Sept. 17, 1968 R. E. BRADBURY, JR 3,401,917

HYDRAULIC CYLINDER APPARATUS

Filed July 1, 1966 5 Sheets-Sheet 1

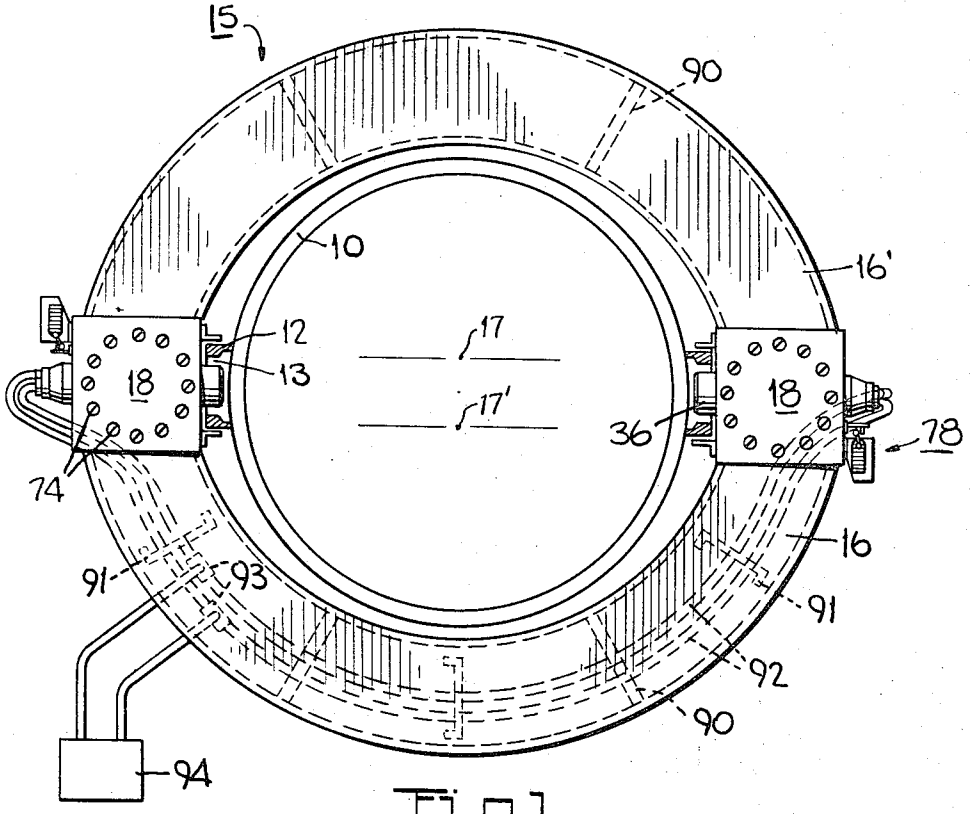


Fig. 1.

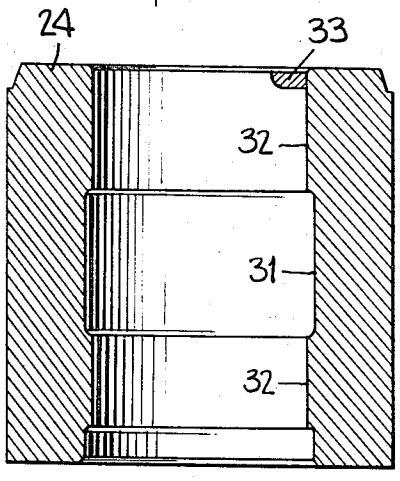


Fig. 2.

INVENTOR.
ROBERT E. BRADBURY, JR.

BY Kenyon & Kenyon

ATTORNEYS

Sept. 17, 1968 R. E. BRADBURY, JR 3,401,917

HYDRAULIC CYLINDER APPARATUS

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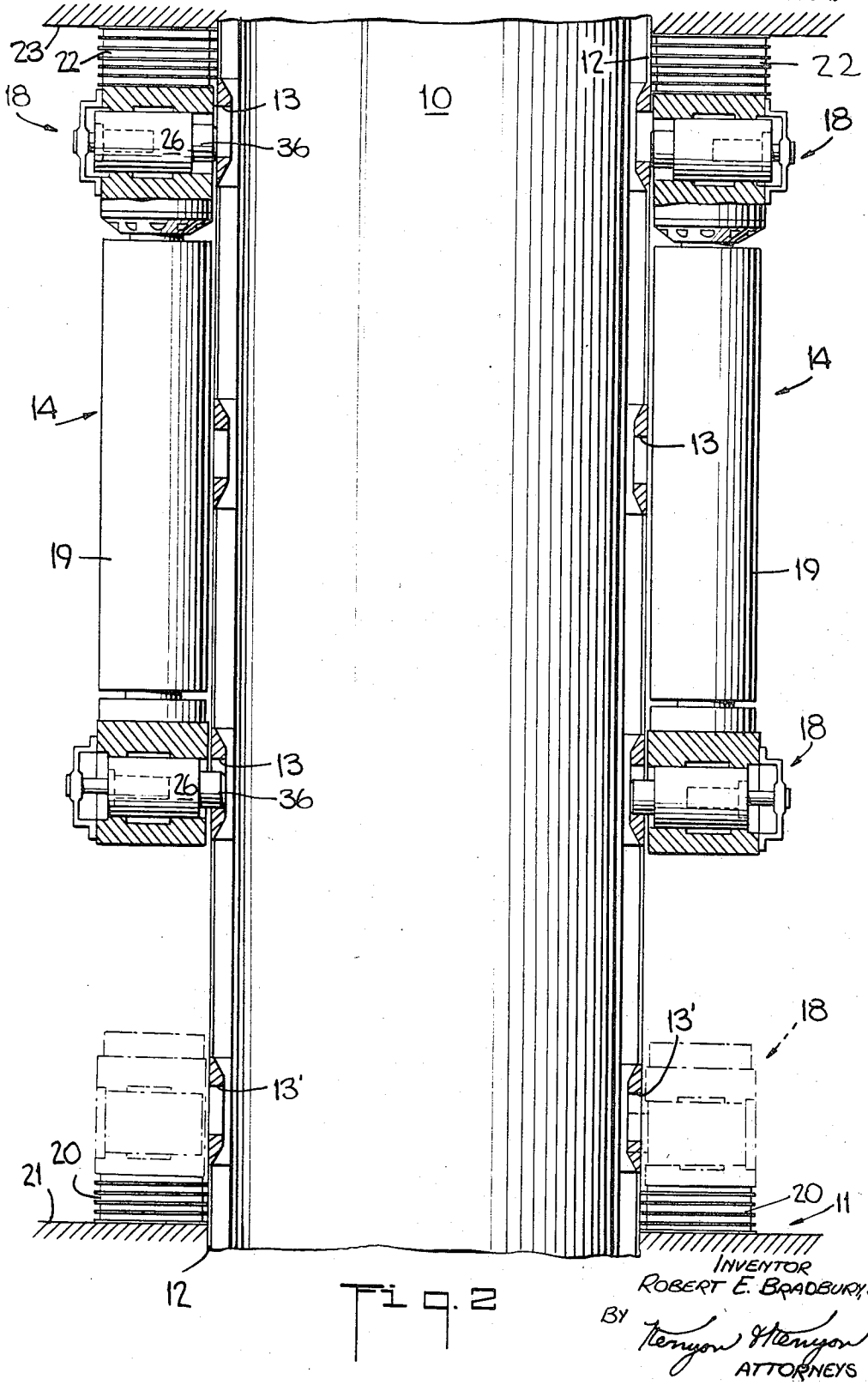


Fig. 2

INVENTOR
ROBERT E. BRADBURY, JR.
BY Kenyon & Kenyon
ATTORNEYS

Sept. 17, 1968 R. E. BRADBURY, JR 3,401,917

HYDRAULIC CYLINDER APPARATUS

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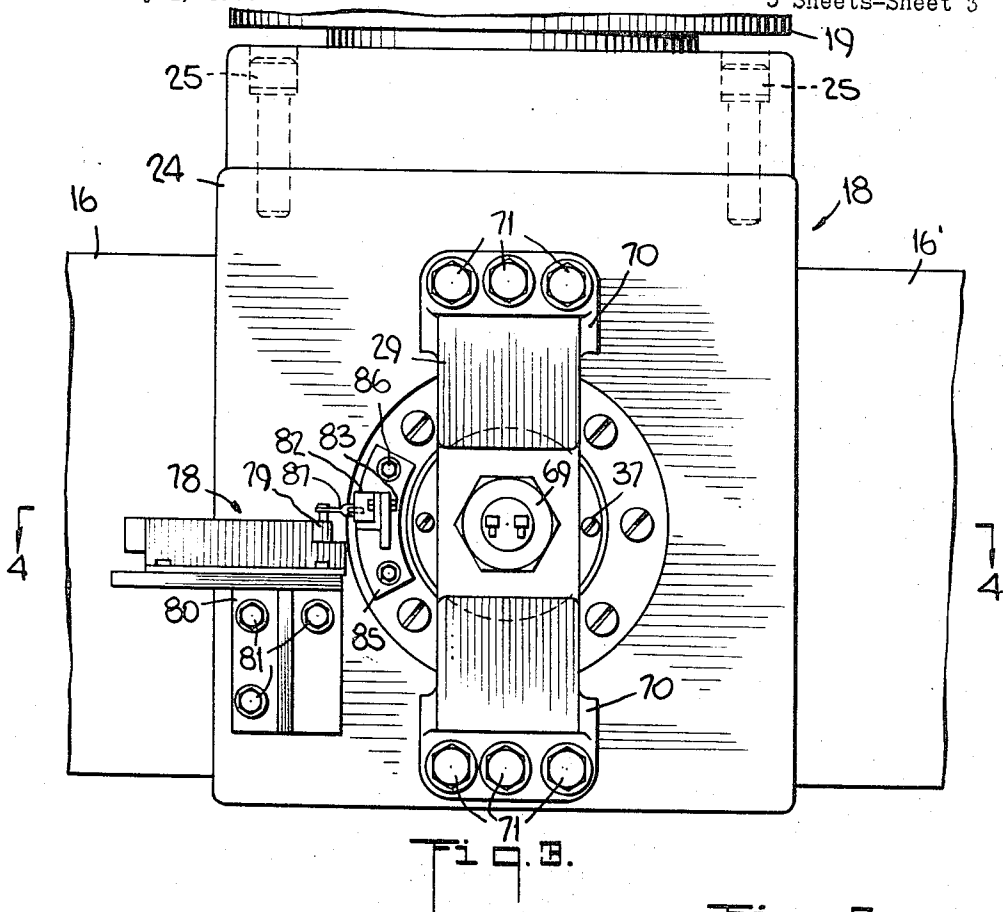


Fig. 5.

Fig. 6.

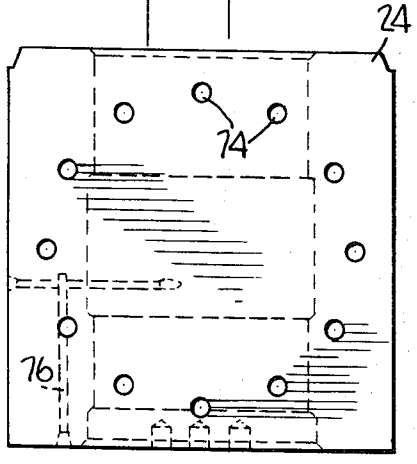
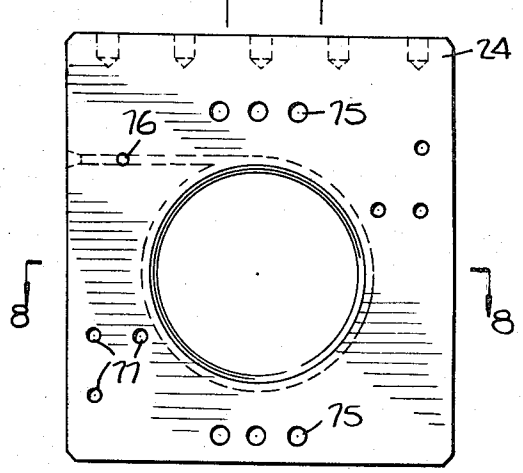


Fig. 7.



INVENTOR.
ROBERT E. BRADBURY, JR.
BY
Kenyon & Kenyon
ATTORNEYS

Sept. 17, 1968 R. E. BRADBURY, JR 3,401,917

HYDRAULIC CYLINDER APPARATUS

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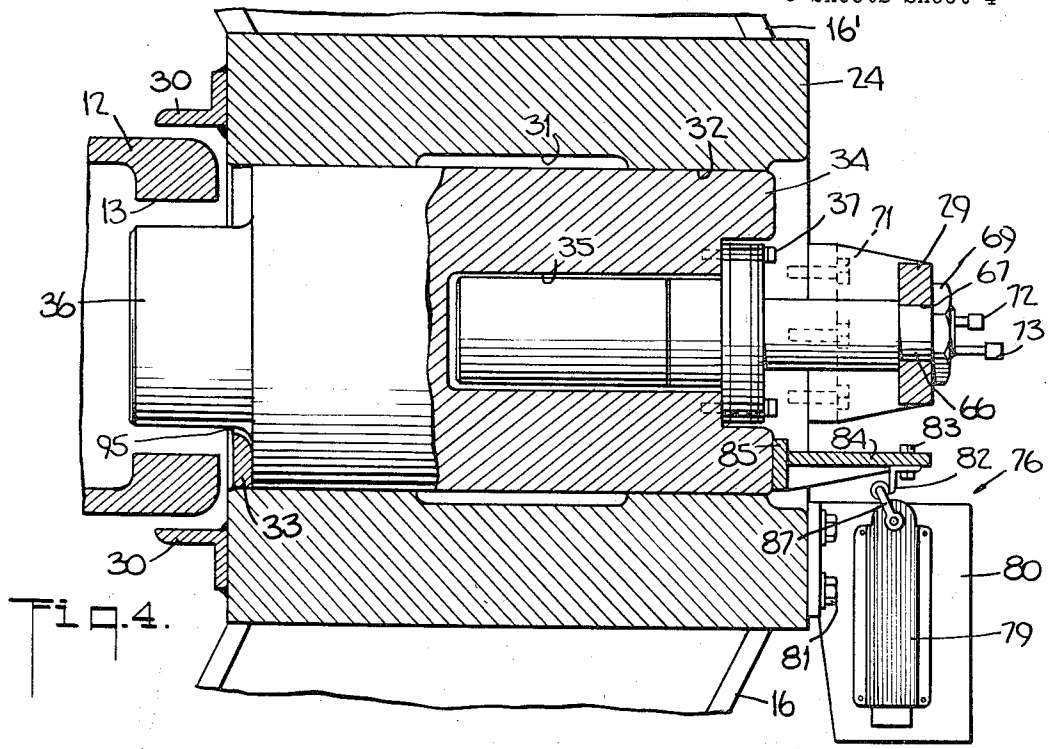


Fig. 4.

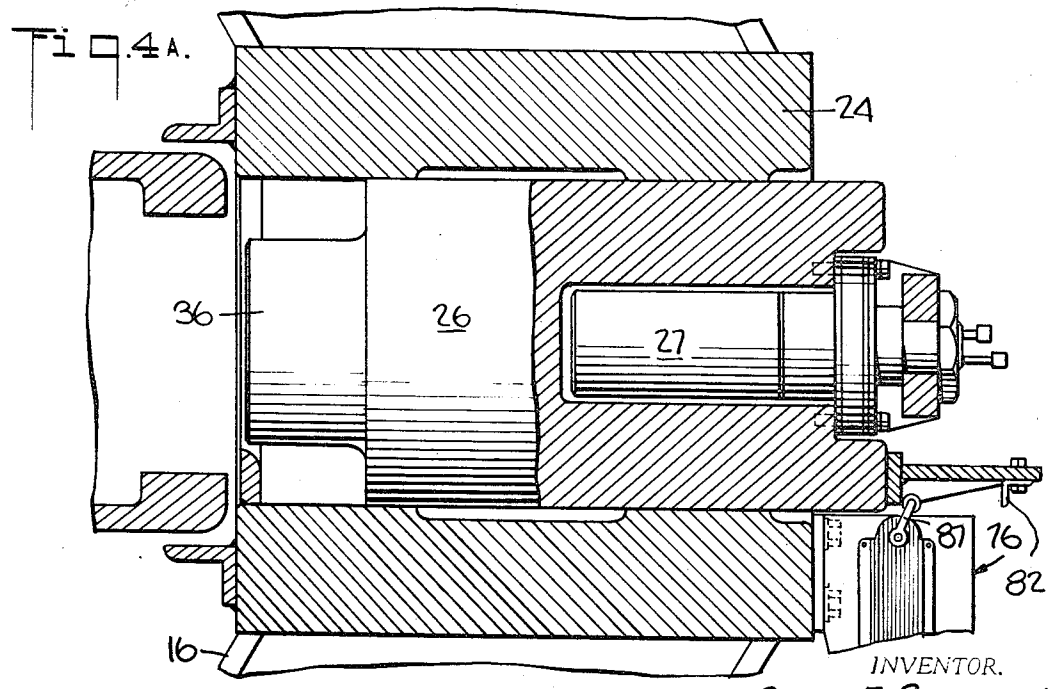


Fig. 4A.

INVENTOR.
ROBERT E. BRADBURY, JR.
BY Kenyon & Kenyon
ATTORNEYS

Sept. 17, 1968 R. E. BRADBURY, JR 3,401,917

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Fig. 5.

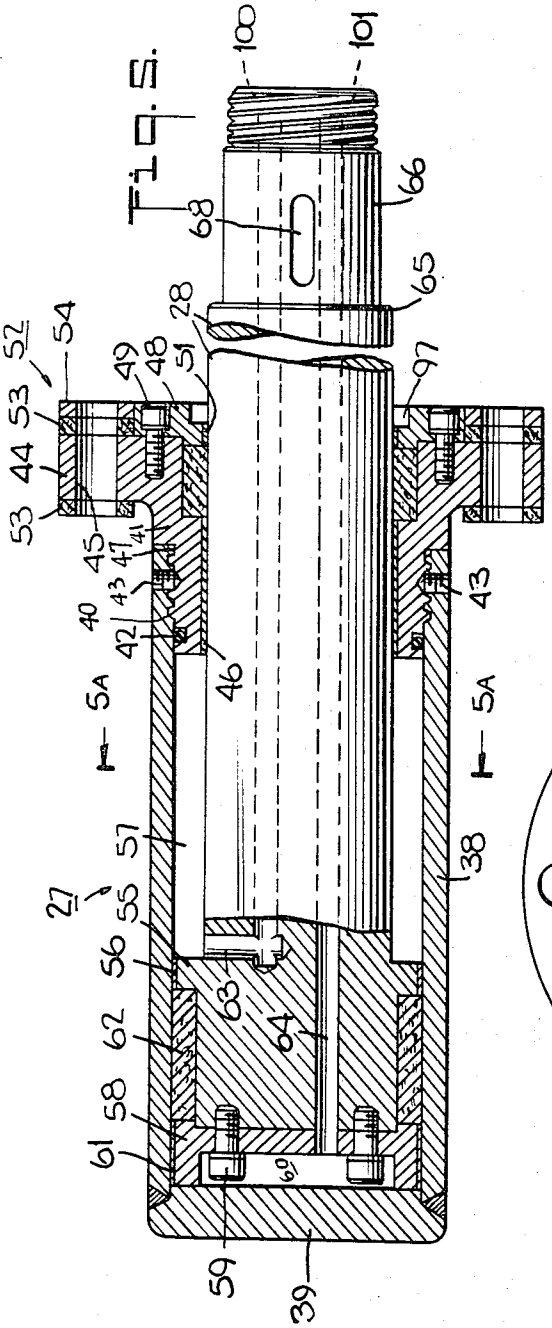


Fig. 5A.

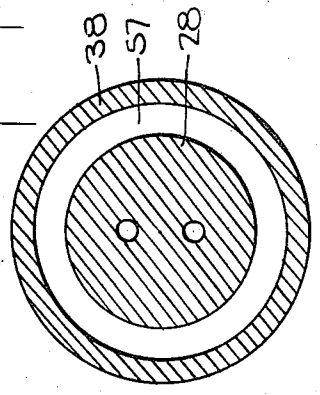
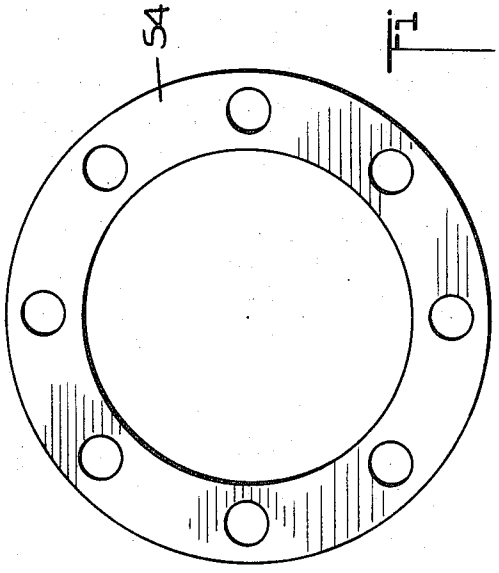


Fig. 5B.



INVENTOR.
ROBERT E. BRADBURY, JR.
BY
Kenyon & Kenyon
ATTORNEYS

United States Patent Office 3,401,917
Patented Sept. 17, 1968

3,401,917

HYDRAULIC CYLINDER APPARATUS

Robert E. Bradbury, Jr., Houston, Tex., assignor to The Offshore Company, Houston, Tex., a corporation of Delaware

Filed July 1, 1966, Ser. No. 562,400
17 Claims. (Cl. 254—106)

ABSTRACT OF THE DISCLOSURE

The hydraulic cylinder apparatus includes a pin cylinder assembly secured within the pin engaging the support leg of the marine platform and fixed to the pin housing. The pin cylinder assembly operates to reciprocate the pin relative to the pin housing within a limited amount of space. Also, the components of the apparatus are of such weight as to be handled manually.

This invention relates to a hydraulic cylinder apparatus. More particularly, this invention relates to a hydraulic cylinder apparatus for a jacking assembly. Still more particularly, this invention relates to a hydraulic cylinder apparatus for a jacking assembly of a marine platform.

Marine platforms, such as a dock or an offshore oil well drilling barge, which are buoyant and are adapted to be towed or otherwise propelled to a marine site are frequently provided with a plurality of openings through which a corresponding number of supporting legs are arranged to be extended. The supporting legs are sometimes lowered into abutment with the marine bottom by a series of jack assemblies secured to the platform, which cooperate through reciprocally mounted support pins with apertured channels on the faces of the legs to lower the legs in a series of strokes. Subsequently and in like manner, the platform is sometimes raised on the legs above the water surface. Conversely, such jack assemblies are sometimes used to lower the platform on the legs to or below the water surface, as well as to raise the legs from the marine bottom in order to permit transportation of the platform to another site.

Heretofore, jack assemblies of the afore-described type for raising and lowering the legs of a marine platform as well as the platform have utilized hydraulic cylinder and piston devices to move the load-supporting pins into and out of the apertured channels on the legs. However, the hydraulic cylinder and piston devices have been fixed to the pins in a tandem relation, i.e., one behind the other. As a result, these hydraulic devices have occupied a relatively large space within the jacking assemblies and have also had a relatively large bulk and weight. Consequently, these hydraulic devices have been unwieldy and inconvenient for manual handling during installation and servicing. In addition, the load-supporting pins and pistons of these hydraulic devices have required an additional means for securing one to the other for proper cooperation in use. This has not only added to the cost of the hydraulic devices but has also allowed a transmission of forces through the securing means in the form of bending stresses, causing premature failure of seals for example. Use of an additional securing means has also increased the difficulty of obtaining and maintaining proper alignment of the various cooperating members of hydraulic devices.

Generally, the invention provides a hydraulic cylinder apparatus containing a pin-actuating means within a load-supporting pin, which apparatus may be used in jacking assembly for raising and lowering the legs and barge of a marine platform. The pin-actuating means includes a pin cylinder assembly which is fixedly secured within the load-supporting pin, the pin being in turn reciprocally

mounted in the pin housing of the jacking assembly. It also includes a piston rod which is mounted within the pin cylinder and fixedly secured to the pin housing, and hydraulic means for reciprocally moving the pin cylinder and load-supporting pin on the piston rod. The load-supporting pin may be reciprocated by the hydraulic means into or from an apertured channel on a support leg of the marine platform so that the support leg can be moved relative to the barge generally in accordance with the jacking operation described in U.S. Patents Nos. 2,920,870 and 2,932,486 which issued on Jan. 12, 1960, and Apr. 12, 1960, respectively.

It is one object of this invention to provide a hydraulic cylinder apparatus which mounts a pin-actuating means within a load-supporting pin.

It is another object of the invention to provide a hydraulic cylinder apparatus having a pin-actuating means and a load-supporting pin which are of such weight and bulk that they can be manually handled for servicing or assembly.

It is another object of the invention to provide a hydraulic cylinder apparatus which requires a minimum amount of space for operation.

It is another object of the invention to provide a jacking assembly with a pair of opposed hydraulic cylinder apparatuses at two vertical planes to carry the weight of a barge of a marine platform as well as to support the legs of the platform.

It is another object of the invention to provide a hydraulic cylinder apparatus which is relatively inexpensive to manufacture and use.

It is another object of the invention to provide a hydraulic cylinder apparatus which is relatively easily repaired and serviced.

These and other objects and advantages of the invention will become more apparent from the following detailed description of an embodiment of the invention taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a plan view of a preferred embodiment of a jacking assembly incorporating a pair of hydraulic cylinder apparatuses disposed about a marine platform support leg according to the invention;

FIG. 2 illustrates a partially broken-away vertical view of the hydraulic cylinder apparatuses of the jacking assembly of FIG. 1;

FIG. 3 illustrates an end view of a lower hydraulic cylinder apparatus of FIG. 2;

FIG. 4 illustrates a fragmentary cross-sectional view taken on line 4—4 of FIG. 3 of the hydraulic cylinder apparatus of FIG. 3 in extended position;

FIG. 4A illustrates a view similar to FIG. 4 of the hydraulic cylinder apparatus in retracted position;

FIG. 5 illustrates a fragmentary cross-sectional view of the pin cylinder and piston rod of a preferred embodiment of the hydraulic cylinder apparatus of the invention;

FIG. 5A illustrates a cross-sectional view taken on line 5A—5A of FIG. 5;

FIG. 5B illustrates a view of a retaining ring on an end of the pin cylinder;

FIG. 6 illustrates a plan view of the pin housing for the hydraulic cylinder apparatus;

FIG. 7 illustrates a side view of the pin housing of FIG. 6; and

FIG. 8 illustrates a cross-sectional view of the pin housing taken on line 8—8 of FIG. 7.

Referring to FIGS. 1 and 2, each support leg or caisson **10** passing through the barge **11** of a marine platform has a pair of elongated channel-shaped racks **12** secured along diametrically opposed portions of the outer surface

of the leg or caisson. The web of each rack **12** has a series of vertically spaced apertures **13** which cooperate with a jacking assembly **14**, in a manner as described in the two aforesaid U.S. patents, for mounting the leg **10** relative to the barge **11**.

The jacking assembly **14** includes a pair of vertically spaced yokes **15** each of which envelopes the leg **10** as shown in FIG. 1, and each of which carries a pair of diametrically disposed hydraulic cylinder apparatuses **18** in confronting relationship to the apertured racks **12** on the leg **10**. Each yoke **15** comprises a pair of semi-circular members **16**, **16'** which have respective centers **17**, **17'** offset from each other (FIG. 1). Offsetting the centers **17**, **17'** of the semi-circular members **16**, **16'** of yokes **15**, decreases the overall dimensions of yoke **15** and thereby results in a saving in both space and cost of materials. Offsetting the centers also provides a larger area of contact between members **16** and **16'** and hydraulic cylinder apparatuses **18**, thereby providing a more satisfactory distribution of stresses between the yoke members **16**, **16'** and apparatuses **18**, and thereby also providing increased surfaces for the securing, as by welding, of members **16**, **16'** to apparatuses **18**. Each yoke member **16**, **16'** is square in cross-section and comprises a plurality of plates secured to one another as by welding. Members **16**, **16'** further comprise a plurality of spaced, internal stiffeners **90**, and member **16** includes a plurality of spaced brackets **91** for holding hydraulic piping **92** in place within yoke **15**. The hydraulic piping **92** extends from the hydraulic cylinder apparatuses **18** through member **16** to T-connectors **93**, and then to a means **94** for controlling the flow of hydraulic fluid into piping **92** and the return of fluid therefrom.

Yokes **15** are operatively connected to each other by a pair of telescoping hydraulic side jacks **19**, each of which is secured between and to a pair of vertically aligned hydraulic cylinder apparatuses **18**. Side jacks **19** and hydraulic cylinder apparatuses **18** are preferably actuated and controlled through a control system as disclosed in copending application of Robert E. Bradbury, Jr. for Jacking Apparatus and Controls, filed on even date herewith. Upon actuation, side jacks **19** move the yokes **15** and consequently the hydraulic cylinder apparatuses **18**, in a stepwise fashion vertically along the racks **12** on the leg **10** to raise or lower the leg **10** through the barge **11**, or to raise or lower the barge **11** on the leg **10**.

Barge **11** is provided with a pair of shock absorbers **20** on its deck **21** for abutting the lower hydraulic cylinder apparatuses **18** when they are in the position shown in dashed-lines in FIG. 2, as well as a pair of shock absorbers **22** mounted at a point **23** which is fixed in position relative to deck **21** for abutting the upper hydraulic cylinder apparatuses **18**. Relative movements of barge **11** with respect to leg **10** are obtained generally as described in the aforesaid two U.S. patents.

Referring to FIGS. 3 and 4, each hydraulic cylinder apparatus **18** includes a pin housing **24** secured, as by bolts **25**, to a side jack **19** and, as by welding, to members **16**, **16'** of yoke **15**. Each hydraulic cylinder apparatus **18** further includes a load-supporting or load-engaging pin **26** slidably mounted concentrically within the pin housing **24**, a pin cylinder assembly **27** fixedly mounted concentrically within a load-supporting pin **26**, and a piston rod **28** fixedly mounted by a bracket **29** to the pin housing **24**. To provide preferable conditions of bearing stress distribution between the racks **12** and the load-supporting pins, each hydraulic cylinder apparatus **18** is secured to a side jack **19** at a slight downward angle to a horizontal plane passing through the leg **10**.

A pair of fixed angle guide brackets **30** are affixed to one end of each pin housing **24** and disposed about an apertured channel-shaped rack **12** on leg **10** for guiding the hydraulic cylinder apparatus **18** along the apertured member **12** during operation of the jacking assembly **14**. In addition, each pin housing **24** is formed with a central bore **31** having a pair of spaced annular bearing lands **32** for slidably guiding pin **26** concentrically therein. Further, an arcuate shaped rotation keeper **33** is secured, as by welding, in the forward end of the bore **31** near the guide bracket end of pin housing **24**, to prevent outward movement of pin **26** and to maintain proper alignment between pin **26** and a limit switch assembly **78** more fully described below. Keeper **33** also serves to limit rotational movement of pin **26** and to limit sideways movement of pin **26** to the extent of the clearance **95** between pin **26** and keeper **33**.

The load-supporting pin **26** is formed with an enlarged body portion **34** slidably disposed in the bearing lands **32** having a central counterbore **35** at one end and a reduced stub shaft portion **36** of preferably square or rectangular cross-sectional shape at the other end. Pin **26** is preferably of tempered steel. The stub shaft portion **36** of pin **26** is centrally located on the pin to project into an aperture **13** of channel-shaped rack **12** on leg **10** when pin **26** is extended. The apertures **13** of rack **12** are of greater dimensions than the stub shaft portion **36** of pin **26** and provide clearances for the stub shaft portion **36** during movement of pin **26**. However, when in load-supporting position, the stub shaft portion **36** will be in contact with the upper or lower side wall of the aperture **13**.

Referring to FIGS. 3, 4, 5, 5A and 5B, pin cylinder assemby **27** is fixedly mounted, as by bolts **37**, to one end of pin **26** for concentric disposition within bore **35** (FIG. 4). The pin cylinder assembly **27** includes a cylindrical barrel **38** (FIG. 5) which is closed at one end by a cap **39** secured thereto as by welding and which is provided at the other end with internal threading **40** to threadably engage an externally threaded mounting collar **41**. An O-ring seal **42** is interposed between barrel **38** and mounting collar **41** to seal the mating surfaces against a flow of fluid. In addition, a pair of lock screws **43** are mounted in barrel **38** to thread into mounting collar **41** to prevent loosening of the collar **41** from the barrel **38**.

The mounting collar **41** includes a radial flange portion **44** which is provided with a series of holes **45** for the passage of the bolts **37**, and an internal annular bearing surface **46** for the piston **28** concentric to the external threads **47**. Bearing surface **46** is formed, for example, of a 1/16 inch brass bearing sleeve. The flange **44** has an annular retaining ring **48** secured to the exterior face of the flange as by circumferentially spaced bolts **49** for retaining a seal packing **50** between the flange portion **44** of collar **41** and the piston rod **28** to prevent a flow of dirt, fluid or corrosive material between the pin cylinder assembly **27** and piston rod **28**. Retaining ring **48** is provided with a bearing surface **51** such as a 1/16 inch brass bearing sleeve for slidably mounting the pin **28** therein, and a wiper-scraper member **97**.

A shock absorber assembly **52** is positioned about the flange portion **44** of mounting collar **41** to absorb shock loading between the pin cylinder assembly **27** and pin **26**, and to provide a controlled amount of freedom for piston rod **28** in the event of a slight misalignment of piston rod **28** with respect to pin cylinder assembly **27**. The shock absorber assembly **52** includes a annular pad **53** of resilient material on each side of flange **44**, and an annular metal retaining ring **54**. Ring **54** and pads **53** are apertured in conformity (FIG. 5B) with flange **44** to permit passage of bolts **37** therethrough for securing the shock absorber assembly **52** in position.

Piston rod **28** (FIGS. 5 and 5A) is slidably mounted within the bearing surfaces **46**, **51** of the cylinder pin assembly **27** in spaced relation to the barrel **38**. The piston rod **28** has an annular land **55** near its forward end, which is spaced from the mounting collar **41**. The land **55** has a bearing surface **56** formed for example of a 1/16 inch brass sleeve, which slidably engages the interior wall of the barrel **38** so as to define a chamber **57** between the cylinder pin assembly **27** and the piston rod **28**. In addition,

a cup-shaped member **58** is secured, as by bolts **59**, to the end of the piston rod **28** to form a chamber **60** with the cap **39** which is coaxial with the piston rod **28**. Cup-shaped member **58** is provided with a circumferential bearing surface **61**, for example a 1/16 inch brass sleeve, which slides on the interior wall of the barrel **38**. Cup-shaped member **58** and land **55** on the piston rod **28** retain a seal **62** between the barrel **38** and piston rod **28** to prevent flow of fluid between chambers **57** and **60**. Seal **62** may be a chevron packing, piston rings or an equivalent sealing means.

Piston rod **28** is further formed with a pair of internal passages **63**, **64**. One of the passages **63** communicates between chamber **57** and a port **100** at the external end of the piston rod **28**, and the other passage **64** communicates between chamber **60** and port **101** at the end of the piston rod.

Referring to FIGS. 3, 4 and 5, the external end of the piston rod **28** is formed with a shoulder portion **65**, and a reduced cylindrical portion **66** to fit within an aperture **67** of mounting bracket **29**. The reduced portion **66** is provided with a slotted keyway **68** which receives a suitable key (not shown) on mounting bracket **29** for aligning piston rod **28** in pin cylinder assembly **27**. The reduced portion **66** is also threaded at the end to receive a threaded nut **69** which abuts bracket **29** to fixedly secure piston rod **28** in place.

The mounting bracket **29** is generally U-shaped with a pair of flanged legs **70** which are secured, as by bolts **71**, to the pin housing **24** to maintain piston rod **28** and pin housing **24** in a fixed relation.

A pair of suitable hydraulic fittings **72**, **73** are fitted as by threading within the ports **100**, **101** at the end of the piston rod **28** and to the hydraulic piping **92** to provide for the escape from and entry of hydraulic fluid into the chambers **57**, **60** from hydraulic control means **94**. A hydraulic control system as described in the aforementioned copending patent application is preferably used with the apparatus of this invention.

Referring to FIGS. 6, 7 and 8, pin housing **24** is preferably formed of one piece of metal with a plurality of circumferentially spaced threaded holes **74** in its top surface to receive the bolts **25** securing the hydraulic cylinder apparatus **18** to the side jacks **19**, and with two sets of linearly aligned threaded holes **75** in a side surface to receive the bolts **71** securing the mounting bracket **29**. In addition, the pin housing **24** is provided with a fluid port means **76** for introducing lubricating means such as grease between the pin housing **24** and pin **26**. Further, the side surface is provided with a set of threaded holes **77** for receiving a limit switch assembly **78**, which provides a means for indicating when pin **26** of the hydraulic cylinder apparatus **18** is fully expanded, fully retracted or in an intermediate position.

Referring to FIGS. 3 and 4, limit switch assembly **78** includes a limit switch **79**, for example, a National Acme Limit Switch SL4–N–W with D–1260 lever, which is mounted on a bracket **80** secured, as by bolts **81**, to the pin housing **24** to cooperate with a lug **82** mounted, as by a bolt **83**, to a bracket **84** having a base **85** secured to the pin **26**, as by bolts **86**. Lever **87**, which has a roller at its end, is positioned in the path of the leg **84** as well as the base **85** to be moved into a series of angular positions relative to the limit switch **79** which correspond to particular positions of expansion and retraction of the pin **26** relative to the leg **10**.

It will be noted that welding is generally not required to secure the members of the pin cylinder assembly **27** to one another, or to secure the pin cylinder assembly **27** to pin **26**. It is one feature of this embodiment of this invention that it is possible to minimize the use of welding, if so desired, and thereby avoid undesirable side effects of welding such as thermal distortion of components, which sometimes results in prior hydraulic cylinder assemblies.

Considering now examples of operation of this embodiment of the invention, in order to lower barge **11** on leg **10** when the leg is supported on the marine bottom with the pins **26** of the lower pair of hydraulic cylinder apparatuses **18** positioned in respective apertures **13** of the racks **12** on leg **10** and the upper pair of hydraulic cylinder apparatuses **18** abutting the shock absorbers **22** at the fixed point **23**, the upper pins **26** are first inserted into respective apertures **13** in the rack **12**. Thereafter, with the load of the barge **11** supported on the upper pins, the lower pins are retracted from the racks. Thereafter, the telescoping jacks **19** are expanded from an initial closed position to a fully opened position to increase the spacing between the yokes **15**, for example, from an initial spacing of about 12 feet to a spacing of about 18 feet. When the retracted lower pins **26** are aligned with a lower set of apertures **13'** in the racks **12** (FIG. 2), the pins **26** are inserted into the racks and positioned in load-supporting relation against the lower side wall of the apertures **13'**. Next, the upper pins **26** are retracted and the jacks **19** telescoped together to lower the barge **11** on the leg **10**. Subsequent lowering of the barge **11** is carried out by repeating these steps.

Referring to FIGS. 4, 4A and 5, each hydraulic cylinder apparatus **18** is operated in the following manner. With the pin **26** retracted out of a rack **12** (FIGS. 4A and 5) a quantity of pressurized hydraulic fluid is introduced into chamber **60** through port **101** and hydraulic piping **92**. After chamber **60** is filled with fluid, further introduction of fluid causes the pin cylinder assembly **27** to move along the piston rod **28** while any fluid in chamber **57** is expelled through port **100** as chamber **57** is reduced in size. Since the pin cylinder assembly **27** is fixed to the pin **26**, pin **26** also moves relative to the piston rod **28** so that the stub shaft portion **26** of pin **26** enters an aperture **13** of the rack **12**. Fluid is continuously introduced under pressure until the stub portion **36** of pin **26** is fully inserted in the rack **12** as indicated by contact of the pin **26** with the keeper **33** as well as by a control signal corresponding to a set position of the lever **87** of the limit switch **79**.

In order to retract the pin, **26**, hydraulic fluid is introduced under pressure into the reduced chamber **57** through port **100** and hydraulic piping **92** to move the pin cylinder assembly **27** on piston rod **28** so as to reduce chamber **60** while expelling fluid from chamber **60** through port **101**. As a result, the pin **26** is retracted from the rack **12**.

This embodiment of the invention provides a hydraulic cylinder apparatus of reduced bulk and weight which takes up a limited space within a jacking assembly of a marine platform. The reciprocating pin of the apparatus is sufficiently sturdy so as to carry the component of weight of a leg or barge, depending on the sequence of jacking operations, when only two such pins are used to support the leg or barge. In addition, the apparatus is adapted to be handled manually for service, installation and repair. For example, when it is desired to replace either packing **50**, packing **62** or O-ring **42**, first nut **69** and then bracket **29** is removed. Bolts **37** are then removed to permit disassembly of annular pads **53** and annular retaining ring **54**. Then cylinder **28** is removed and bolts **49** and mounting collar **41** are disassembled. The person servicing the assembly then has access to O-ring **42** as well as to packing **50** and packing **62**. During the described sequence of disassembly, not only can each of the members removed be handled manually by one person, but, in addition, the weight of the members being disassembled does not have to be supported by the person disassembling the appartus until the member is actually being detached and removed.

Although this invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example, and that changes may be made in the details of

construction and arrangement of parts without departing from the spirit and scope of the invention. For example, although the invention has been described with reference to a barge having tubular support legs, it is apparent that it may also be used with legs having other cross-sections, such as with legs having a rectangular or triangular cross-section and with lattice-type legs. Also, although the invention has been described with reference to jacking assemblies which cooperate with apertured channel-like members on the support legs and which have yokes which envelope the support legs, it is apparent that the hydraulic cylinder apparatus of this invention may also be used with other types of marine jacking assemblies as well as in other environments.

What is claimed is:

1. A hydraulic cylinder apparatus for engaging a support leg of a platform having associated therewith spaced vertically aligned apertures comprising

(1) a pin housing,

(2) a load-engaging pin slidably mounted in said pin housing for engagement within one of the apertures associated with the support leg, and

(3) means mounted within said load-engaging pin and fixedly secured to said pin housing for reciprocating said pin in said pin housing relative to the apertures associated with the support leg.

2. A hydraulic cylinder apparatus as set forth in claim **1** wherein said means is mounted concentrically within said pin.

3. A hydraulic cylinder apparatus as set forth in claim **1** wherein said means includes a pin cylinder assembly fixedly secured in concentric relation in one end of said pin and a piston rod slidably mounted concentrically in said pin cylinder assembly, said piston rod being fixedly secured to said pin housing whereby said pin cylinder assembly is moveable relative to said piston rod.

4. A hydraulic cylinder apparatus for a support leg of a marine platform having a spaced vertically aligned aperture associated therewith comprising

(1) a pin housing,

(2) a load-engaging pin which is slidably mounted on said pin housing and which has a stub shaft portion extending from one end thereof for engagement in one of the apertures associated with the support leg,

(3) a means mounted concentrically within said load-supporting pin and fixedly secured to said pin housing for reciprocating said pin in said pin housing, said means including

(a) a pin cylinder assembly fixedly secured in concentric relation within the other end of said load-supporting pin in coaxial alignment with said stub shaft portion, and

(b) a piston rod slidably mounted concentrically in said pin cylinder assembly and fixedly secured to said pin housing,

whereby said pin cylinder assembly is movable relative to said piston rod.

5. A hydraulic cylinder apparatus as set forth in claim **4** wherein said stub shaft portion is square-shaped in cross section.

6. A hydraulic cylinder apparatus as set forth in claim **4** wherein said pin cylinder assembly and said piston rod define a first chamber radially therebetween and a second chamber coaxially therebetween for receiving pressurized fluid therein.

7. A hydraulic cylinder apparatus as set forth in claim **6** wherein said piston rod includes a pair of internal fluid passages each of which communicates between one of the chambers and the exterior of said piston rod for passing pressurized fluid therethrough.

8. A hydraulic cylinder apparatus as set forth in claim **4** which further includes a shock absorber assembly between said pin and said pin cylinder assembly at said other end of said pin for absorbing shock therebetween.

9. A hydraulic cylinder apparatus as set forth in claim **4** which further comprises a plurality of seals between said pin cylinder assembly and said piston rod for preventing passage of fluid therebetween.

10. A hydraulic cylinder apparatus as set forth in claim **4** which further includes a U-shaped mounting bracket secured to said pin housing and said piston rod.

11. A hydraulic cylinder apparatus for a support leg of a marine platform having a spaced vertically aligned apertures associated therewith comprising

(1) a pin housing,

(2) a load-supporting pin which is slidably mounted in said pin housing and which has a load-supporting portion extending from one end thereof for engagement in one of the apertures associated with the support leg,

(3) means mounted within said load-supporting pin and fixedly secured to said pin housing for reciprocating said pin in said pin housing, said means including

(a) a pin cylinder assembly fixedly secured within the other end of said load-supporting pin,

(b) a piston rod slidably mounted on said pin cylinder assembly and fixedly secured to said pin housing, and cooperating with said pin cylinder assembly to define a first chamber and a second chamber therebetween for receiving pressurized fluid therein, and having a pair of internal fluid passages each of which communicates between one of the chamber and the exterior of said piston rod for passing pressurized fluid therethrough,

(4) a shock absorber assembly between said pin and said pin cylinder assembly at said other end of said pin for absorbing shock therebetween, and

(5) a plurality of seals between said pin cylinder assembly and said piston rod for preventing passage of fluid therebetween.

12. A hydraulic cylinder apparatus as set forth in claim **11** further comprising a limit switch assembly having a limit switch secured to said pin housing and a lug secured to said pin, said limit switch including a lever mounted in the path of movement of said lug for indicating the position of said pin during movement thereof.

13. A jacking assembly for a support leg of a marine platform said support leg having associated therewith spaced vertically aligned apertures comprising

(1) a pair of vertically spaced yokes,

(2) a pair of hydraulic cylinder apparatuses mounted in diametric opposition on each of said yokes, each of said apparatuses including a pin housing, a load-supporting pin slidably mounted in said pin housing for insertion in the apertures associated with said support leg, and means mounted within said pin and fixedly secured to said pin housing for reciprocating said pin in said pin housing, and

(3) a pair of vertically disposed telescoping jacks each of said jacks being connected to respective said hydraulic cylinder apparatuses of each of said yokes for moving said yokes relative to each other whereby said jacking assembly is movable along the support leg.

14. A jacking assembly as set forth in claim **13** wherein each of said yokes is formed of a pair of semi-circular members, each of said semi-circular members having a center which is offset from the center of the other of said semi-circular members.

15. A jacking assembly as set forth in claim **13** wherein each of said apparatus is mounted at a slight downward angle relative to a horizontal plane passing through the support leg.

16. A jacking assembly as set forth in claim **13** wherein said means is mounted concentrically within said pin.

17. A jacking assembly for a support leg of a marine platform said support leg having associated therewith spaced vertically aligned apertures comprising

(1) a pair of vertically spaced yokes,

(2) a pair of hydraulic cylinder apparatuses mounted in diametric opposition on each of said yokes, each of said apparatuses including

(a) a pin housing,

(b) a load-supporting pin which is slidably mounted in said pin housing and which has a load-supporting portion extending from one end thereof for insertion in the apertures associated with said support leg,

(c) means mounted within said load-supporting pin and fixedly secured to said pin housing for reciprocating said pin in said pin housing, said means including

(i) a pin cylinder assembly fixedly secured within the other end of said load-supporting pin,

(ii) a piston rod slidably mounted on said pin cylinder assembly and fixedly secured to said pin housing, and cooperating with said pin cylinder assembly to define a first chamber and a second chamber therebetween for receiving pressurized fluid therein, and having a pair of internal fluid passages each of which communicates between one of the chambers and the exterior of said piston rod for passing pressurized fluid therethrough,

(d) a shock absorber assembly between said pin and said pin cylinder assembly for absorbing shock therebetween, and

(e) a plurality of seals between said pin cylinder assembly and said piston rod for preventing passage of fluid therebetween, and

(3) a pair of vertically disposed telescoping jacks each of said jacks being connected to respective said hydraulic cylinder apparatuses of each of said yokes for moving said yokes relative to each other whereby said jacking assembly is movable along the support leg.

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OTHELL M. SIMPSON, *Primary Examiner.*