Dec. 1, 1953 S. W. LONG 2,661,232

DRILLING HOOK ASSEMBLY

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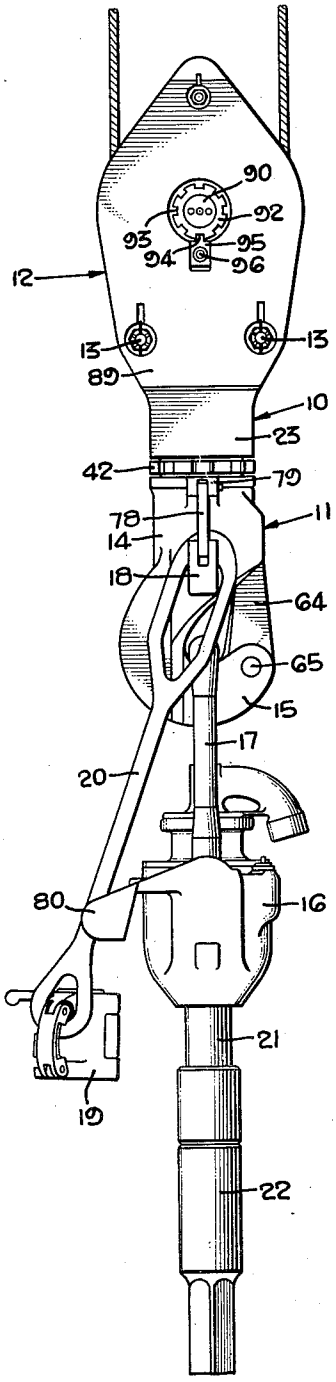


FIG. 1.

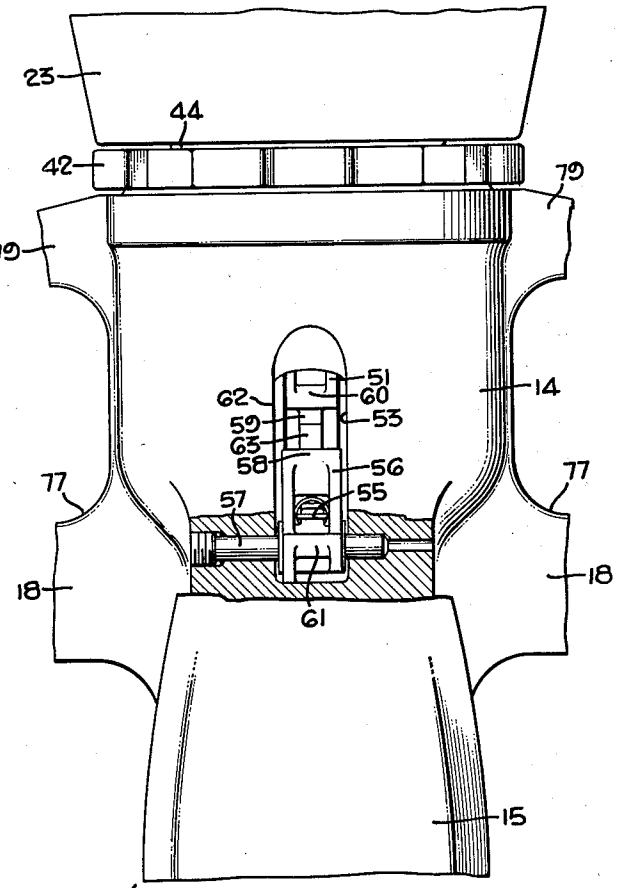


FIG. 5.

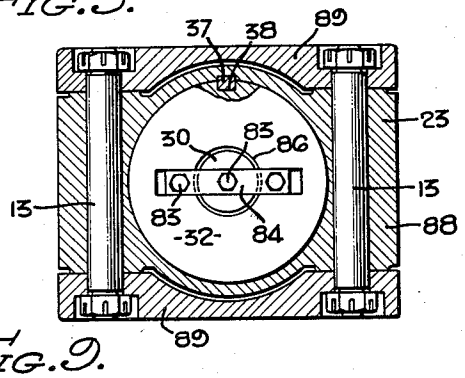


FIG. 9.

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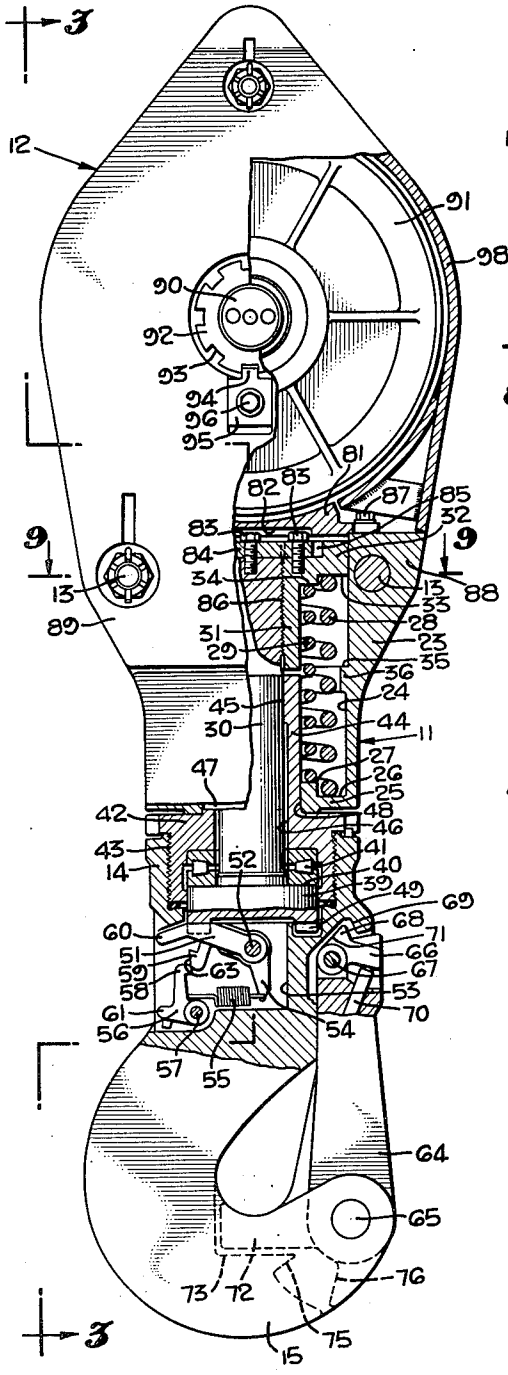


FIG. 2.

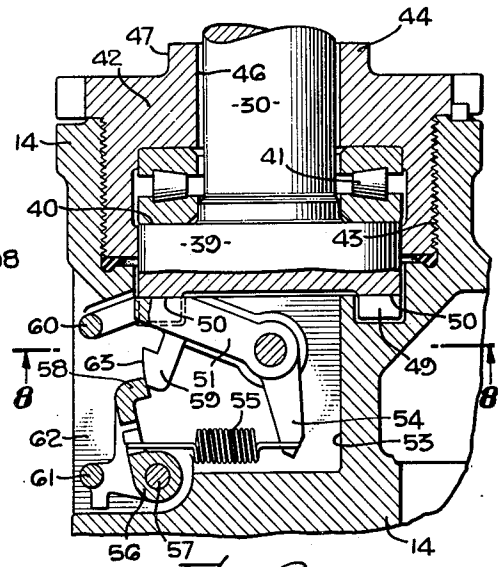


FIG. 6.

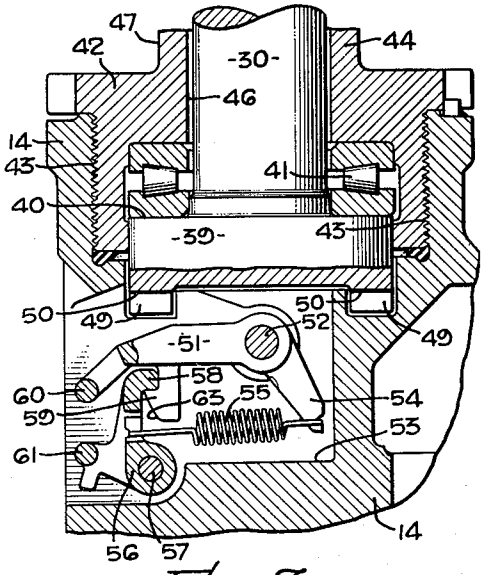


FIG. 7.

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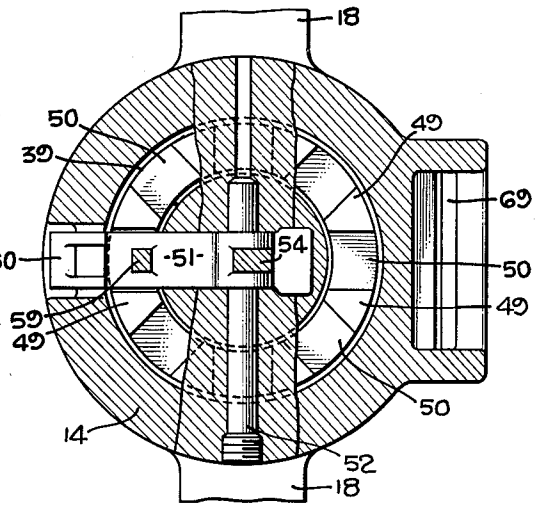
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DRILLING HOOK ASSEMBLY

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FIG. 8.



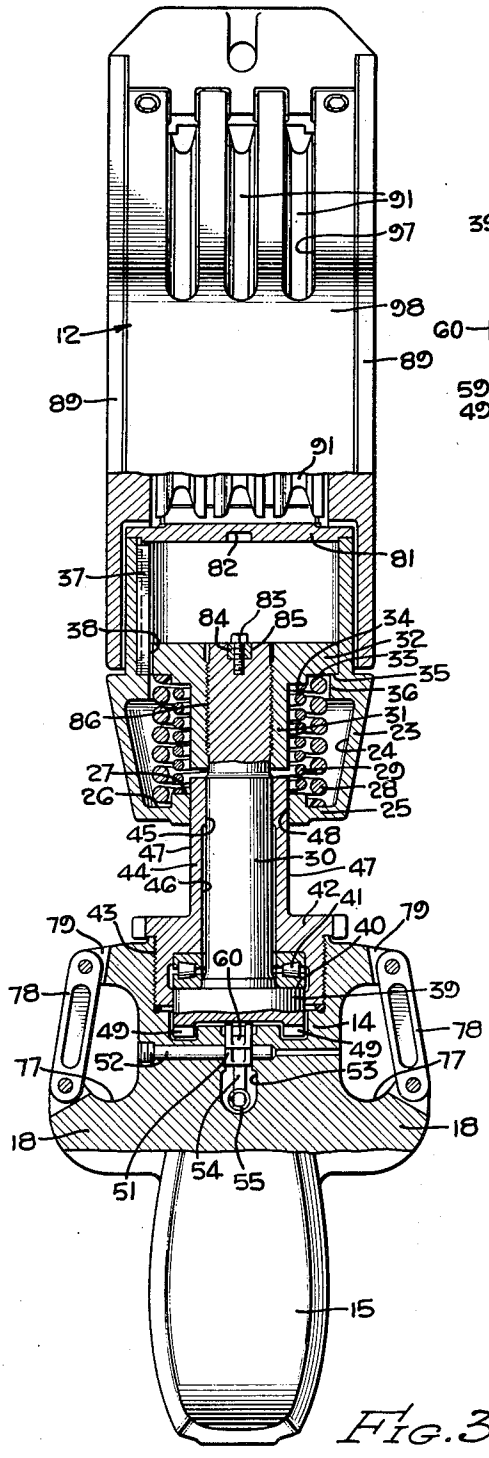


FIG. 3.

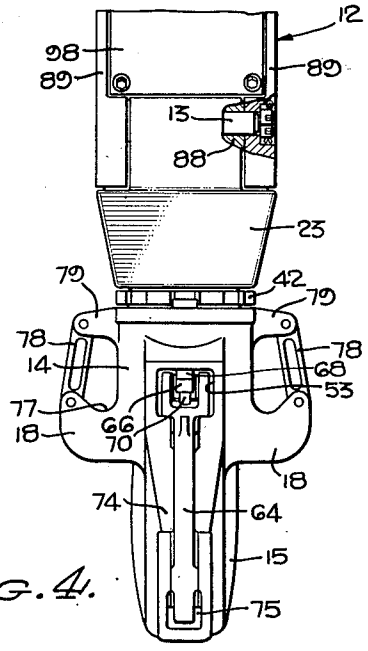


FIG. 4.

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UNITED STATES PATENT OFFICE

2,661,232

DRILLING HOOK ASSEMBLY

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Application May 21, 1951, Serial No. 227,426

9 Claims. (Cl. 294—82)

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This invention relates to well drilling apparatus and is particularly directed to improvements in a drilling hook assembly. Devices of this type are used within the derrick for supporting the swivel and drill string while the rotary bit is on bottom and are also used for raising and lowering drill pipe or casing by means of the usual pipe elevators.

Among the objects of my invention is to provide a drilling hook construction which is particularly adapted for integral connection with a travelling block so that a minimum over-all length of hook and block may be achieved.

Another object is to provide a drilling hook construction having a nonrotary stem which reciprocates relative to a support and which carries a thrust bearing for rotatably supporting the load carrying member of the assembly.

Another object is to provide a device of this type in which a stiffening sleeve on the load carrying member encircles the nonrotary stem and projects upwardly into the spring housing.

Another object is to provide a novel form of rotation lock for locking the load-carrying member against rotation.

A further object is to provide a novel form of connection between the hook assembly and the travelling block.

Other and more detailed objects and advantages will appear hereinafter.

In the drawings:

Figure 1 is a side elevation showing a preferred embodiment of my invention in drilling position.

Figure 2 is a side elevation on an enlarged scale and shown partly in section.

Figure 3 is a rear elevation partly in section taken substantially on the line 3—3 as shown in Figure 2.

Figure 4 is a front elevation partly broken away showing the connection between the travelling block and hook assemblies.

Figure 5 is a rear elevation partly broken away and partly in section showing the rotation lock mechanism.

Figure 6 is a sectional elevation partly broken away showing the rotation lock parts in locking position.

Figure 7 is a view similar to Figure 6 showing the rotation lock parts in inoperative position.

Figure 8 is a sectional plan view taken substantially in the direction 8—8 as shown in Figure 6.

Figure 9 is a transverse sectional view taken substantially on the line 9—9 as shown in Figure 2.

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Referring to the drawings, the hook and block unit generally designated 10 comprises a drilling hook assembly 11 and a travelling block assembly 12 connected by bolt elements 13. The load carrying member 14 of the hook assembly 11 is provided with a central hook 15 for supporting a swivel 16 by means of its bail 17 and is provided with side lugs 18 for supporting the pipe elevator 19 by means of the usual links 20. The swivel 16 is provided with the usual rotary stem 21 which is connected to the upper end of the rotary drill string 22. The pipe elevator 19 is used for raising and lowering the drill string in the hole for the purpose of changing the bit and is also used for handling casing, as will be readily understood by those skilled in this art.

In accordance with my invention I provide a nonrotary base or housing 23 which is provided with a central opening 24 and which terminates in an annular flange 25. A pair of shoulders 26 and 27 on this flange 25 support outer and inner concentric coil springs 28 and 29 respectively. These springs are positioned within the central opening 24.

A nonrotary stem 30 extends into this opening 24 and is exteriorly threaded on its upper end to receive the nut 31. The nut is provided with a flange 32 having shoulders 33 and 34 which are engaged by the springs 29 and 28 respectively. From this description it will be understood that the springs 28 and 29 support the nonrotary stem 30 with respect to the housing 23.

In Figure 3 the parts are shown in loaded position. In this position the springs 28 and 29 are compressed, and the flange 32 on the nut 31 engages the abutment 35 on the annular rib 36. The key 37 is also shown in Figure 3, and this key is mounted on the housing 23 and slidably engages a notch 38 provided in the flange 32 of the nut 31. The interengagement of the parts 37 and 38 permits axial sliding movement between the parts 23 and 31 but prevents relative turning movement therebetween.

The lower end of the stem 30 is provided with an enlarged head 39 having an upwardly facing shoulder 40. A thrust bearing assembly 41 is mounted on this shoulder 40 and a sleeve member 42 rests on this thrust bearing assembly. The sleeve member 42 is connected to the load carrying member 14 by means of threads 43. The sleeve 42 is provided with a tubular extension 44 which encircles a portion of the stem 30. The upper portion of the extension 44 is bored at 45 to provide a relatively close running fit with the stem 30. The remainder of the extension 44 and sleeve 42 is counterbored as shown at 46 to pro-

vide clearance. The outer cylindrical surface 47 of the sleeve extension 44 has a relatively close running fit within the bore 48 of the housing flange 25. From this description it will be understood that the sleeve 42 and its extension 44 reciprocate vertically with the nonrotary stem 30 but are fixed with relation to the load carrying member 14 and turn as a unit therewith.

The bore 48 and cylindrical surface 47 cooperate to guide the sleeve extension 44 with respect to the housing 23 and thus prevent universal swiveling movement of the load carrying member 14 with respect to the stem 30. The thrust bearing assembly 41 is designed to carry axial thrust and not to accommodate universal pivoting movement between the members which it connects. The cooperation between the sleeve extension 44 and the bore 48 stiffens the assembly so that universal swinging or pivoting movement of the load carrying member 14 is effectively prevented.

Releasable lock means are provided for locking the load carrying member 14 against rotation and for locking it in various positions with respect to the housing 23. As shown in the drawings, this means includes a series of lugs 49 formed integrally on the underside of the stem head 39. The recesses 50 defined between adjacent lugs 49 are shaped to receive the central portion of the locking lever 51 which is pivoted on the transverse pin 52. The locking lever 51 is positioned in a cavity 53 formed within the load carrying member 14. An arm 54 on the lever 51 is engaged by a tension spring 55 also positioned within the recess 53. The tension spring also engages a latching lever 56 which is pivotally mounted on transverse pin 57. The latching lever 56 has a projection 58 which engages a lug 59 formed on the locking lever 51. The coil spring 55 acts to hold the parts 58 and 59 in engagement so that the locking lever 51 is held in inoperative position as shown in Figure 7. When the latching lever 56 is turned counterclockwise as viewed in Figures 6 and 7, the interengaging parts 58 and 59 are separated so that the spring 55 moves the locking lever 51 in a clockwise direction.

The locking lever 51 enters one of the recesses 50 between the lugs 49 when the relative angular position of the load carrying member 14 and load supporting stem 30 brings one of the recesses 50 into a position of alignment with the locking lever 51. This operative position of the parts is shown in Figure 6. The projection 58 rides against the surface 63 on the lug 59 to prevent the latching lever 56 from turning clockwise. Actuating knobs 60 and 61 are provided on the levers 51 and 56 respectively, and these project outward through an entrance slot 62 leading into the cavity 53. These knobs 60 and 61 may be actuated manually or by means of a long handled tool (not shown).

When the locking lever 51 is in the inoperative position shown in Figure 7, the load carrying member 14 is free to turn relative to the stem 30 and housing 23. This permits the member 14 to turn while lowering drill pipe or casing into the hole by means of the elevator 19 and links 20 and thus avoid any possibility of unscrewing of the piping coupling threads during this operation. It also enables the member 14 to turn when an upper length of pipe is being turned to threadedly connect it to the sectional drill string. During the drilling operation when the swivel 16 is supported from the hook 15 as shown in Figure 1, the load carrying member 14 must be restrained from rotation, and it is for this purpose that the locking mechanism shown in Figures 6 and 7 is employed.

The springs 28 and 29 are chosen so that they exert sufficient force to lift a "stand" of drill pipe by means of the elevator 19. However, the springs are compressed by heavier loads so that the nut 31 rests on the abutment 35.

The load carrying member 14 of the drilling hook assembly includes the central hook 15 and the laterally projecting side lugs 18. The hook 15 is provided with a bill 64 which is pivoted to the hook 15 by means of the pin 65. The upper swinging end of the bill 64 is provided with a latch 66 pivoted to the bill at 67. The latch 66 has a projection 68 which engages an abutment 69 on the member 14 to prevent the bill from swinging open. A spring urged plunger 70 on the bill 64 holds the latch in operative position. When the latch 67 is turned clockwise as viewed in Figure 2 against the action of the spring urged plunger 70, the projection 68 swings to a retracted position so that the bill 64 may pivot clockwise about the pin 65. Stop lugs 75 and 76 limit the extent of opening movement of the bill 64. The cam surface 71 on the latch 66 engages the member 14 when the bill 64 is swung counterclockwise toward closed position so that the latch 66 is automatically retracted.

A finger 72 is formed integrally with the bill 64, and this finger projects into a recess 73 formed in the hook 15. When the swivel bail 17 enters the load carrying notch 74 of the hook 15 it rests initially on this finger 72 and thereby automatically moves the bill 64 to closed position.

The side lugs 18 are each provided with a load carrying notch 77 for supporting the elevator links 20. Keeper bars 78 are bolted to the lugs 18 and to the projections 79 to hold the elevator links 20 in position against displacement. When the swivel 16 is suspended from the hook 15 the elevator links 20 assume the inoperative position shown in Figure 1 and normally rest against the bumper 80 on the swivel 16.

The housing 23 may be provided with a suitable cover plate 81 secured in place by bolts 87. This cover plate may be notched at 82 to provide clearance for the heads of the bolts 83 which serve to hold the locking bar 84 in position on the stem 30 and nut 32. This locking bar is received in a transverse groove 85 formed in the upper end of the stem 30 and in the nut 31 and serves to prevent turning movement of the nut 31 on the stem 30 along the threads 86.

The upper end of the housing 23 is flared outwardly at diametrically spaced locations to form load carrying lugs 88. The horizontal bolt elements 13 extend through these lugs 88 and through the lower portions of the side plates 89 of the travelling block assembly 12 to form a rigid connection between the travelling block and hook assemblies.

A pintle 90 extends horizontally between the side plates 89 and rotatably supports the cable sheaves 91 by means of suitable bearing assemblies. A nut 92 is threaded to one end of the pintle 90 for holding the pintle in position on the side plates 89. This nut may be provided with a series of recesses 93 on its periphery and the projection 94 on a lug 95 enters one of these recesses to secure the nut 92 against turning movement. A bolt 96 secures the lug 95 to one of the side plates 89. The usual slots 97 are provided in the curved face plates 98 and the

cable extends through the slots and is reeved around the sheaves 91 in the usual manner.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. Apparatus of the class described comprising in combination: a nonrotary housing, an axially movable stem telescopically received in said housing, spring means in the housing for supporting the stem, means preventing relative turning movement between the stem and the housing, a head on the lower end of the stem, a thrust bearing assembly mounted on said head, a load carrying member, a sleeve member connected to the load carrying member and supported on the thrust bearing assembly, the sleeve member having a tubular extension encircling a portion of the stem, and the housing having an axial bore slidably receiving said tubular extension.

2. Apparatus of the class described comprising in combination: a nonrotary housing, an axially movable stem telescopically received in said housing, a nut threaded upon the upper end of the stem, spring means in the housing engaging the nut for supporting the stem, cooperating parts on the nut and housing for preventing relative turning movement of the housing and stem, a head on the lower end of the stem, a thrust bearing assembly mounted on said head, a load carrying member, a sleeve member connected to the load carrying member and supported on the thrust bearing assembly, the sleeve member having a tubular extension encircling a portion of the stem, and the housing having an axial bore slidably receiving said tubular extension.

3. Apparatus of the class described comprising in combination: a nonrotary housing having an end flange, an axially movable stem telescopically received in said housing, spring means in the housing resting on the end flange for supporting the stem, means preventing relative turning movement between the stem and the housing, a head on the lower end of the stem, a thrust bearing assembly mounted on said head, a load carrying member, a sleeve member connected to the load carrying member and supported on the thrust bearing assembly, the sleeve member having a tubular extension encircling a portion of the stem, and the housing end flange having an axial bore slidably receiving said tubular extension.

4. Apparatus of the class described comprising in combination: a nonrotary housing having an end flange, an axially movable stem telescopically received in said housing, a nut threaded upon the upper end of the stem, spring means in the housing resting on the end flange and engaging the nut for supporting the stem, cooperating parts on the nut and housing for preventing relative turning movement of the housing and stem, a head on the lower end of the stem, a thrust bearing assembly mounted on said head, a load carrying member, a sleeve member threaded to the load carrying member and supported on the thrust bearing assembly, the sleeve member having a tubular extension encircling a portion of the stem, and the housing end flange having an axial bore slidably receiving said tubular extension.

5. Apparatus of the class described comprising in combination: a housing, an axially movable stem supported in said housing, a head on the lower end of the stem, the head having a lower face, a load carrying member rotatably supported on said head, lock means for securing the load carrying member against rotation relative to the head, said lock means including a pivoted locking lever carried on the load carrying member, the configuration of the lower face of the head being such as to provide a locking position for engagement with said lever, latch means including a spring to hold the lever out of engagement with the head, the spring being adapted to resiliently urge the locking lever into locking engagement upon release of the latch means.

6. Apparatus of the class described comprising in combination: a housing, an axially movable stem supported in said housing, a head on the lower end of the stem, the head having a lower face provided with a plurality of lock elements, a load carrying member rotatably supported on said head, lock means for securing the load carrying member against rotation relative to the head, said lock means including a pivoted locking lever carried on the load carrying member and engageable with said lock elements, latch means including a spring to hold the lever out of engagement with the lock elements, the spring being adapted to resiliently urge the locking lever into locking engagement upon release of the latch means.

7. Apparatus of the class described comprising in combination: a nonrotary housing, an axially movable stem telescopically received in said housing, spring means in the housing for supporting the stem, a head on the lower end of the stem, the head having a lower face, a load carrying member rotatably supported on said head, lock means for securing the load carrying member against rotation relative to the head, said lock means including a pivoted locking lever carried on the load carrying member, the configuration of the lower face of the head being such as to provide a locking position for engagement with said lever, latch means including a spring to hold the lever out of engagement with the head, the spring being adapted to resiliently urge the locking lever into locking engagement upon release of the latch means.

8. Apparatus of the class described comprising in combination: a housing, an axially movable stem supported in said housing, a head on the lower end of the stem, the head having a lower face, a load carrying member rotatably supported on said head and provided with a cavity, lock means in said cavity for securing the load carrying member against rotation relative to the head, said lock means including a pivoted locking lever carried on the load carrying member, the configuration of the lower face of the head being such as to provide a locking position for engagement with said lever, a portion of the lever being accessible exteriorly of the cavity for actuation of the lever, latch means including a spring to hold the lever out of engagement with the head, the spring being adapted to resiliently urge the locking lever into locking engagement upon release of the latch means.

9. Apparatus of the class described comprising in combination: a housing, an axially movable stem in said housing, a head on the lower end of the stem, the head having a lower face provided with a series of locking lugs, a load carrying member rotatably supported on said head, the load carrying member having a cavity and an entrance

slot leading to the cavity, a pivoted locking lever in the cavity carried on the load carrying member engageable with said lugs, latch means including a pivoted latching lever and a spring in the cavity to hold the locking lever out of engagement with said lugs, the spring being adapted to resiliently urge the locking lever into locking engagement upon release of the latching lever, a portion of each of the levers extending into the entrance slot for accessibility exteriorly of the load carrying member.

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