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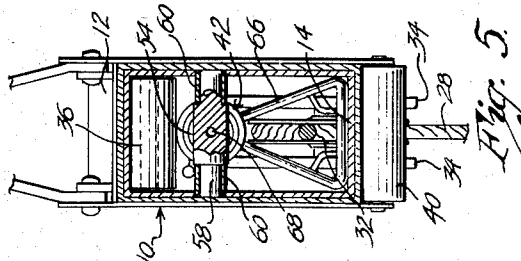
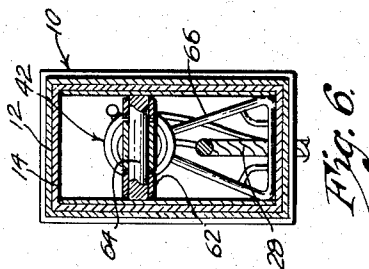
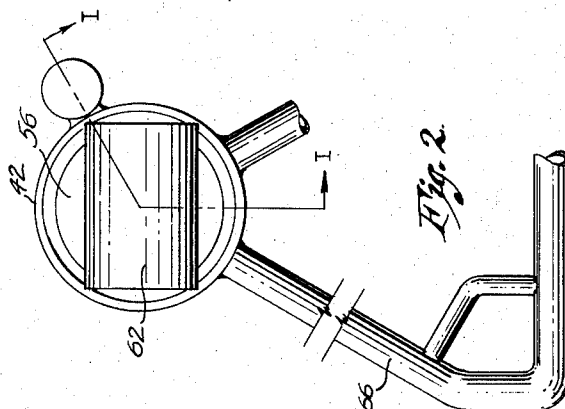
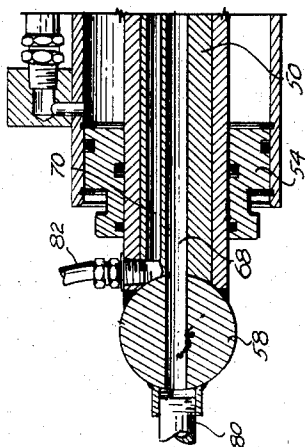
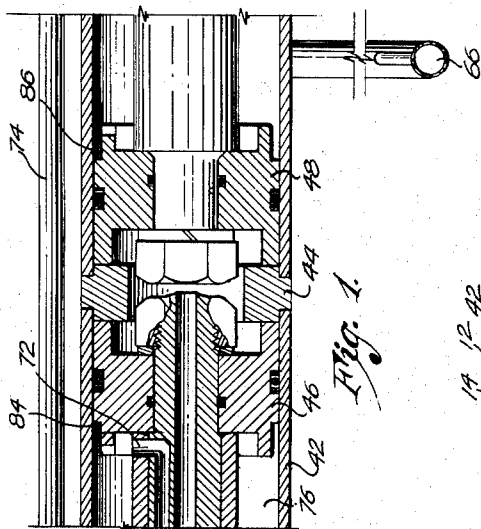
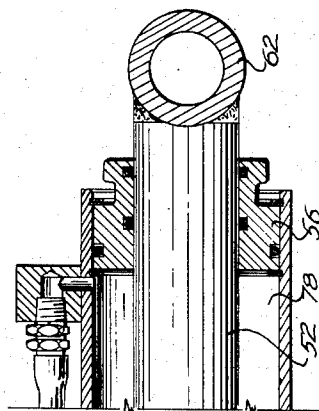
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2,886,005

HYDRAULIC BOOM EXTENSION ASSEMBLY

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2 Sheets-Sheet 1



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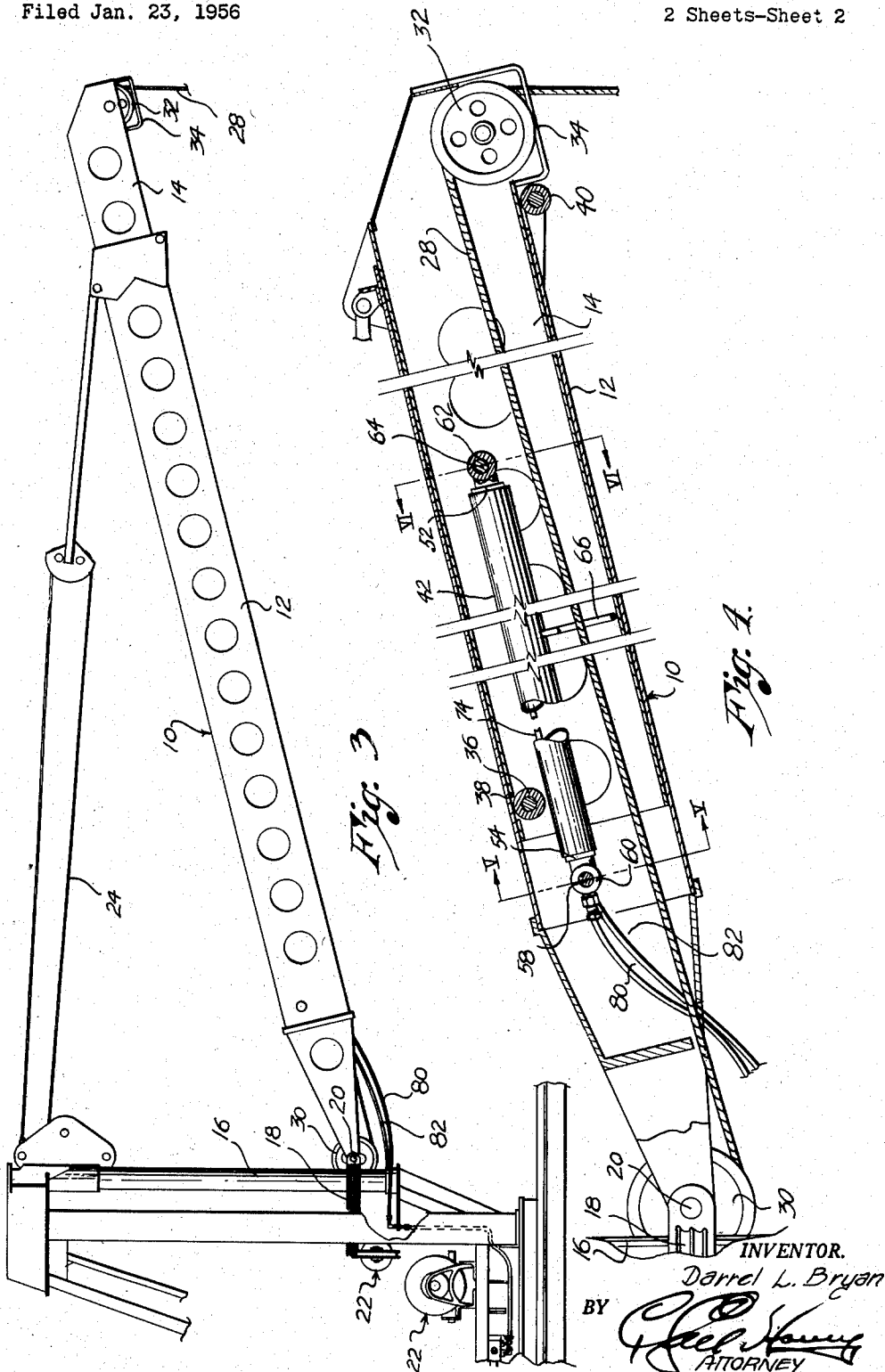
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HYDRAULIC BOOM EXTENSION ASSEMBLY

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2 Sheets-Sheet 2



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HYDRAULIC BOOM EXTENSION ASSEMBLY

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Application January 23, 1956, Serial No. 560,553

2 Claims. (Cl. 121—38)

This invention relates to improvements in load-hoisting devices of the kind disclosed in Raymond O. Pitman et al. Patents No. 2,559,733 and No. 2,717,701, and more particularly to the boom structure of such devices, the primary object being to provide novel actuating structure for extensible booms.

It is the most important object of the present invention to provide a hydraulic boom extension assembly that includes a pair of opposed, double-acting pistons reciprocable within a common cylinder, the latter of which is itself mounted for free movement with respect to the pistons and the extensible sections of the boom.

Another important object of the present invention is to provide hydraulic power means of the aforementioned character that is housed within a pair of relatively telescoped extensible boom sections and having each piston connected with one of the sections to the end that the latter are moved relatively upon actuation of the pistons within their cylinder.

A further object of the present invention is to mount a hydraulic, double-acting piston and cylinder assembly within a boom by connection of each of the pistons to one of the sections and by slidably supporting the cylinder within one of the sections for reciprocable movement with respect thereto.

A still further object of this invention is to provide a hydraulic assembly wherein is included means for directing hydraulic pressure between the pistons through one of the stems therefor, as well as to the outer faces of the two pistons through passage means in the said stem and a by-pass interconnecting the two opposed chambers of the cylinder.

Other objects include important details of construction to be made clear or become apparent as the following specification progresses, reference being had to the accompanying drawings, wherein:

Figure 1 is a longitudinal, cross-sectional view through a hydraulic boom extension assembly made pursuant to my present invention taken on irregular line I—I of Fig. 2.

Fig. 2 is a fragmentary, end elevational view thereof.

Fig. 3 is a fragmentary, side elevational view on a reduced scale of a load-hoisting device in the nature of that disclosed by the aforementioned patents and having an extensible boom structure embodying the hydraulic assembly of the instant invention.

Fig. 4 is an enlarged, fragmentary, longitudinal, cross-sectional view through the boom structure shown in Fig. 3 and showing in elevation the hydraulic assembly illustrated in Figs. 1 and 2.

Fig. 5 is a transverse, cross-sectional view taken on line V—V of Fig. 4; and

Fig. 6 is a cross-sectional view taken on line VI—VI of Fig. 4.

The disclosures of the patents above-identified, are incorporated herein by reference for a complete understanding of the type of load-lifting device chosen for illustration in Fig. 3 of the drawings and with which the

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hydraulic boom extension assembly of the instant invention is adapted to be used.

Boom structure 10 includes an outermost, elongated, tubular section 12 and an inner elongated, tubular section 14 telescoped within the section 12 for longitudinal reciprocable movement with respect thereto.

The boom section 12 is mounted on an upright standard 16 through the medium of sheave means 18 rigid to the standard 16. A pivot 20 permits swinging movement of the boom structure 10 on a horizontal axis and standard 16 itself is mounted for rotation on its vertical axis for horizontal swinging movement of the boom structure 10. Such horizontal movement is controlled by opposed hydraulic piston and cylinder units operably coupled through cable means with sheave 18, one of such units being seen in Fig. 3 and designated by the numeral 22. Vertical swinging of the boom structure 10 is controlled by cable means 24 that is in turn operably connected with power means, not shown.

A winch is coupled with lifting cable 28 that extends through the tubular standard 16 beneath a pulley 30 on pivot 20, thence through the boom structure 10 and over a pulley 32 mounted at the outermost end of the inner boom structure 14. Section 14 is provided with guide means 34 for the cable 28 and with a roller 36 at its innermost end therewithin disposed in rolling contact with the innermost face of the uppermost wall of boom section 12. A slot or opening 38 in the section 14, clears the roller 36. Another roller 40 carried by the section 12 at the outermost end thereof, is in rolling contact with the lower face of section 14. Consequently, rollers 36 and 40 provide anti-friction means for freedom of movement of the section 14 as a load on the cable 28 tends to tip the outer end of section 14 downwardly and the inner end thereof upwardly toward the upper surface of section 12.

The power means forming the subject matter of the instant invention for reciprocating the section 14 with respect to section 12, is hydraulically actuated and, to this end, there is provided an elongated cylinder 42 that may be formed in two sections as seen in Fig. 1 interconnected by a tubular plug 44 serving as a stop for a pair of opposed pistons 46 and 48.

Pistons 46 and 48 have elongated stems or rods 50 and 52 respectively secured rigidly thereto and extending in opposite directions beyond the ends of the cylinder 42 through glands 54 and 56 that are in turn held in place by retainer rings as shown in Fig. 1.

Rod 50 has a crosshead 58 on the outermost end thereof received by opposed tubular journals 60 secured rigidly to the section 12 adjacent the innermost end of the latter. The rod 52 is provided with a tubular crosshead 62 that is received by a stub shaft 64 traversing the section 14 and rigidly secured to the latter.

Cylinder 42 is freely movable with respect to pistons 46 and 48 and with respect to the boom structure 10 and is, therefore, slidably supported by the inner section 14 through the medium of a pedestal 66.

A fluid passage 68 extending longitudinally through the rod 50 and its crosshead 58, communicates with the cylinder 42 between the pistons 46 and 48. A second fluid passage 70 within the rod 50 has a lateral discharge end 72 communicating with the cylinder 42 between the piston 46 and the gland 54. A by-pass 74 interconnects chambers 76 and 78 of the cylinder 42. Hydraulic fluid is directed to and from the passages 68 and 70 through flexible hoses 80 and 82 respectively emanating from a suitable source of fluid pressure not shown.

In operation, when hydraulic pressure is directed into the cylinder 42 through hose 80 and passage 68, section 14 is extended outwardly as the cylinder 42 and the piston 48 move toward the outermost end of the section

12 and during such movement of the gland 54 toward the piston 46, fluid within the chamber 76 flows to the hose 82 by way of passage 70. As soon as the gland 54 engages the piston 46 thereby limiting the extent of movement of the cylinder 42, the fluid pressure between the pistons 46 and 48 causes the piston 48 to move along the cylinder 42 toward the gland 56. Fluid is forced from the chamber 78 through the by-pass 74, thence into the chamber 76 and to hose 82 by way of lateral extension 72 and passage 70.

Manifestly, the section 14 is retracted by reversing the flow of hydraulic fluid and as such fluid is forced into the chamber 76 through hose 82, passage 70 and lateral extension 72, cylinder 42 is first retracted toward the crosshead 58, the gland 56 bearing against the piston 48 and moving the latter therewith toward the piston until the stop 44 strikes the piston 46. As soon as the piston 46 strikes the gland 54, incoming fluid will flow into chamber 78 by way of by-pass 74, thereby moving the piston 48 inwardly with respect to the cylinder 42 until it strikes the stop 44.

The by-pass 74 remains in communication with the chambers 76 and 78 even when the pistons 46 and 48 are in engagement with the glands 54 and 56 respectively by virtue of the provision of annular grooves 84 and 86 in pistons 46 and 48 respectively, and during retraction fluid escapes from between the pistons 46 and 48 by way of passage 68.

It is seen from the foregoing that maximum extension of the section 14 is provided through use of a relatively short, lightweight hydraulic piston and cylinder assembly. The opposed pistons 46 and 48 multiply the effective movement of the section 14 and through use of simple valve controls within the hydraulic system, it is possible to adjust the boom 10 so as to position the pulley 32 at any desired location above a load to be lifted through use of a cable 28.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. Hydraulic structure for reciprocating a pair of telescoped tubes, said structure comprising a floating cylinder; a pair of opposed pistons within the cylinder; a piston rod extending outwardly from each piston respectively, one of the rods having a first passage for flow of hydraulic fluid into and out of said cylinder, said first

passage communicating with said cylinder between the pistons, and a second passage within said rod for flow of fluid into and out of the cylinder, said second passage communicating with the cylinder between one of the pistons and that end of the cylinder proximal to said one rod, said one of the pistons being mounted on said one rod; stop means within said cylinder and disposed between said pistons for limiting the movement thereof; and a by-pass line communicating with said second passage and interconnecting the opposite ends of the cylinder.

2. Hydraulic structure for reciprocating a pair of telescoped tubes, said structure comprising a pair of tubular sections; glands closing each section at one end thereof; a tubular plug joining said sections at the opposite ends thereof whereby to form an elongated cylinder, said plug being disposed centrally thereof; a pair of opposed pistons within said cylinder, said plug being between said pistons and forming a stop therefor whereby said pistons are maintained in spaced relationship; a piston rod extending outwardly from each piston respectively and through said glands, one of said rods having a first passage communicating with said cylinder between the pistons, and a second passage in said one rod for flow of fluid into and out of the cylinder, said second passage communicating with the cylinder between one of the pistons and that end of the cylinder proximal to said one rod, said one of the pistons being mounted on said one rod; and a by-pass line communicating with said second passage and interconnecting the opposite ends of the cylinder.

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