April 12, 1966 C. R. LYLES 3,245,128

OIL WELL ROPE SOCKET TOOL

Original Filed May 4, 1961

FIG. 1

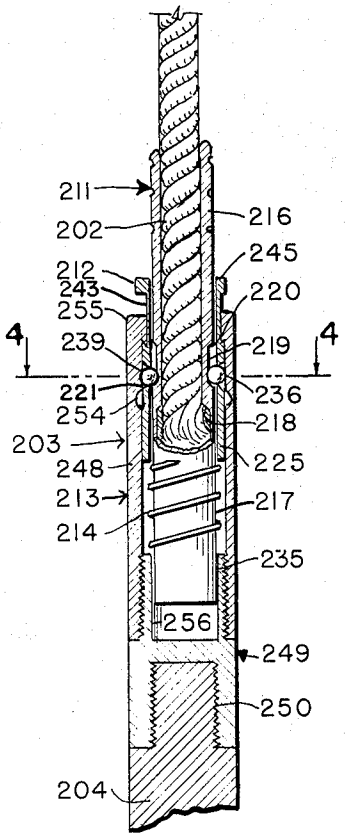


FIG. 2

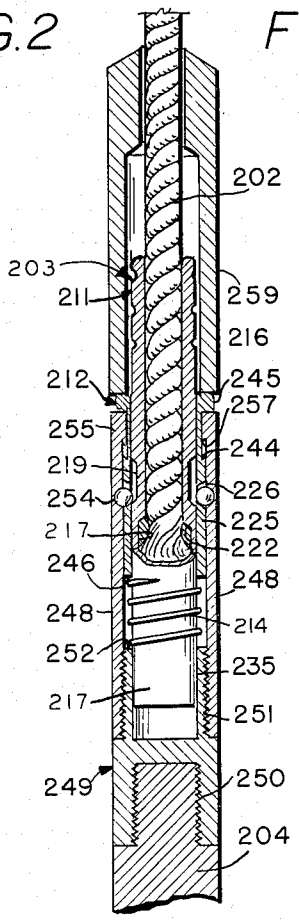


FIG. 3

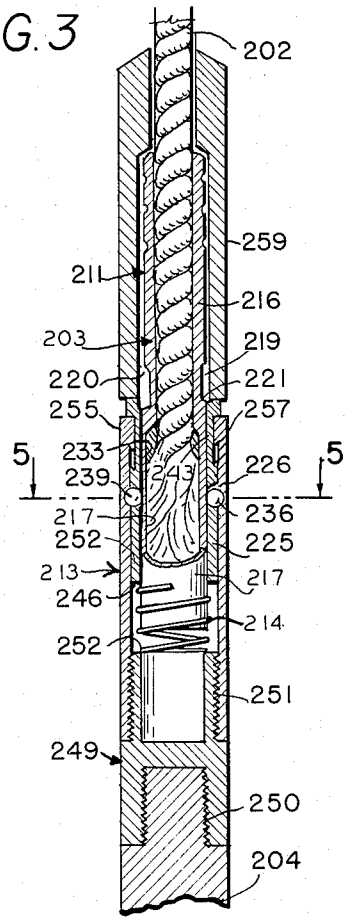


FIG. 4

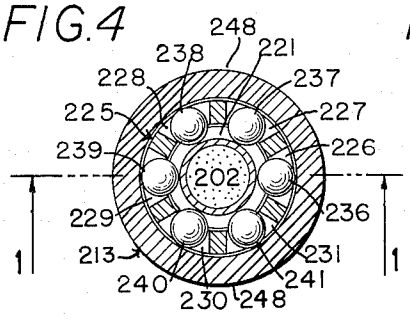
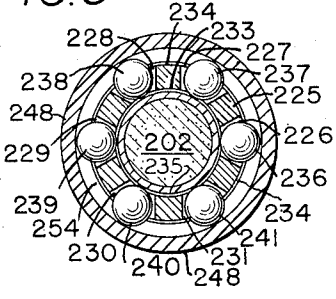


FIG. 5



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3,245,128

OIL WELL ROPE SOCKET TOOL

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Original application May 4, 1961, Ser. No. 107,837. Divided and this application Sept. 17, 1962, Ser. No. 224,095

3 Claims. (Cl. 24—123)

This application is a divisional application of my co-pending United States patent application Serial No. 107,837 filed May 4, 1961. This invention relates to an oil well tool. More particularly, this invention relates to a device for use in oil wells for controlling other tools or instruments in said well. Yet more particularly, this invention relates to a rope socket device for moving other tools within a well hole.

One object of this invention is to provide a mechanism operable down well and controllable from the surface for controlling the position of components in an oil well tool.

Another object of this invention is to provide an improved releasable locking mechanism.

A further object of this invention is to provide a releasable rope socket incorporating the releasable locking mechanism.

Still further object of this invention is to provide a releasable rope socket.

Other objects of this invention will be apparent to those skilled in the art on study of the below disclosure of which the drawings attached hereto form a part.

In the attached drawings, wherein like numerals denote like parts in the various figures:

FIGURE 1 is an overall diagrammatic longitudinal view of a rope socket according to this invention in a beginning operative position, said device being shown broken away in part along section **1—1** of FIGURE 4;

FIGURE 2 is a view of the device of FIGURE 1 in a stage of operation subsequent to that shown in FIGURE 1 and viewed as in FIGURE 1;

FIGURE 3 is a view of the device of FIGURE 1 in a stage of operation subsequent to that shown in FIGURE 2 and viewed as in FIGURE 1;

FIGURE 4 is a cross sectional view taken along plane **4—4** of FIGURE 1; and

FIGURE 5 is a cross sectional view taken along plane **5—5** of FIGURE 3.

According to one embodiment of this invention, a wire line or rope **202** as used in oil fields is connected through a releasable socket assembly, generally shown as **203**, to a fish or tool generally shown as **204**. Generally, the releasable socket assembly comprises a shell subassembly **211**, a detent subassembly **212**, a tubular sleeve subassembly **213**, and a spring **214**, as shown in FIGURE 1 in its tool supporting position.

The shell subassembly **211** comprises an elongated thick walled tube, section **216**, connected to a tubular downward extension thereof, section **217**, with thinner walls; the thick walled section and the thin walled section both have the same outer diameter and are joined together by an inner shoulder **218**; the thicker wall section **216** is provided with an external annular recess or groove **219**; the external annular groove **219** is coaxial with the central longitudinal axis of the cylindrical tube **216**. This groove has an upper upwardly and outwardly sloped outer

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shoulder **220** and a lower downwardly and outwardly sloped outer shoulder **221**, the lower shoulder **221** is above the level of the inner shoulder **218**. The slope of those shoulders (45°) permits the locking balls to move in and out of such recess or groove readily. The depth of recess or groove **219** is sufficient to provide a strong locking action between the detent subassembly **212** and the shell subassembly **211**.

The detent subassembly **212** is comprised of a tubular member having two portions. The lower thicker portion is comprised of a hollow cylindrical tubular detent ball retaining member **225** provided with thick walls and a plurality of equi-spaced conically shaped passageways therethrough indicated as **226, 227, 228, 229, 230** and **231**. Each of these passageways has an orifice opening to the interior surface **233** of the tubular detent ball retaining member **225** which orifice is smaller than the orifice of each such passageway opening to the outer surface **234** of said tubular detent ball retaining member **225**. These passageways are all arranged with their center in a plane normal to the axis of the tubular detent ball retaining member **225**. The inner surface **233** of the tubular detent ball retaining member **225** and the outer surface **235** of the shell subassembly **211** are slightly spaced away from each other allowing a smooth sliding action therebetween.

Spherical balls as **236, 237, 238, 239, 240** and **241**, respectively, are each located in each of the passegways **226, 227, 228, 229, 230** and **231** therefor, respectively. The diameter of each of these balls is greater than the diameter of the orifice of each of said passageways opening to the interior surface **233** of the tubular detent ball retaining member **225**. The axis of the cone defining the conical surface of each of said passageways **226** through **231** is normal to the longitudinal axis of the tubular detent ball retaining member **225**. The thickness of the tubular detent ball retaining member **225** is ½ the diameter of a ball such as **236** through **241**. The diameter of the orifices of each of the passageways, as **226** to **231**, opening to the interior surface **233** of the tubular detent ball retaining member **225**, is sufficiently large so that when said balls rest on the inner surface of the tubular sleeve member **248** as shown in FIGURES 1 and 4 such balls project through the orifices of such passageways interiorly therefrom for the depth of the annular recess or groove **219** which depth about ⅜ the diameter of said balls. However, the size of the orifice of each such passageway is less than the size of the balls and the conical taper of the passageway walls provide, as in elements **39** and **139** described in my co-pending patent application Serial No. 107,837, that such balls may not escape from passageways **236** through **241**.

Above the thick walled tubular detent ball retaining member **225** of the detent subassembly **212**, is a narrower tubular locking portion **243** separated from the thicker tubular detent ball retaining member **225** by a shoulder **244**. The inner surface **233** of tubular detent ball retaining member **225** and tubular locking portion **243** are coextensive with each other. A collar **245** is provided at the upper end of the tubular locking portion **243** and extends laterally over the upper end of tubular sleeve member **248**. The upper portion of tubular sleeve member **248** forms a shoulder **257** below a collar **255**.

The tubular sleeve subassembly 213 comprises a tubular sleeve 248 and a coupling 249 provided with a female socket 250 and a male threaded socket portion 251; the male threaded socket portion 251 has a lesser internal diameter than does the tubular sleeve member 248 and provides a shoulder 252. The tubular sleeve member 248 is firmly attached, as by screwing, onto the male threaded socket portion 251. At its upper end the tubular sleeve member 248 is provided with an internal annular recess 254 which is coaxial to the longitudinal axis of the tubular sleeve member 248: the shape of the recess is hemispherical in cross section opening into the inner surface of tubular sleeve member 248 with an obtuse angle of about 130°. The depth of this recess from the interior surface of tubular sleeve member 248 is ⅜ to ½ the diameter of the locking balls as 236 to 241. This provides a sufficient depth for the balls therein to completely avoid any contact with the annular recess 219. The angle of meeting of such recess with the passageways 236 through 241 is small enough to permit the balls to move in and out of such recess readily. The shape of the recess matches a diametral cross-section of such balls for reception thereof. A collar 255 is provided at the top of tubular sleeve member 248. The internal diameter of the male threaded socket portion 251 is slightly larger than and slidably fits over the outside of the thin walled tubular section 217 of the shell subassembly 211.

The inner surface of the collar 255 is a hollow cylinder which provides a slidable fit for the tubular locking portion 243 of the detent subassembly 212. A compression spring 214 is firmly located between the shoulder 252 and the bottom edge 246 of the tubular detent ball retaining member 225.

In operation, the wire cable 202 supports the releasable socket subassembly 203 and a tool 204 therebelow. Accordingly, the position of the tool 204 may be controlled to be placed in a position as desired. Upon the positioning of the well tool 204 at such level as is desired a tubular weight, as 259, which encircles the rope 202 and has a greater internal diameter than the external diameter of tube 217, may be dropped down the well. This weight will strike the upper shoulder of the collar 245 (as shown in FIGURE 2) and depress the detent ball retaining member with respect to the tubular sleeve member 248 to an extent equal to the height which the lower portion of the collar 245 extends above the upper portion of the collar 255 of the tubular sleeve subassembly 213. Thereupon, the ring of detent retaining passageways 226 through 231 is moved downwardly with respect to the tubular sleeve member 248 and is brought into registration with the internal annular recess 254. Inasmuch as the total of the depth of the annular recess 254 and the thickness of the tubular detent ball retaining member 225 is at least as great as the diameter of the balls 236 through 241 carried in those passageways, the weight 259 maintains the collar of the subassembly in its position as shown in FIGURE 2 by overcoming the upward force of the spring, such detent balls offer no opposition to the movement of the section 217 past such balls as shown in FIGURE 3 and, accordingly, permit the ready removal of the wire line 202 with shell subassembly 211 from the releasable socket assembly 203, as shown in FIGURE 3.

At the surface, the wire line 202 is readily inserted in the releaseable socket assembly 203 by depressing the collar 245 to avoid that the balls 236 through 241 would project inwardly, as in FIGURES 1 and 4, and prevent such insertion of the shell subassembly 211 into the tubular sleeve subassembly 213; accordingly, the collar 245 contacts the collar 255 and the passageways 226 through 231 are brought into registration with the annular recess 254: this permits the shell sub-assembly 211 to be located in place as shown in FIGURE 2.

On release of the collar 245 the spring 214 expands and moves the detent ball retaining member 225 into a position shown in FIGURE 1 whereat the balls 236 through 241 serve to lock the tubular section 216 to the tubular detent ball retaining member 225 as shown in FIGURE 1. In such position the weight of the tool 204 passes by socket 250 to tubular sleeve member 248 to shoulder 257 of collar 255 and thence to detent ball retaining member 225 and the walls of the passageways 226 through 231; thence to balls 236 through 241, respectively therein. The balls transmit the load to lower shoulder 221 of annular recess or groove 219, the section 216, and shoulder 218, especially with babbit 222, and pass the load to the wire line 202. The wire line 202 then supports the socket assembly 203 and the fish 204 until such are lowered into a position in the well where release of such tool is desired, which is accomplished as above described.

The fish 204 and the releasable socket assembly 203 may be recovered by conventional fishing tools or, preferably by a device as shown in my co-pending U.S. patent application Serial No. 97,287 filed March 21, 1961, in FIGURE 12 (now U.S. Patent 3,186,745 issued June 1, 1965).

Having thus described a preferred embodiment of the means by which the objects of this invention are obtained, modifications thereof within the skill of the art are intended to be included within the scope of the appended claims.

I claim:

1. A well tool releasable locking subassembly repeatably settable, while located subsurface, in each of a plurality of positions comprising a detent retaining means and detents carried thereby, a fixed member and a movable member, said detent retaining means comprising a generally cylindrical hollow sleeve with a central longitudinal axis, a plurality of passageways each extending from the interior surface of said sleeve through the thickness of the walls of said sleeve to the exterior surface of said sleeve, said passageways each providing a path through said wall normal to the central longitudinal axis of said cylindrical sleeve, said detents each being a movable detent having a circular cross section in each said passageway, each said detent having a greater thickness than said sleeve wall, said fixed member having an interior wall closely yet slidably fitting the exterior surface of the wall of said generally cylindrical hollow sleeve, means in each said passageway preventing the escape of the detent therein from said passageway through the end thereof distant from said interior wall of said fixed member, a recess in said interior wall of said fixed member adapted to receive a large portion of each said detent, the total of the depth of said recess and the thickness of said wall of said generally cylindrical hollow sleeve member being at least as great as the thickness of each of said detents in each said passageway therefor, said movable member having a cylindrical wall with its outer surface slidably fitting adjacent to the interior surface of the wall of said generally cylindrical hollow sleeve member, and an annular exteriorly open recess at an intermediate portion along the length of the outer cylindrical surface of the wall of said movable member, said wall surface except for said recess being cylindrical, said recess being adapted to receive a portion of each of said detents, the total of the depth of said recess in said movable member and the thickness of said wall of said generally cylindrical hollow sleeve member being at least as great as the thickness of each of said detents in each said passageway therefor, and wherein said detent retaining means has a laterally projecting shoulder which extends over the top of said fixed member and is urged upwardly by a spring between the bottom of said detent retaining means and an upwardly facing surface of said fixed member to maintain said passageways in said generally cylindrical hollow sleeve out of registration with respect to the inwardly open recess in the interior surface of the fixed member wall and said movable member comprises a sleeve attached to a rope, and wherein said

rope extends upwardly therefrom and, in combination therewith, a weight member encircling said rope and with an internal cavity open at both its upper and lower ends and having at its lower end an opening greater than the external diameter of the movable member and said lower end of said weight member being engagable with the upper end of the detent retaining means and of sufficient weight to compress the spring to bring the passageways in said detent retaining means sleeve into registration with the opening of the inwardly open recess in the interior surface of the fixed member wall.

2. Apparatus as in claim 1 wherein the detents are spherical in shape and the edges of the opening of each of the passageways in the detent retaining means at the end thereof distant from said interior wall of said fixed member are spaced apart a distance less than the full diameter of said spherical detent.

3. Apparatus as in claim 1 wherein the distance from the bottom of the outwardly projecting shoulder of the detent retaining means to the center of the passageways

through said sleeve of said detent retaining means is substantially the same distance as the axial distance of the center of the opening of the recess in the interior wall of the fixed member to the top of said fixed member.

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