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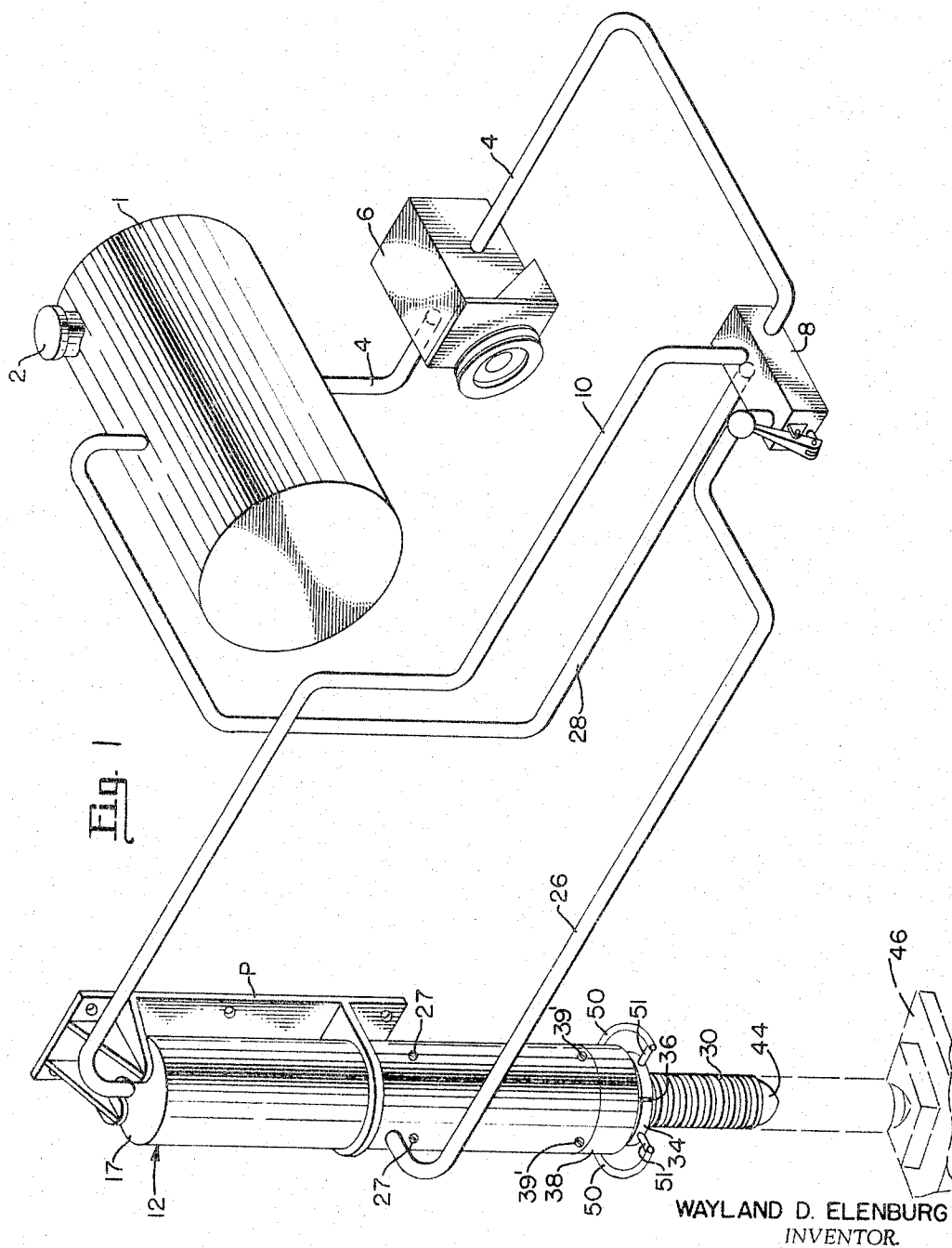
W. D. ELENBURG

3,321,182

COMBINATION HYDRAULIC JACK AND LOAD HOLDING MECHANISM

Filed March 26, 1965

2 Sheets-Sheet 1



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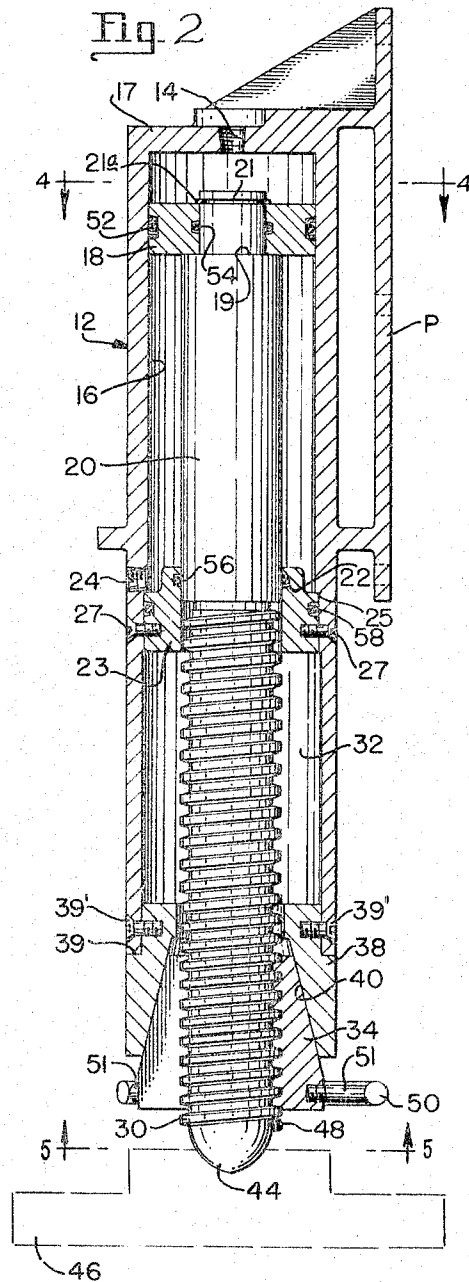
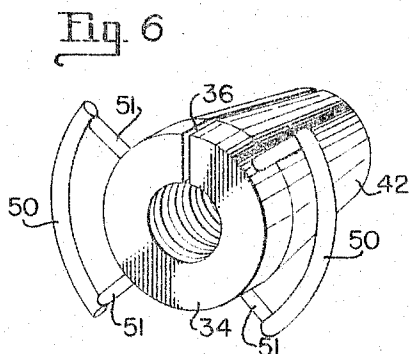
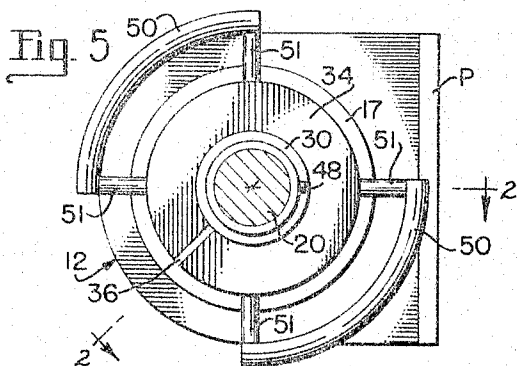
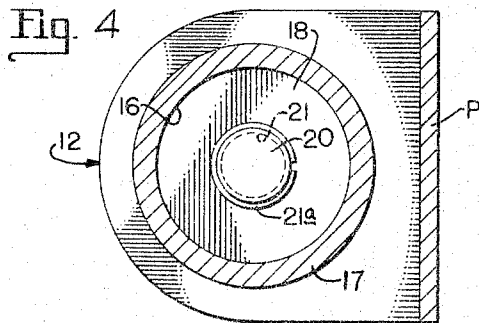
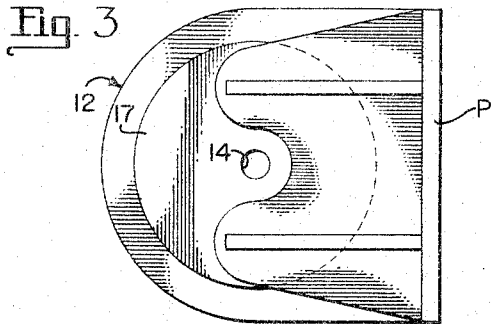
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2 Sheets-Sheet 2



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3,321,182

COMBINATION HYDRAULIC JACK AND LOAD HOLDING MECHANISM

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This invention relates to improvements in jacks and more particularly to a hydraulic jack for holding a heavy load with safety, and without strain being exerted on the packing and rings of the hydraulic jack.

Various hydraulic jacks have been proposed heretofore, but these for the most part were undesirable for holding a heavy load over an extended period of time, as the failure of a hose, valve, or other hydraulic mechanism might render the hydraulic jack ineffective, and if the jack was supporting a corner of a drilling rig or the like, the drilling rig might become unbalanced and fall.

The present jack is so constructed that the load may be lifted hydraulically and, when lifted to the desired height, a screw member and companion unit may be made to engage the body of the jack to support the load, thereby enabling the hydraulic pressure on the hydraulic system and jack to be released.

Various hydraulic jacks for lifting and holding loads for a short time have been proposed heretofore and various screw jacks for lifting and holding loads have been proposed heretofore; however, due to the labor usually entailed in jacking up a load with a screw jack, screw jacks are usually not desirable. However, the jacking up of the load with a hydraulic jack, either by manual operation or by a mechanical operated pump, enables the load to be readily jacked up to the desired height. It is then usually necessary to "block" the load with cribbing, as a safety measure, so as to obviate damage in case of a failure of the hydraulic system to support the load.

An object of this invention is to provide a combination hydraulic lifting mechanism and a mechanical holding mechanism to hold a load without the danger of failure of the hydraulic system.

Another object of the invention is to provide a jacking and holding mechanism whereby a load may be raised hydraulically and retrogression of the hydraulic plunger is obviated by mechanical means.

Still another object of the invention is to provide a hydraulic jacking and holding system which embodies a hydraulic ram for lifting a load, with a threaded portion thereon to receive a nut to hold the load without strain on the hydraulic system.

Still a further object of the invention is to provide a unitary hydraulic jack with a screw thereon for lifting a load hydraulically and for holding the load mechanically.

Still another object of the invention is to provide a combination hydraulic jack with a screw thereon, the housing of which is made in a unitary casing and which will receive a unitary screw and hydraulic plunger thereinto a substantial distance when in one position, and which will extend the screw outwardly therefrom hydraulically when in another position.

Still another object of the invention is to provide a combination hydraulic lifting jack and a screw and wedge holding mechanism within a housing, with a screwthreaded nut of the screw mechanism being conical and longitudinally split to complementarily seat within a conical recess of the housing so as to hold the screw against movement relative to the housing.

Still another object of the invention is to provide a

combination hydraulic jack and screw member which screw member has a free spinning nut threadably engaging the screw member and means associated with the nut to enable the ready spinning of the nut into seating relation with the housing.

With these objects in view and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings in which like reference characters designate like parts in the several views thereof, in which:

FIG. 1 is a perspective view of a hydraulic system, embodying a hydraulic reservoir, a hydraulic pump, a hydraulic valve, and a combination hydraulic jack and a screw holding mechanism;

FIG. 2 is a longitudinal, sectional view through the combination hydraulic jack and screw holding mechanism on an enlarged scale, with certain parts being shown in elevation;

FIG. 3 is a top plan view of the combination hydraulic jack and screw holding mechanism, showing the mounting bracket therefor;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 2, looking in the direction indicated by the arrows;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 2, looking in the direction indicated by the arrows; and

FIG. 6 is a perspective view of the holding nut removed from the screw-threaded element, showing a longitudinal slit in a side thereof, and showing a leverage arrangement associated with the holding nut.

With more detailed reference to the drawings, the numeral 1 designates a hydraulic fluid reservoir having a fill cap 2 in the upper side thereof and with an outlet pipe 4 leading from the bottom thereof, a hydraulic pressure pump 6 is within the hydraulic fluid conduit 4, which hydraulic fluid conduit connects with a conventional four-way, distributor valve 8, which may direct hydraulic fluid through hydraulic conduit 10 into the upper end of the hydraulic jack and screw holding mechanism generally designated by the numeral 12, through an inlet opening 14 in the upper end thereof. The hydraulic jack 12 and screw holding mechanism has a cylinder 16, which cylinder has a head 17 on an end thereof, in which cylinder is mounted a piston 18 on plunger 20, which plunger extends through the piston 18 which piston is centrally apertured. The plunger 20 has a shoulder 19 thereon, against which piston 18 seats. The end of plunger 20 has a groove 21 formed therein adjacent the face of piston 18 opposite shoulder 19, in which groove a clip ring 21a is fitted to retain the piston 18 against longitudinal movement with respect to plunger 20. The other end of plunger 20 extends through a stuffing box 22 in housing 32 in the lower end of cylinder 16, which stuffing box forms a seal with piston rod 20. The cylinder 16 has a fluid passage 24 at the opposite end thereof from inlet opening 14 to which passage 24 a hydraulic fluid conduit 26 is connected, the conduit 26 also connects to a port in four-way, distributor valve 8.

Upon application of hydraulic pressure, by pump 6, through conduit 4 and conduit 10, the hydraulic fluid is directed to the upper face of piston 18 to move the piston downward within cylinder 16, with the hydraulic fluid exhausting out through passage 24 and into conduit 26 and through four-way, distributor valve 8 to return to reservoir 1 through hydraulic return conduit 28. The lower end of the hydraulic plunger 20 is screwthreaded, as indicated at 30, and extends through housing 32 and through a conical nut 34, which nut has a longitudinal split 36 in a side thereof to enable the conical nut to be pressed inward in tight relation with threads 30 on plunger 20.

The lower end of the housing 32 has a bushing 38 fitted therein and secured thereto by screws 39' which bushing

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38 has a conical recess 40 in the lower side thereof which recess is complementary to the conical surface 42 of nut 34. However, the conical nut 34 is truncated and does not extend to the lower end of conical recess 40; therefore, a seating and wedging action will take place upon the release of hydraulic pressure from the upper face of piston 18 when a load is imposed on the housing, by hydraulic jack and screws holding mechanism 12.

The plunger 20 preferably has a rounded nose 44 on the lower end thereof to complementally seat in a bed plate 46, which bed plate has a complementary recess formed therein. A screw retention member 48 is positioned on the lower threaded end 30 of plunger 20 so as to retain the nut 34 on the screwthreaded end of plunger 20. Parti-cylindrical handle members 50 are secured to radially disposed bolts 51 on the nut 34 to enable the nut to be spun up into engagement with the conical recess 40 in bushing 38 which is positioned on the lower end of housing 32, when it is desired to transfer the load from the hydraulic jack to the screw 30 to be supported thereby to enable the release of hydraulic pressure from hydraulic fluid conduit 10.

To release the strain from the screw, the pump 6 may be started and pressure applied to the upper face of piston 18 through hydraulic fluid conduits 4 and 10, which will urge plunger 20 downward, which will release nut 34 from within conical recess 40, then the nut 34 can be spun downward on screw 30 to enable the plunger 20 to be moved from the dashed outline position as indicated in FIG. 1, to the position indicated in FIG. 3. Then by releasing pressure through four-way, distributor valve 8 from the upper end of cylinder 16 and diverting the pressure into the lower end of cylinder 16 through hydraulic fluid conduit 26 the piston 18 may be retracted to the upper end of the cylinder as indicated in FIG. 3.

While the hydraulic jack mechanism has been shown in some detail, as having O-ring sealing elements 52 intermediate the piston 8 and cylinder 16, and an O-ring 54 intermediate the upper end of plunger 20 and the piston 18, it is to be understood that other forms of conventional sealing elements may be used.

The cylinder head 23 is fitted in shouldered relation, as indicated at 25, with the cylinder 16, so the shoulder 25 will position the cylinder head 23 at the correct position with the screws 27 retaining the cylinder head 23 against outward movement. The stuffing box 22 has O-rings 56 in sealing relation with plunger 20, so as to retain hydraulic fluid within cylinder 16. An O-ring 58 surrounds cylinder head 23 and forms a seal between the cylinder head and the cylinder 16.

The bushing 38 is turned to present a shoulder 39 thereon, so the load is transferred from attachment plate P, which forms a mounting bracket, on the hydraulic jack and screw holding mechanism to the bushing 38.

It is to be appreciated that when the load is to be supported over a period of time, the load is raised to the desired height by the hydraulic jack, whereupon the nut 34 is spun upward on screwthreaded member 30 until the conical surface thereof engages the complementary recess 40 in bushing 38, and with the bed plate 46 in place, the rounded portion 44 is fitted within a complementary recess within the bed plate and the pressure is released from the hydraulic jack by manipulation of four-way, distributor valve 8, and the load, which is attached to attachment plate P, is transmitted through metal bearing shoulder 39 on bushing 38, thence through conical recess 40 in metal bearing relation to nut 34, and thence to screw member 30 in shear relation, and thence to bed plate 46 in a compression load. In the above manner, the load is entirely supported in metal to metal relation, without strain on any hydraulic components.

During the jacking operation the load is transmitted from a mounting bracket or attachment plate P to the upper face of piston 18 and through the plunger 20 to the bed plate 46.

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While the invention has been shown as assembled with screw-threaded bolts to hold the various elements in place, it is to be understood that other conventional methods of assembly are within the spirit of invention and the scope of the appended claims.

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

1. In combination, a hydraulic lifting jack with a screw and wedge load holding mechanism, which comprises;
 - (a) a mounting bracket,
 - (b) a hydraulic cylinder associated with said mounting bracket,
 - (1) said hydraulic cylinder having an apertured cylinder head forming a closure therefor, which apertured cylinder head is adapted to receive a plunger therethrough,
 - (2) said hydraulic cylinder having a housing extending outwardly therefrom,
 - (3) an apertured bushing associated with the outer end of said housing,
 - (4) the outer end of said bushing being a conical recessed portion, which tapers inwardly toward said hydraulic cylinder,
 - (c) a piston movably mounted within said hydraulic cylinder in sealed relation with respect thereto,
 - (d) a hydraulic plunger connected to said piston in said hydraulic cylinder and extending outwardly through said apertured cylinder head,
 - (1) said hydraulic plunger having a smooth surface thereon for at least the length of the stroke of said plunger,
 - (2) a sealing element within said apertured head of said hydraulic cylinder, which sealing element forms a seal with said hydraulic plunger,
 - (3) said hydraulic plunger having an outwardly extending screw-threaded portion thereon, which screw-threaded portion is at least the length of the effective stroke of said hydraulic plunger,
 - (e) a complementary conical nut, having a slit formed through one side thereof, positioned on the screw-threaded portion of said plunger, so, when a load is transferred from the conical recessed end member to the screw-threaded portion of the plunger, the complementary conical nut will yield into wedging, holding engagement in the complementary recessed end member to tightly engage said screw-threaded portion of said plunger.
2. A combination hydraulic jack and positive supporting mechanism, which mechanism comprises;
 - (a) an elongated, unitary cylindrical housing,
 - (1) one end of said housing being substantially closed,
 - (2) a removable, apertured head fitted within said cylindrical housing intermediate the ends thereof,
 - (3) said elongated cylindrical housing having a counterbore formed therein to complementally receive said removable, apertured head therein,
 - (4) said removable, apertured head having a sealing element therearound to form a positive fluid seal with the counterbore of said cylindrical housing,
 - (5) removable fastening means extending through said cylindrical housing and engaging said removable head to removably secure said head in secure relation within said cylinder,
 - (b) a hydraulic plunger mounted within said housing,
 - (1) a portion of said plunger extending out of an end of said housing,
 - (2) said plunger extending axially through said apertured head and being sealed in substantially fluid tight relation with respect thereto,
 - (3) the outwardly extending portion of said plunger being screw threaded,

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- (c) an apertured bushing secured in the outer end of said cylindrical housing opposite said substantially closed end,
- (1) said bushing having an inwardly extending conical recess formed therein,
- (d) a screw threaded conical nut complementally engaging the screw threaded portion of said plunger and being adapted to complementally seat in said conical recess,
- (1) said screw-threaded conical nut having a longitudinal slit extending through one side thereof to enable the conical nut to be pressed inward in tight relation with said screw-threads of said plunger, when said conical nut is seated within said conical recess in said apertured bushing,
- (e) bracket means associated with said housing to connect said housing to a member to be supported.
3. A combination hydraulic jack and positive supporting mechanism as defined in claim 2; wherein
- (a) said bushing is fitted in abutting, shouldered relation with the end of said housing.
4. A hydraulic jack and holding mechanism comprising;
- (a) a unitary, cylindrical member, a portion of which cylindrical member forms an elongated cylinder and a portion of which cylindrical member forming a housing,
- (1) said portion of said cylindrical member which forms an elongated cylinder having a first head in end of said elongated cylinder,
- (b) a second head, having a central bore formed therein, removably positioned within said cylindrical member and substantially closing the other end of said elongated cylinder and being a spaced distance from said first head and being spaced intermediate the ends of said cylindrical member,
- (1) holding means associated with said cylindrical member and said second head to secure said second head against relative longitudinal movement with respect to said cylindrical member,
- (2) sealing means surrounding said second head and forming a fluid tight seal between said second head and the bore of said cylindrical member,
- (c) a shoulder formed within said cylindrical member at the end of said elongated cylinder to receive said second head thereagainst in abutting relation,
- (1) said elongated cylinder having fluid passages formed therein near each end thereof,
- (d) a piston mounted in said elongated cylinder for longitudinal movement therein,
- (1) a plunger associated with said piston and forming a seal therewith,
- (i) sealing means surrounding said plunger and forming a fluid tight seal between said plunger and said second head,
- (ii) said plunger having an outwardly extending portion, which is screw threaded for a portion of the length thereof,
- (iii) said outwardly extending end of said plunger having a rounded surface thereon,
- (2) fluid sealing means surrounding said piston and forming a seal between the diameter of the piston and the bore of said elongated cylinder,
- (3) said plunger having a shouldered portion thereon and being in seating relation with said piston,

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- (4) said plunger having a groove formed therearound adjacent the side of said piston opposite said shoulder,
- (e) a clip ring fitted within said groove in said plunger and being in binding engagement with the opposite face of said piston to maintain said piston and said plunger against relative movement,
- (f) an axially apertured bushing fitted in the outer end portion of said housing portion of said cylindrical member,
- (1) said bushing having an outwardly extending shoulder formed thereon which is in abutting relation with the outer end portion of the housing portion of said cylindrical member,
- (2) fastening means securing said bushing in fixed relation to said housing,
- (3) said screw threaded portion of said plunger extending outwardly through said axial aperture in said bushing,
- (4) said bushing having a conical recess formed therein, which conical portion tapers inwardly,
- (g) a screw threaded nut threadably engaging the screw threaded portion of said plunger,
- (1) said screw threaded nut having an exterior conical taper thereon which is complementary to the conical recess in said bushing,
- (2) the conical portion of said nut being of less effective engaging length than the depth of said conical recess,
- (3) said nut having a longitudinal slit formed through a side thereof which slit extends into the threaded bore thereof to enable the conical portion of said nut to yield to be pressed inward into tight relation with said screw-threaded portion of said plunger,
- (h) pins secured to said nut exteriorly thereof, and extending outwardly at spaced intervals therearound,
- (1) at least one arcuate member secured to said outwardly extending pins to form a portion of a hand wheel and an inertia weight,
- (i) abutment means associated with the lower end of said screwthreaded portion of said plunger to retain said nut thereon,
- (j) bracket means associated with said cylindrical member to support a load thereon, and
- (1) said bracket means having holes formed therein.

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