpose. After the ram and return spring are in place, the rod 18, the butt of which here is seated in and closes the outer end 4 of the sleeve, may either be welded in place or removably attached, depending on whether subsequent disassembly of the unit is desired. The sleeve is then readily inserted through the open end of the housing and locked there by the pin 7.

While the fluid pressure mechanism, as a whole, is only capable of exerting unidirectional force toward or away from the support to which the housing is anchored, and will thus normally be used as a pulling or tensioning mechanism, it is also possible for the mechanism to act within itself to grip an object between the open end 2 of the housing and the adjustable nut 19 carried by the stem.

From the above detailed description it will be apparent that there has been provided an improved fluid pressure mechanism which is adapted to exert unidirectional forces and may readily be applied as a clamping or like mechanism wherever large forces are required within relatively small confines. It should be understood that the described and disclosed embodiments are merely exemplary of the invention and that all modifications are intended to be included which do not depart either from the spirit of the invention or the scope of the appended claims.

Having described my invention, I claim:

1. Fluid pressure mechanism comprising a housing, a member within and spaced from said housing, a piston interposed between and slidable relative to said housing and member, and means extending transversely through said piston intermediate ends thereof for fixing said housing and member against relative movement, said piston being moved axially relative to said housing and member on injection of fluid intermediate said piston and member.

2. Fluid pressure mechanism comprising a housing movably attachable to a support, a reaction member within and fixed axially of said housing, a hollow piston intermediate and slid-

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able relative to said housing and member, said piston forming with said member a fluid chamber separate from said housing and being moved axially relative to said housing and member on injection of fluid into said chamber, and means movable with said piston for admitting fluid into said chamber.

3. Fluid pressure mechanism comprising a housing, a reaction member within and spaced from said housing, a hollow piston intermediate and slidable relative to said housing and member, said piston forming with said member an expansible fluid chamber and having an axial slot beyond limits of said chamber, means extending transversely through said slot for fixing said member to said housing, and means, acting between said piston and member for normally contracting said chamber, said piston being moved axially relative to said housing and member by injection of fluid into said chamber.

4. Fluid pressure mechanism comprising a housing, means carried adjacent an end of said housing for movably attaching said housing to a support, a closed-end sleeve slidably mounted in said housing, load-connecting means carried by said sleeve and projecting from an opposite end of said housing, a reaction member enclosed by said sleeve and forming therewith an axially expansible chamber separate from said housing, means for fixedly connecting said reaction member and slidably connecting said sleeve to said housing, said sleeve being moved axially in one direction relative to said housing and member by injection of fluid into said chamber, and resilient means normally urging said sleeve in the opposite direction.

5. Fluid pressure mechanism comprising a housing connectable to a support, a closed-ended sleeve slidably mounted in said housing, load-connecting means carried by said sleeve and projecting beyond said housing away from said support, a reaction member enclosed by said sleeve and forming therewith an axially expansible chamber separate from said housing, and yieldable means reacting between said sleeve and member and normally contracting said chamber, said sleeve being moved axially relative to said housing and member by injection of fluid into said chamber for varying the spacing between said support and a load.

6. Fluid pressure mechanism comprising a housing, means carried axially of said housing for movably attaching an end thereof to a support, a closed-ended sleeve slidably mounted in said housing, load-connecting means carried by said sleeve and projecting axially beyond said housing away from said support-connecting means, a reaction member enclosed by said sleeve and forming therewith an axially expansible chamber separate from said housing, means extending transversely through said sleeve intermediate ends thereof for fixing said member and limiting movement of said sleeve axially of said housing, and yieldable means reacting between said sleeve and member and normally contracting said chamber, said sleeve being moved axially against said yieldable means relative to said housing and member by injection of fluid into said chamber.

7. Fluid pressure mechanism comprising a housing, means carried by an end of said housing for movably attaching said housing to a support, a sleeve slidably mounted in said housing and having a closed end, load-connecting means carried by said sleeve and projecting axially of said housing beyond an opposite end thereof, a re-

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action member enclosed by said sleeve and forming therewith an axially expansible chamber separate from said housing, means extending transversely through said sleeve for fixing said member axially of said housing, resilient means reacting between said sleeve and member and normally contracting said chamber, said sleeve being moved axially against said resilient means relative to said housing and member by injection of fluid into said chamber, and means carried by said sleeve adjacent said closed end thereof for admitting said fluid into said chamber.

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