

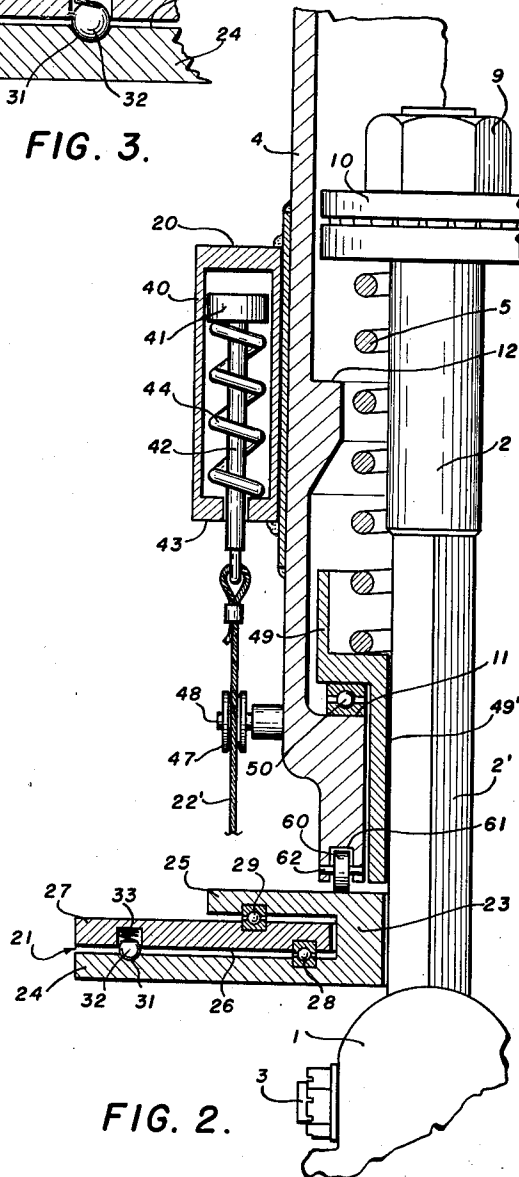
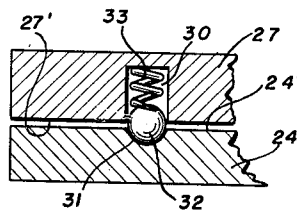
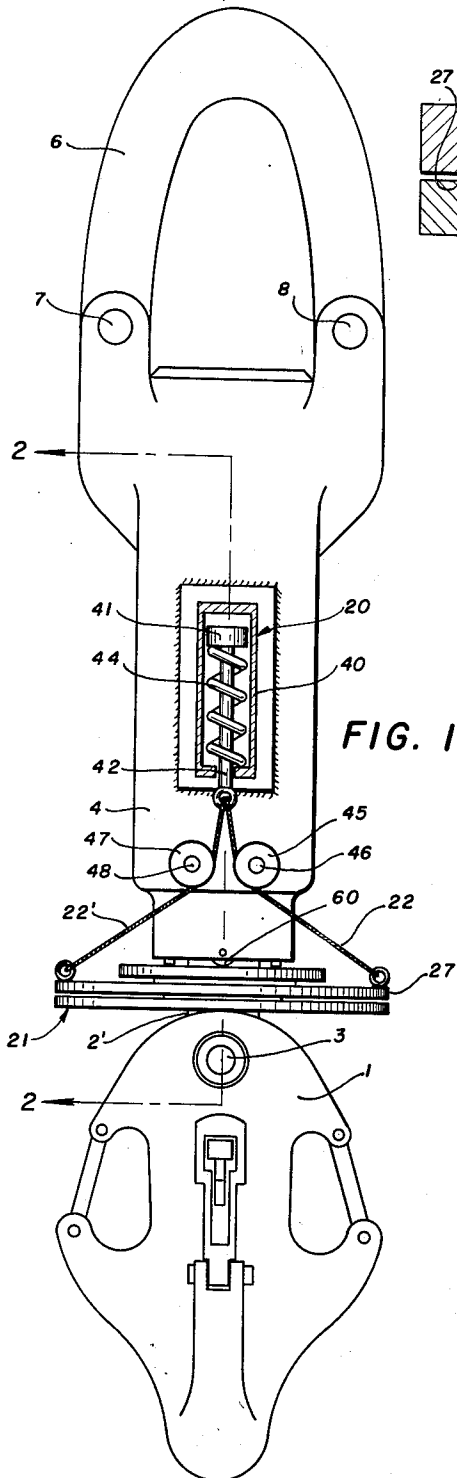
March 16, 1954

D. RAGLAND
DRILLING HOOK

2,672,364

Filed Oct. 27, 1951

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

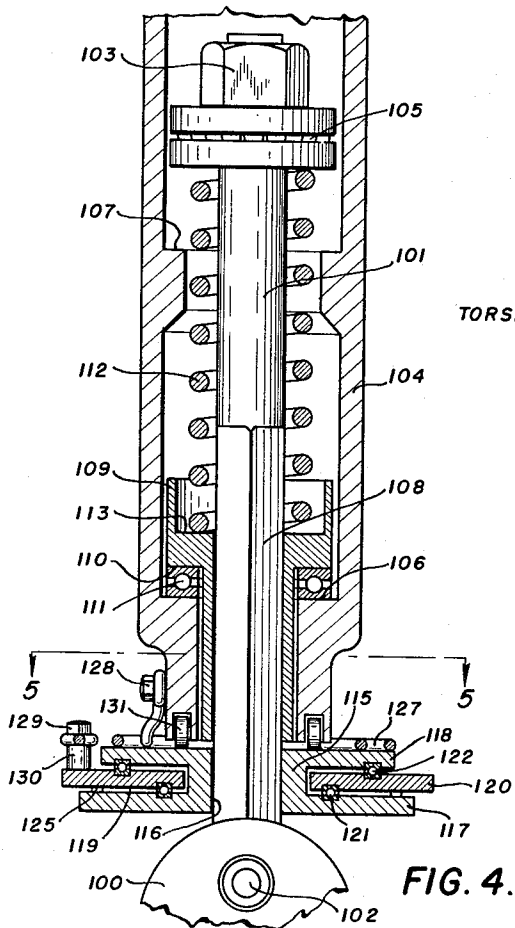


FIG. 4.

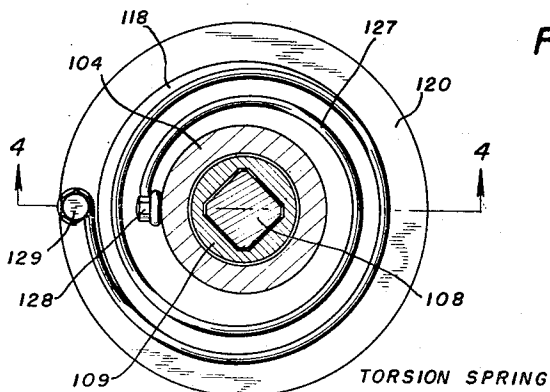


FIG. 5.

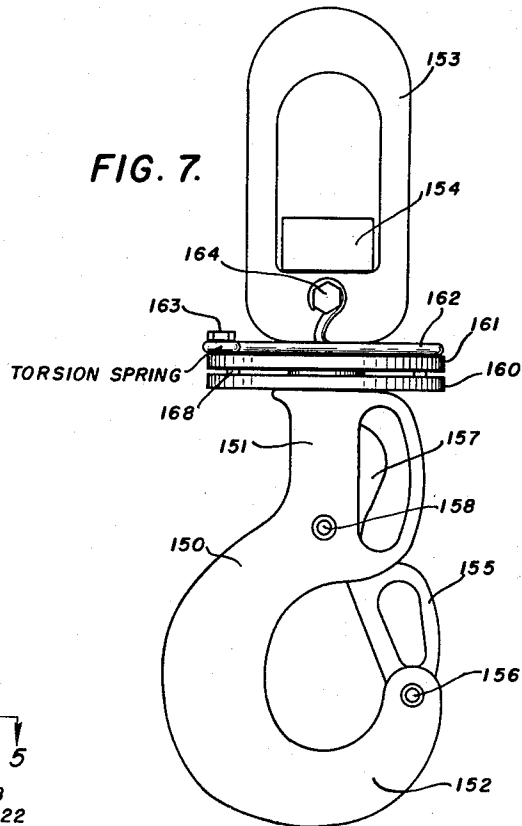


FIG. 7.

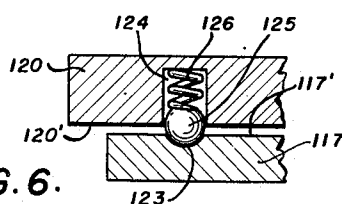


FIG. 6.

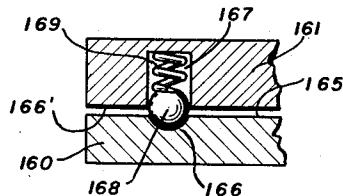


FIG. 8.

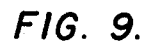
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DRILLING HOOK

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,672,364

DRILLING HOOK

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5 Claims. (Cl. 294-82)

1

This invention relates to drilling hooks and, more particularly, relates to hooks used for suspending tubular material in a borehole drilled into subsurface formations.

Drilling hooks are used in the drilling of boreholes into subsurface formations for suspending a string of casing, drill pipe, tubing or rods. Essentially all of these hooks consist of a load supporting member and a hook member suspended from the load supporting member, the hook member being adapted for rotative movement relative to the load supporting member. In addition to providing for such rotative movement, it has become common to provide for limited longitudinal movement of the hook member relative to the load supporting member in which case the load supporting member is provided with a compression spring which serves to raise a stand of drill pipe as it is disconnected from the drilling string. Damage to the threads of the tool joints is avoided by providing such a spring. It is also customary to provide a latching mechanism arranged to lock releasably the hook body against rotation with respect to the load supporting member. With this latching arrangement in the disengaged position the hook body is free to rotate with respect to the load supporting member while engagement of the latching arrangement prevents relative rotation of the hook with respect to the load supporting member. This latching arrangement is provided so that the hook body can be maintained in a predetermined radial position with respect to the traveling block. This locking arrangement can be used with safety in some situations but cannot be used safely in others.

When making round trips with drill pipe, it is necessary that the elevators suspended from hooks of the aforementioned type stay in a predetermined position with respect to the traveling block. Ordinarily it is desirable that the opening of the elevator face the derrick man so that the elevator can be easily latched and unlatched. Alignment of the elevator in this manner can be accomplished by engaging the aforementioned latching arrangement but the elimination of the swivel action constitutes a hazard and consequently this practice cannot be safely adapted.

It is an object of the present invention to provide a means on conventional drilling hooks which maintains the hook body in a predetermined position with respect to the member which supports the hook body while at the same time permitting relative rotation between the

2

hook body and the member supporting the hook body when the forces tending to rotate the hook body exceed a predetermined selected value.

Other objects and advantages will be apparent from the following detailed description taken in conjunction with the accompanying drawings wherein

Fig. 1 is a front elevation of one embodiment of the present invention;

Fig. 2 is a fragmentary sectional view taken along line 2-2 of Fig. 1;

Fig. 3 is an enlarged sectional view of the clutch used in Figs. 1 and 2;

Fig. 4 is a sectional view of another embodiment of the present invention;

Fig. 5 is a view taken along the line 5-5 of Fig. 4;

Fig. 6 is an enlarged sectional view of the clutch arrangement used in Fig. 4;

Fig. 7 is a view in elevation of still another embodiment of the present invention;

Fig. 8 is a sectional detail view of the clutch arrangement of Fig. 7;

Fig. 9 is a sectional view of another clutch arrangement which may be used in the embodiment of Figs. 1 and 4;

Fig. 10 is a sectional view of another clutch arrangement which may be used in the embodiment of Figs. 1 and 4; and

Fig. 11 is a view in elevation of the clutch sections of Fig. 10.

Referring first to Figs. 1 to 3, inclusive, of the drawings, a drilling hook has been shown comprising a hook body 1 pivotally connected to the lower end of shank 2 by a pivot pin 3, shank 2 being yieldably supported in housing 4 by means of spring 5. A ball 6 is connected to the upper end of housing 4 by means of bail bolts 7 and 8. Affixed to the upper end of shank 2 is a shank nut 9 and affixed to shank 2 by nut 9 is a bearing assembly 10. The lower end of compression spring 5 is carried by swivel ring 49 which is rotatably mounted on shoulder 11 of housing 4 by bearing assembly 50. The center of swivel ring 49 describes a squared opening 49' which encloses the squared section 2' of shank 2 and allows vertical movement of said shank through said opening, while the upper end abuts against the lower surface of bearing assembly 10, spring 5 biasing shank 2 and shank nut 9 upwardly. An inwardly projecting stop 12 is provided inside housing 4 adjacent the upper end thereof so that as spring 5 is compressed under load, shank 2 and hook body 1 move downwardly until ball bearing assembly 10 abuts on stop 12. Ball bear-

3

ing assembly 10 is provided so that hook body 1 and shank 2 may be freely rotated with respect to housing 4.

The alignment assembly, indicated generally by the numeral 20, the clutch assembly, indicated generally by the numeral 21, and connecting cables, indicated by the numerals 22 and 22', are mounted on the hooks shown in Figs. 1 to 3, inclusive, in such a way as to connect hook body 1 and housing 4 to cause these two members to assume a predetermined position with respect to each other under normal conditions but to permit the free rotation of hook body 1 with respect to housing 4 when hook body 1 is subjected to forces exceeding a predetermined selected value.

Clutch assembly 21 consists of a member 23 slidably mounted on the squared portion 2' of shank 2 for movement thereon longitudinally of the shank. It will be noted that member 23 consists of a lower disc-like portion 24 and an upper disc-like portion 25 with an annular recess 26 being defined therebetween. Mounted within annular recess 26 for free rotation with respect to member 23 is disc-like member 27, member 27 being spaced from portions 24 and 25 by bearings 28 and 29, respectively. Lower disc-like portion 24 is provided with at least one depression 31 and preferably with a series of circumferentially spaced depressions 31 in its upper surface 24' while the lower surface 27' of member 27 is provided with one or more recesses 30. Recesses 30 are positioned so that they match up with depressions 31, recesses 30 being provided with a ball 32 biased toward disc-like portion 24 by means of a spring 33. It will be noted that ball 32 fits into a depression 31.

A roller 60 is mounted in recess 61 at the lower end of housing 4 on an axle 62. Rollers 60 are for the purpose of providing rolling contact between housing 4 and member 23.

Alignment assembly 20 comprises a cylinder 40 having a piston 41 disposed therein. Connected to piston 41 is a piston rod 42 which is adapted to pass through the lower end 43 of cylinder 40. A spring 44 is arranged within cylinder 40 and biases piston 41 upwardly therein. A pulley 45 is rotatably mounted on housing 4 by means of pin 46; a similar pulley 47 is also mounted on housing 4 by means of pin 48. A cable 22 passes over that side of pulley 45 which is adjacent to pulley 47 with one end of the cable being attached to piston rod 42 exteriorly of housing 40 and the other end being attached to disc-like member 27. A cable 22' passes over that portion of pulley 47 nearest pulley 45 with one end attached to piston rod 42 exteriorly of housing 40 and the other end attached to disc-like member 27. The ends of the two cables are attached to disc-like member 27 at points on the disc sufficiently separated from each other to cause a tension on spring 44.

Any force of less than a certain value tending to rotate hook body 1 will be transmitted through member 23 and ball 32 to disc-like member 27. However, rotative motion of disc 27 with respect to housing 4 is resisted by means of spring pressed piston 41 which is connected by means of piston rod 42 and cables 22 and 22' to disc-like member 27. If hook body 1 is caused to rotate to the left, as viewed in Fig. 1, disc-like member 27 will move in cooperation therewith, in turn causing cable 22' to move over pulley 47 and to pull piston 41 downwardly against spring 44. If hook body 1 is rotated to the right, as viewed in Fig. 1, disc-like member 27 is also

4

caused to move to the right, in turn causing cable 22 to move over pulley 45, pulling piston 41 downwardly within cylinder 40 against the bias of spring 44. It will be appreciated, therefore, that spring 44 resists any tendency of member 27 to rotate and tends to return disc-like member 27 and hook body 1 to its normal position with respect to housing 4.

If a force of more than a predetermined value is applied to hook body 1, alignment assembly 20 cannot return the hook body to its normal position and it is for this reason that clutch assembly 21 is provided. When such a force is applied to hook body 1, balls 32 are forced upwardly within recesses 30 against the bias of springs 33, permitting hook body 1 and member 23 to rotate with the disc-like member 27. The point at which this occurs is, of course, determined by the strength of spring 33. When, of course, the misalignment force ceases to operate or drops below the predetermined value, ball 32 is forced into one of the depressions 31 in the upper surface 24' of member 23, alignment assembly 20 again being ready to maintain hook body 1 in normal alignment with housing 4.

Referring to Figs. 4, 5, and 6, the numeral 100 designates a hook body which is affixed to a shank 101 by means of shank pin 102. Affixed to the upper end of shank 101 is shank nut 103, both of which are disposed within housing 104 for limited longitudinal movement therein as well as for free rotation therein. Affixed to the lower surface of shank nut 103 is bearing assembly 105. Housing 104 defines an inwardly extending shoulder 106 adjacent its lower end and a stop 107 adjacent its upper end. Shank 101 defines a squared portion 108 at its lower end upon which is mounted a swivel ring 109 which is adapted to be moved slidably on squared portion 108 and, accordingly, to rotate with shank 101. The outer surface of swivel ring 109 is such as to permit its rotation in housing 104 when shank 101 is rotated. Disposed between surface 110 of swivel ring 109 and shoulder 106 of housing 104 is a bearing assembly 111. A spring 112 circumscribes shank 101, the upper end of spring 112 abutting against bearing 105 and the lower end of spring 112 abutting against surface 113 of swivel ring 109. Of course, spring 112 biases nut 103 and shank 101 upwardly while biasing swivel ring 109 downwardly. Ball bearing assembly 111 is provided so that shank 101 can rotate freely within housing 104 when the load on hook body 100 is insufficient to compress spring 112 and cause bearing assembly 105 to abut upon shoulder 107. On the other hand, when hook body 100 carries a full load, spring 112 is compressed so that bearing assembly 105 abuts upon shoulder 107. When this condition occurs, the full weight on hook body 100 is transmitted through bearing 105 to housing 104.

A releasable latching mechanism may be mounted on housing 104 opposite swivel ring 109 so that swivel ring 109 can be fixed against rotation with respect to housing 104 when the latching mechanism is engaged with the swivel ring and permitted to rotate with respect to housing 104 when the latching mechanism is disengaged. A number of different latching mechanisms for this purpose are commercially available and, accordingly, their construction will not be described here, particularly since the provision of such mechanisms is not part of the present invention. As a matter of fact, the structure of Fig. 4 so far described hereinbefore is conventional in drilling

75 hooks. My invention consists of providing along

with this conventional structure means for normally maintaining the hook body 100 in alignment with respect to housing 104. This means will now be described in detail.

Referring again to Fig. 4, the numeral 115 designates a member mounted on the squared portion 108 of shank 101 for movement thereon longitudinally of the shank without rotation with respect thereto. In order to accomplish this, a squared opening 116 is provided in member 115 which is adapted to engage with the squared portion 108 of shank 101. Member 115 consists of a lower disc-like portion 117 and an upper disc-like portion 118, an annular recess 119 being defined therebetween. Mounted within annular recess 119 for free rotation with respect to member 115 is a disc-like member 120, member 120 being spaced from portions 117 and 118 by means of bearings 121 and 122, respectively. Lower disc-like portion 117 is provided with at least one depression 123, and preferably with the series of circumferentially spaced depressions, in its upper surface 117' while the lower surface 120' of member 120 is provided with one or more recesses 124. Recesses 124 are positioned so that they match up with depressions 123, recesses 124 being provided with a ball 125 biased toward disc-like portion 117 by means of a spring 126. It will be noted that ball 125 fits into a depression 123.

A torsion spring 127 having one end affixed to housing 104 by means of bolt 128 and the other end affixed to disc-like member 120 by means of bolt 129 and spacer 130 is of sufficient strength normally to return hook body 100 to a predetermined radial position with respect to housing 104 when a force is applied to hook body 100 which tends to move it from said position. Rollers 131 are rotatably mounted on the lower end of housing 104 so as to provide rolling contact between member 115 and housing 104.

Any force of less than a predetermined value tending to rotate hook body 100 will be transmitted through member 115 and balls 125 to disc-like member 120. However, rotative motion of disc-like member 120 with respect to housing 104 is resisted by means of torsion spring 127 and torsion spring 127 will therefore tend to maintain hook body 100 in a predetermined radial position with respect to housing 104. If, on the other hand, a force of more than a predetermined value is applied to hook body 100 for rotating said body, torsion spring 127 will be unable to resist rotation of hook body 100 and it is for this reason that the clutch assembly hereinbefore described is provided. When such a force is applied to hook body 100, balls 125 are forced upwardly within recess 124 against the bias of springs 126, permitting hook body 100, shank 101, and member 115 to rotate with respect to disc-like member 120. The point at which this occurs is, of course, determined by the strength of springs 126 and torsion spring 127. When the misalignment force acting upon body 100 ceases to operate thereon or drops below the predetermined value, balls 125 are forced into one of the depressions 123 in the upper surface 117' of member 117, torsion spring 127 again being ready to maintain hook body 100 in normal alignment with respect to housing 104.

Referring to Figs. 7 and 8, numeral 150 refers to a hook body defining a shank 151 at its upper end and a bill 152 at its lower end. Shank 151 is connected to a bail 153 by means of shank nut 154 so that hook body 150 is free to rotate with respect to bail 153. Bill 152 is shown as being

provided with a latching arm 155 pivotally connected to said bill by means of latching arm pin 156. A latch 157 is pivotally connected by means of latch pin 158 to body 150 for engagement with latching arm 155 for enclosing load receiving recess 159.

Affixed to shank 151 is disc 160. Disposed above disc 160 and circumscribing shank 151 is a second disc 161. Disc 161 is free to move radially with respect to shank 151. One end of a torsion spring 162 is affixed to disc 161, as by means of bolt 163, while the other end of torsion spring 162 is affixed to bail 153, as by means of a bolt 164. The upper surface 165 of disc 160 is provided with at least one depression 166, and preferably with a series of radially spaced depressions 166, while the lower surface 166' of disc 161 is provided with at least one recess 167. Mounted within recess 167 is a ball 168 which is biased toward disc 160 by means of a spring 169. Recess 167 in disc 161 is so arranged with respect to depressions 166 in disc 160 that ball 168 is normally forced into one of said depressions by spring 169.

If a force of less than a predetermined magnitude is applied to hook body 150 for rotating said body, torsion spring 162 tends to resist this motion. This comes about because the force tending to rotate body 150 is transmitted through disc 160 and balls 168 to disc 161. Because the force is of less than a predetermined magnitude, torsion spring 162 returns hook body 150 to its normal predetermined position. If, on the other hand, a force of more than a predetermined magnitude is applied to hook body 150 tending to rotate said body, balls 168 are forced upwardly against the bias of spring 169, thus permitting disc 160 to rotate relative to disc 161. This relative rotation will continue until the force rotating the hook body drops below the predetermined value, at which time spring 169 will force ball 168 into one of depressions 166, after which torsion spring 162 will return hook body 150 to its normal alignment.

Rather than using the clutch arrangement shown in the embodiments of Figs. 1 and 4, any clutch arrangement may be used in which the hook body is yieldably connected to the housing by a locking part adapted to secure the hook body and the housing together to cause them to move radially in unison under normal conditions and to permit the hook body to rotate independently of the housing when the hook body is subjected to an abnormal force tending to rotate same. Figs. 9, 10, and 11 illustrate suitable clutch arrangements which may be used in connection with the embodiment shown in Fig. 1 and may be suitably modified to be employed in the embodiment shown in Fig. 4.

Referring to Fig. 9, the numeral 170 designates a member slidably mounted on the squared portion 2' of shank 2 as previously shown for movement thereon longitudinally of the shank. Member 170 defines a squared opening 171 adapted to fit around squared portion 2' so as to prevent rotation of member 170 with respect to shank 2. Member 170 consists of a lower disc-like portion 172 and an upper disc-like portion 173 with an annular recess 174 being defined therebetween. Mounted within annular recess 174 for free rotation with respect to member 170 is a disc-like member 175 which is spaced from portions 172 and 173 by means of bearings 176 and 177, respectively. The lower surface 175' of disc-like member 175 is provided with one or more recesses 178

within which is mounted a friction button 179 biased downwardly by means of spring 180. The lower surface 181 of button 179 abuts on upper surface 182 of disc-like portion 172. Affixed to the upper surface of disc-like member 175 is a cable 183 which may be connected to piston rod 42 of the alignment assembly shown in Figs. 1 and 2.

Referring to Fig. 10, member 190 is shown as being slidably mounted on squared portion 2' of shank 2. Member 190 is provided with a squared opening 191 which fits around squared portion 2' so that member 190 may be moved longitudinally with respect to shank 2 and rotated together. Member 190 consists of a lower disc-like portion 192 and an upper disc-like portion 193 with an annular recess 194 defined therebetween. Mounted within annular recess 194 for free rotation with respect to member 190 is a disc-like portion 195 which is spaced from portions 192 and 193 by means of bearings 196 and 197, respectively. Mounted within an annular recess 198 defined in the lower surface 199 of disc-like member 195 is a saw-toothed ring 200. Ring 200 is affixed to disc 195 by means of bolts 201, ring 200 having a continuous series of downwardly projecting teeth 202. Portion 192 is provided with an annular recess 203 just opposite recess 198 in disc-like member 195. In recess 203 is mounted a ring 204 with a continuous series of upwardly extending teeth 205 which are adapted to mate with teeth 202 of ring 200 in the manner indicated in Fig. 11. Ring 204 is provided with a plurality of downwardly depending pins 206 adapted to extend through openings 207 in disc-like portion 192 and around which are springs 208. Springs 208 bias ring 204 upwardly so that teeth 205 are normally pressed into mating engagement with teeth 202 of ring 200. If a rotative force of less than a predetermined value is applied to a hook body affixed to shank 2, disc-like member 195 rotates along with member 190 because of the engagement of teeth 205 with teeth 202. When, however, a force of more than a predetermined magnitude is applied to the hook body, teeth 205 slide over teeth 202, compressing springs 208 in so doing. Teeth 205 continue to slide over teeth 202 until the force tending to rotate the hook body drops below a selected predetermined value, at which time teeth 205 and 202 cease to slide over each other.

It will be apparent that various modifications may be made in the device disclosed without departing from the spirit of my invention.

Having fully described and illustrated the hook of my invention, what I desire to claim and to secure by Letters Patent is:

1. A load suspending device comprising, in combination, a load supporting member; a hook member suspended from said load supporting member and adapted for rotative motion relative to said load supporting member; biasing means arranged externally of said load supporting member and acting to maintain said hook member in a predetermined radial position with respect to said load supporting member; and a clutch member disposed between said load supporting member and said hook member, said clutch member acting normally to prevent rotation of said hook member with respect to said load supporting member but to permit said member to rotate with

respect to said load supporting member when the forces tending to rotate said hook member exceed a predetermined selected value.

2. A load suspending device comprising, in combination, a housing; a hook suspended from said housing, said hook being adapted for rotative motion relative to said housing; biasing means mounted exteriorly on said housing and arranged normally to maintain said hook in a predetermined radial position with respect to said housing; and a clutch disposed between said housing and said hook and arranged to permit relative rotative motion between said hook and said housing when the forces tending to rotate said hook exceed a predetermined selected value.

3. A load suspending device comprising, in combination, a load supporting housing; a hook member yieldably suspended by means of a spring from said housing and adapted for limited longitudinal motion relative to said housing, said hook member being freely rotatable with respect to said housing; spring means arranged externally of said housing and acting to bias said hook member to a predetermined radial position with respect to said housing; and a clutch member associated with said housing and said hook member to permit relative rotative motion between said hook member and said housing when the forces tending to rotate said hook member exceed a predetermined selected value.

4. A load suspending device comprising, in combination, a housing; a hook suspended from said housing, said hook being adapted for rotative motion relative to said housing; spring means mounted exteriorly on said housing and arranged normally to maintain said hook in a predetermined radial position with respect to said housing; and a clutch disposed between said housing and said hook and arranged to permit relative rotative motion between said hook and said housing when the forces tending to rotate said hook exceed a predetermined selected value.

5. A load suspending device comprising, in combination, a housing; a hook suspended from said housing for rotary motion relative thereto; a clutch comprising a pair of discs, one of which is affixed to said hook and the other of which is free to rotate with respect to said hook; means disposed between said discs to permit said discs normally to move together but also to permit the disc affixed to the hook to rotate therewith while the other of said discs remains stationary when a force in excess of a predetermined value is applied to said hook for rotating said hook; and a spring having one end affixed to said housing externally thereof and the other end affixed to the other of said discs, said spring being arranged to bias said other disc to a normal position relative to said housing.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
998,615	Huneke	July 25, 1911
1,672,964	Stull	June 12, 1928
2,158,373	Long	May 16, 1939
2,464,590	Landahl	Mar. 15, 1949
2,588,654	Nystrom et al.	Mar. 11, 1952