April 17, 1962 M. A. RHOADS 3,030,073

POSITIONING APPARATUS

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Fig. 1.

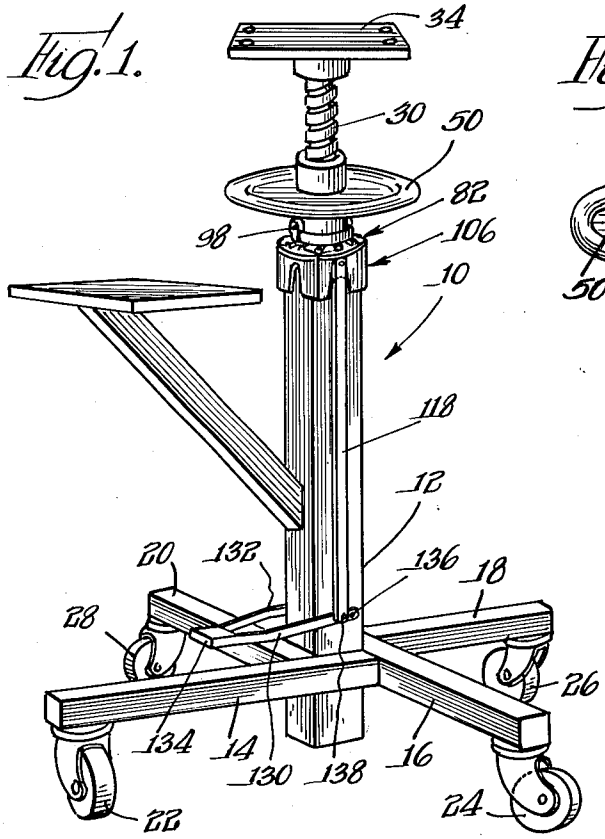

Fig. 2.

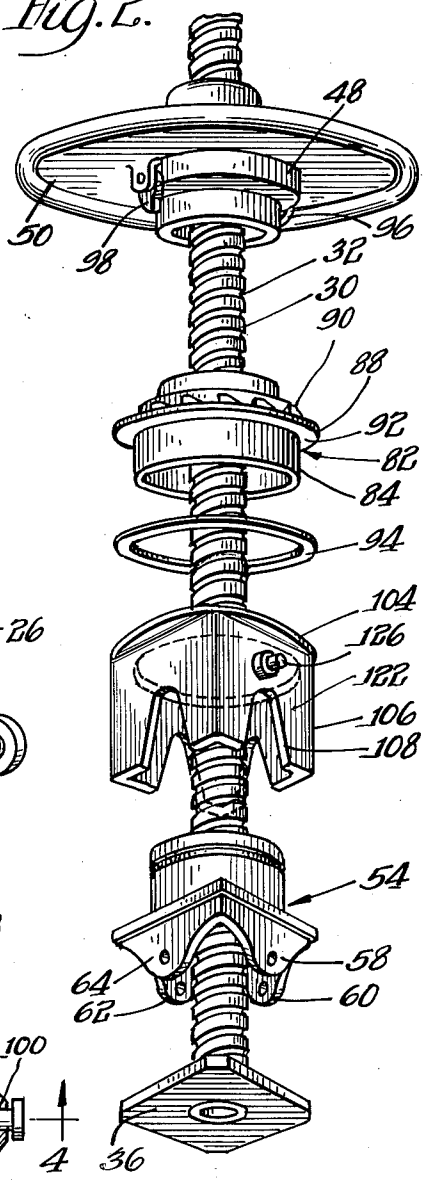

Fig. 3.

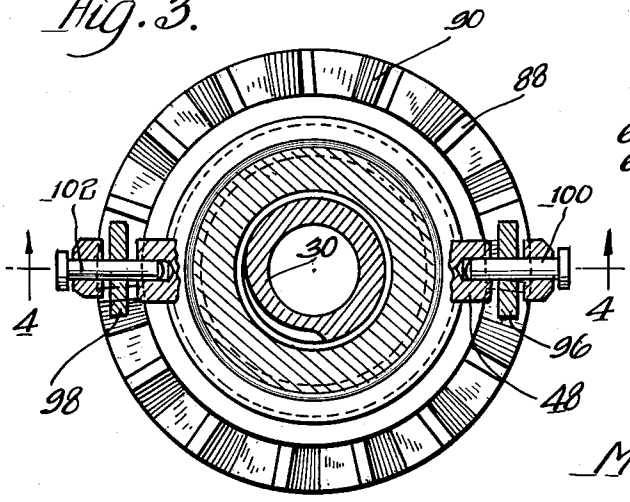

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Fig. 4.

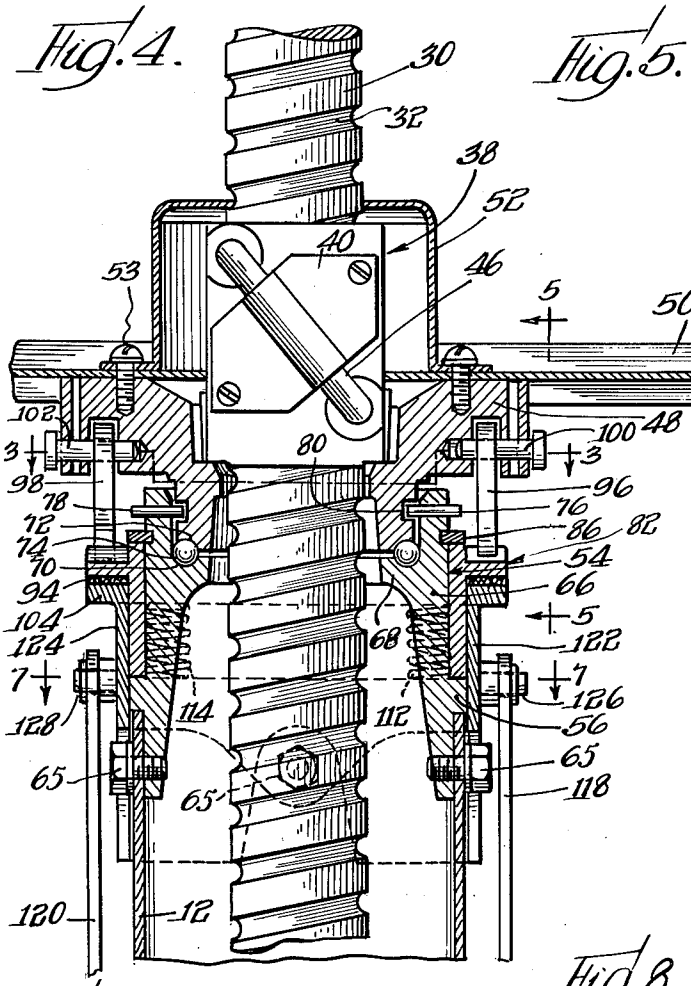


Fig. 5.

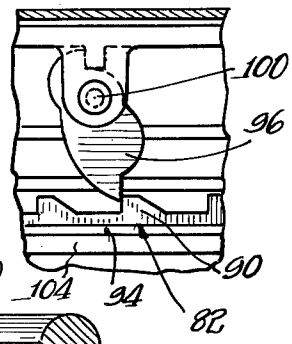


Fig. 6.

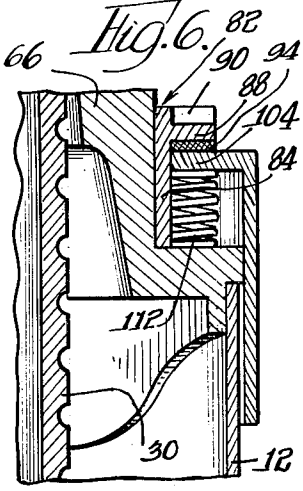


Fig. 7.

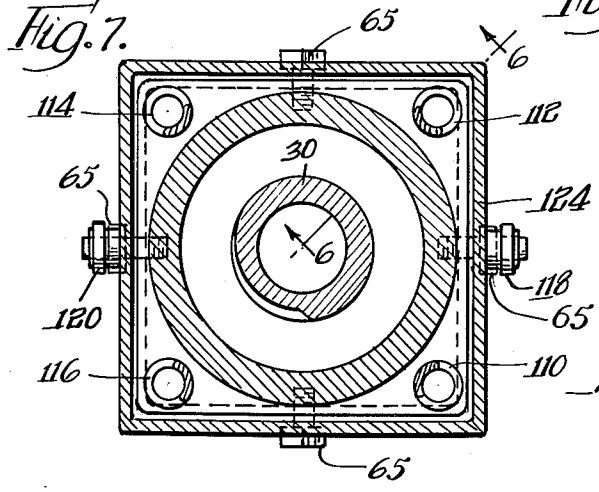
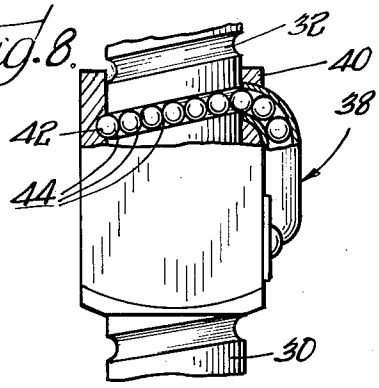


Fig. 8.



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POSITIONING APPARATUS

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5 Claims. (Cl. 254—7)

The present invention relates to a novel jack structure.

While the present invention will be described with particular reference to a lifting jack in order to facilitate disclosure thereof, it will be apparent that certain features of the present invention may be incorporated into various load positioning structures. The present invention contemplates a load positioning structure or jack which includes relatively axially shiftable and relatively rotatable screw rod and cooperable nut means which are constructed so that they may be manipulated to advance a load in one direction and so that they will permit the load to return in the opposite direction under its own force in the absence of some restraining means.

It is an important object of the present invention to provide a load shifting or jack structure of the above described type having means for normally preventing reverse movement of the load, which means is easily operable for permitting such reverse movement of the load in a fully controlled manner.

A more specific object of the present invention is to provide a novel load shifting or jack structure of the above described type including manually controlled brake means which permits the load to be freely advanced in one direction and which may be operated so as to permit reverse movement and precision positioning of the load.

A further object of the present invention is to provide a mechanism of the described type which is of rugged and economical construction and which may be readily produced and maintained.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings wherein:

FIG. 1 is a perspective view showing a lifting jack incorporating features of the present invention;

FIG. 2 is a fragmentary partially exploded perspective view showing features of the present invention in greater detail;

FIG. 3 is a cross sectional view taken generally along line 3—3 in FIG. 4;

FIG. 4 is a fragmentary sectional view taken generally along line 4—4 in FIG. 3;

FIG. 5 is a fragmentary sectional view taken generally along line 5—5 in FIG. 4;

FIG. 6 is a fragmentary sectional view taken generally along line 6—6 in FIG. 7;

FIG. 7 is a cross sectional view taken substantially along line 7—7 in FIG. 4; and

FIG. 8 is a fragmentary elevational view partially broken away so as to show a detail of a portion of the structure.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, a load positioning apparatus or lifting jack 10 incorporating features of the present invention is shown in FIG. 1. This apparatus comprises an upstanding hollow strut or column 12 which, in the embodiment shown, has a rectangular cross section. Base members or legs 14, 16, 18 and 20 are welded or otherwise secured to the sides of a lower end portion of the upstanding strut and radiate generally horizontally therefrom. Preferably castors 22, 24, 26 and 28 or some suitable wheeled devices are respectively secured to and depend from outer end portions of the legs so as to enable the load positioning apparatus or jack to be easily moved.

Disposed within the upstanding strut 12 is an elongated screw rod 30 having a helical groove 32 formed therein along the length thereof. In the illustrated embodiment of the present invention, the rod 30 is adapted to be axially shifted for positioning or lifting a load. Therefore, a plate member 34 or other suitable means capable of engaging and supporting a load is mounted on the rod 30 for axial movement therewith. A rectangular member or plate 36 is fixed to the lower end of the rod 30 and is axially slidable within the hollow strut 12. The plate member 36 serves to prevent the rotation of the rod 30 during a load positioning or supporting operation.

In order to support and actuate the rod 30, a recirculating ball type nut unit 38 is provided at the upper end of the hollow strut. The recirculating ball unit 38 may be of known construction and, in general, comprises a body 40 having a helical groove therein complementary to the groove 32 for accommodating a plurality of balls 44. A conduit 46 is provided between upper and lower ends of the groove 42 for forming a closed path for the circulating balls 44.

The nut unit 38 is disposed on and non-rotatably connected with a hub member 48 which is adapted to be actuated or rotated by suitable means. In the embodiment shown, a hand wheel 50 is secured to the hub member so that the hub member may be manually operated. Preferably a cover 52 is provided over the nut unit 38 and is secured to the hand wheel and hub member assembly by means of a plurality of screws 53.

In order to support the hub member 48 and thus the nut unit and the screw rod, a head member 54 is mounted on the upper end of the upstanding strut 12. The head member includes a peripheral generally rectangular flange 56 adapted to engage the upper end of the strut 12 for supporting the head member thereon. A plurality of ears 58, 60, 62 and 64 depends from the flange 56, which ears are generally rectangularly arranged and are adapted to telescope within the upper end of the strut 12. Screws 65 extending through apertures in the strut member and threaded into tap apertures in the ears are provided for securing the head member and the strut in assembled relationship.

The head member 54 includes a cylindrical portion 66 extending upwardly from the flange 56 and having an internal radially extending flange 68 which provides an upwardly facing ball race 70. The ball race 70 cooperates with a complementary downwardly facing ball race 72 provided in a lower margin of the hub member 48 for retaining a plurality of bearing balls 74 therebetween. Thus relatively simple and rugged ball bearing means is provided as an integral part of the hub and head members so that the hub may be freely rotated. In order to prevent axial displacement of the hub member relative to the head member, an upper end of the cylindrical portion 66 telescopes around a lower cylindrical portion of the hub member 48 and pins 76 and 78 project from the cylindrical portion 66 and into an annular groove 80 formed in the hub member.

As will be understood, the recirculating ball type nut unit and the ball bearing support for the hand wheel hub 48 reduce friction to such an extent that a weight or load supported by or acting axially against the screw rod 30 may readily cause reverse rotation of the nut unit and hand wheel and thus reverse movement of the screw rod. In accordance with the feature of the present invention, the structure is provided with brake means which permits the hand wheel to be freely rotated in one direction and which selectively prevents reverse movement of the hand wheel and thus the screw rod or permits such reverse movement in a controlled manner. More specifically, a ratchet wheel 82 is provided, which wheel has a cylindrical axially extending hub 84 which snugly

and rotatably surrounds the cylindrical portion 66 of the head member 54. The lower end of the ratchet wheel hub portion 84 is supported by the flange 56 of the head member, and axial movement of the ratchet wheel upwardly or away from the flange 56 is restrained by a retaining ring 86 projected from an annular groove formed in the outer surface of the cylindrical head portion 66.

The ratchet wheel 82 is also provided with a radially projecting peripheral flange 88 having circumferentially spaced teeth 90 projecting from an upwardly facing surface thereof. The opposite axially or downwardly facing surface 92 of the flange 88 is provided with a smooth finish for cooperation with a brake disc 94 formed from a suitable friction material such, for example, as leather. The brake disc 94 is supported and actuated in the manner described below so as normally to retain the ratchet wheel against rotation. Thus the ratchet wheel is adapted to cooperate with a pair of pawls 96 and 98 for preventing any reverse rotation of the hand wheel and thus reverse movement of the screw rod. The pawls are respectively pivotally supported by pins 100 and 102 extending into suitable apertures formed in the hub member 48 and the pawls are yieldably biased by suitable means, which in the present instance is gravity, to a position shown best in FIG. 5 for engagement with a tooth 90. As will be understood, the pawls are constructed and supported so that they may pivot to permit the teeth 90 to pass freely therebeneath during forward rotation of the hand wheel while pivotal movement in the opposite direction is limited so that the pawls will be effective for engaging the teeth and preventing reverse rotation of the hand wheel relative to the ratchet wheel.

The brake disc 94 is supported by an annular plate member 104 and is preferably bonded or otherwise secured thereto. The plate member 104 is welded to or formed integrally with a depending rectangular sleeve 106 which is axially slidably and telescopically assembled over the upper end of the upstanding strut 12. Sides of the sleeve 106 are provided with elongated recesses 106 for accommodating heads of the screws 65. The sleeve 106 cooperates with the upper end portion of the strut 12 for guiding the plate member 104 and preventing rotation thereof relative to the strut. The plate member 104 is normally yieldably biased upwardly or toward the flange 88 of the ratchet wheel for aggressively urging the friction brake disc 94 against the surface 92 of the ratchet wheel and thereby restraining the ratchet wheel against rotation. More specifically, the plate member 104 is yieldably biased by means of a plurality of compression springs 110, 112, 114 and 116, which springs are compressed between the plate member 104 and corners of the flange 56 of the head member as shown in FIGS. 4, 6 and 7.

In order to release the ratchet wheel for rotation and thus permit lowering or reverse movement of the screw member 30, means is provided for disengaging the brake disc from the ratchet wheel in a controlled manner. As shown in FIGS. 1, 4 and 7, this means includes elongated links 118 and 120 having upper ends pivotally connected with opposite sides 122 and 124 of the sleeve 106 by pins 126 and 128 respectively. The links extend to a lower portion of the strut 12 and have their lower ends pivotally connected to arms 130 and 132 of a foot pedal 134. The arms 130 and 132 embrace the strut 12 and are pivotally connected thereto by pins 136, only one of which is shown, laterally offset from pins 138 connecting the arms and the links. With this structure it will be appreciated that when an operator depresses the foot pedal 134, the links 118 and 120 will be shifted downwardly so as to depress the plate member 104 against the action of the compression springs and thereby disengage the brake disc from the ratchet wheel. It is to be noted that an operator may selectively actuate the pedal 134 so as to disengage the brake disc completely or only partially from the ratchet wheel. In other words, an operator may actuate the brake means so as to permit the ratchet wheel to rotate freely or with any desired amount of resistance from the brake disc. This enables the operator to maintain the desired control over the rotation of the ratchet wheel and thus lowering movement of the screw rod 30 so that the screw rod may be lowered rapidly or slowly or stopped at any desired position.

While the preferred embodiment of the present invention has been shown and described herein, many structural details may be changed without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A load positioning apparatus comprising a support structure, elongated screw means associated with said support structure, recirculating ball nut means cooperably engaging said screw means, anti-friction bearing means supporting one of said first and second mentioned means on and for rotation relative to said support structure, means for rotating said one means for causing axial movement of the other said first and second mentioned means relative to the support structure, a rotatably supported toothed ratchet member having an annular brake surface, pawl means interconnected with said one means and engageable with said ratchet member for permitting rotation of said one means relative to the ratchet member in one direction and for preventing rotation of said one means relative to the ratchet member in an opposite direction, a brake member frictionally engageable with substantially the entire brake surface of said ratchet member for retaining said ratchet member against rotation, means yieldably biasing one of said members toward and into engagement with the other said member for frictionally locking said members together, and control means for progressively retracting one of said members for progressively reducing the frictional engagement of said members for permitting rotation of said ratchet member in a controlled manner.

2. A load position apparatus comprising a support structure, elongated screw means associated with said support structure, recirculating ball nut means cooperatively engaging said screw means, bearing means rotatably supporting one of said first and second mentioned means on and for rotation relative to said support structure, means for rotating said one means in one direction for causing axial movement of the other of said first and second mentioned means relative to the support structure, an annular ratchet member rotatably supported concentric with said one means, pawl means interconnected with said one means and engageable with said ratchet member for permitting rotation of said one means relative to the ratchet member in said one direction and for preventing rotation of said one means relative to the ratchet member in an opposite direction, an annular brake member concentric with and frictionally engageable with said ratchet member for frictionally engaging said ratchet member, means non-rotatably and axially shiftably supporting said brake member, spring means yieldably biasing said brake member toward and into engagement with said ratchet member for frictionally locking said ratchet and brake members together, and control means connected with said brake member for progressively retracting said brake member for progressively reducing the fictional engagement of said ratchet and brake members for permitting rotation of said ratchet members in said opposite direction in a controlled manner.

3. A load positioning jack comprising an upright strut, an elongated screw rod axially shiftably disposed along said strut, means preventing rotation of said rod relative to said strut, anti-friction nut means rotatably supported on said strut and threadedly receiving said screw rod, means for rotating said nut means in one direction for axially shifting said screw rod, an annular ratchet wheel rotatably supported on said strut adjacent said nut means, pawl means interconnected with said nut means and en-

gageable with said ratchet wheel for causing rotation of the ratchet wheel with the nut means in a direction opposite to said one direction, axially shiftably supported annular brake means frictionally engageable with said annular ratchet wheel, spring means yieldably biasing said brake means into engagement with said ratchet wheel for frictionally locking said ratchet wheel against rotation, and manually operable control means connected with said brake means for shifting the brake means for progressively reducing the frictional engagement thereof with said ratchet wheel for permitting rotation of the ratchet wheel in a controlled manner.

4. A load positioning apparatus comprising a support structure, elongated screw means associated with said support structure, recirculating ball nut means cooperably engaging said screw means, means rotatably supporting one of said first and second mentioned means on said support structure, means for rotating said one means in one direction for causing relative axial movement of said first and second means, and means for releasably restraining said one means against rotation in the opposite direction, said releasable restraining means including an annular member facing axially of said screw operatively interconnected with said one means for movement therewith in said opposite direction, an axially shiftably supported annular brake member frictionally and axially engageable with said first mentioned member, compression spring means axially yieldably biasing

said shiftably supported annular brake member into engagement with said first mentioned member for restraining rotation of said first mentioned member, and manually operable linkage means including an axially shiftable component connected with said brake member for progressively axially shifting and disengaging said brake member from said first mentioned member in a controlled manner for permitting controlled movement of said one means in said opposite direction.

5. A load positioning apparatus as claimed in claim 4, wherein said support structure includes an upstanding hollow strut member and said brake member includes a portion slidably telescoped with the upper end portion of said strut member, and wherein said linkage means includes an operator member pivotally mounted on said strut member beneath the brake member and connected to said brake member by the axially shiftable component.

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