

Sept. 29, 1959

J. L. JOHNSTON

2,906,346

SLIP ACTUATING DEVICE

Filed Aug. 1, 1955

2 Sheets-Sheet 1

FIG. 1

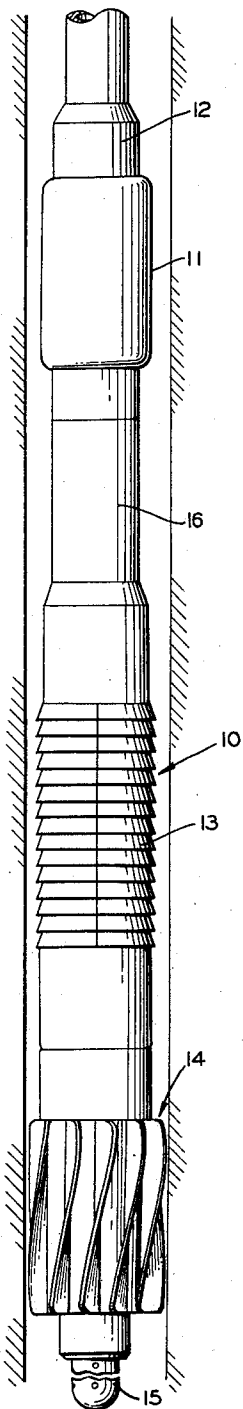
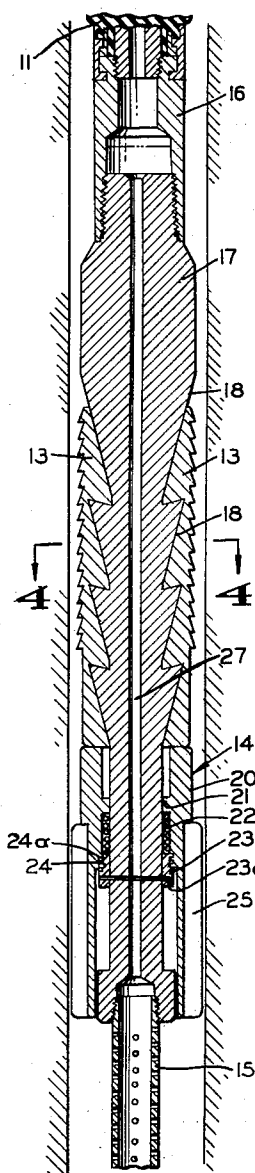


FIG. 2

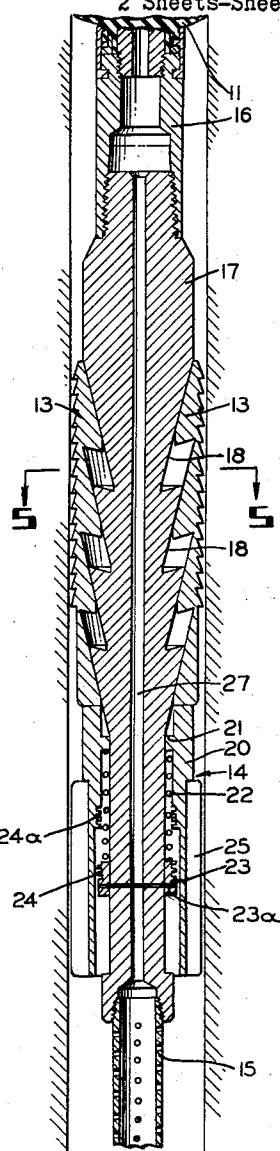


FIG. 3

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FIG. 4

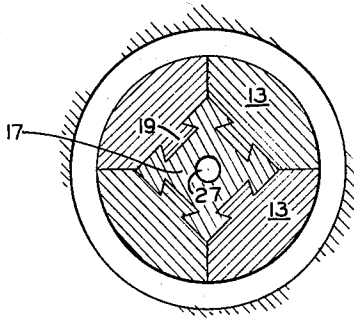


FIG. 5

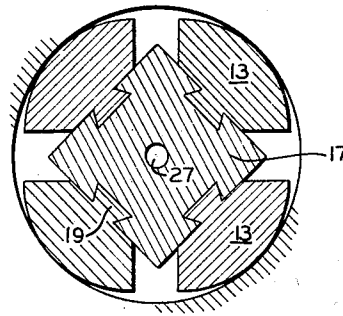
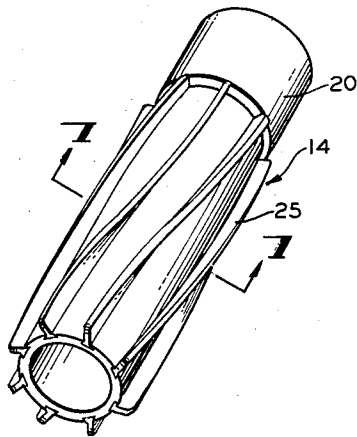


FIG. 6

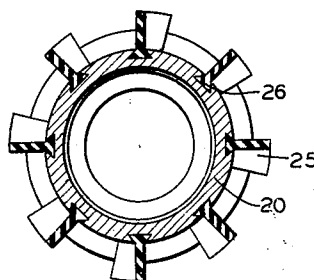


FIG. 7

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2,906,346

SLIP ACTUATING DEVICE

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Application August 1, 1955, Serial No. 525,591

3 Claims. (Cl. 166—214)

This invention relates to a well tool, and more particularly to a slip actuating device for use with various well tools employing slips such as well packers, tubing anchors and the like.

The principal object of this invention is to provide a novel slip actuating mechanism for use with well packers, tubing anchors or the like, said actuating mechanism being actuated by rotation of the well string in combination with the fluid within the well bore.

A further object of this invention is to provide a slip actuating mechanism wherein the slips are actuated by relative longitudinal movement between two members which are originally threadedly connected, and wherein the threaded connection may be disconnected by rotation of the well string.

One form which the invention may assume is exemplified in the following description and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a view in elevation embodying the principles of the invention and showing the device in combination with a well packer.

Fig. 2 is a sectional view of the slip mechanism per se, the elements being shown in their initial locked position.

Fig. 3 is a view similar to that shown in Fig. 2, but showing the elements released and the slips expanded.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3.

Fig. 6 is a perspective view of the slip actuating collar.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 6.

The slip mechanism disclosed herein may be used as a tubing support or may be incorporated into a packer construction in the manner shown herein. The structure of the packer per se forms no part of the instant invention. For purposes of illustration, the packer may be of the type shown in the United States Patent No. 2,390,372, issued December 1945, to M. O. Johnston et al.

Referring now to the drawings, and particularly Fig. 1 thereof, there is disclosed a slip mechanism generally indicated at 10 attached to the lower end of a packer 11 which in turn is fastened to the lower end of a well tubing string 12. Below the packer 11 is a plurality of slips 13 and an actuating element generally indicated at 14. A well screen 15 is attached below the slip mechanism.

Referring now to Figs. 2 and 3, a tubular sub 16 is attached to the lower end of packer 11 and a mandrel 17 is fastened to the lower end of sub 16. The mandrel 17 has a plurality of downwardly and inwardly tapered surfaces 18 which cooperate with upwardly and outwardly tapered internal surfaces on slips 13. The slips 13 are fastened to the mandrel 17 by dovetail joints 19 in the manner best seen in Figs. 4 and 5.

A tubular sleeve 20 surrounds the lower end of mandrel 17 and has an internal flange 21 in sliding engagement therewith. The upper end of sleeve 20 is in abutting relation with the lower ends of the slips. A compression spring 22, confined between flange 21 and an abutment 23 fixed to the mandrel by a pin 23a, normally urges the

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sleeve and hence the slips upwardly toward their expanded position. The abutment 23 has a coarse external thread 24 formed thereon and the sleeve 20 has a mating internal thread 24a. When the threads are interengaged, they retain the sleeve 20 in its lower position relative to the mandrel.

As can best be seen in Fig. 6, the sleeve 20 has a plurality of laterally extending vanes 25 made of elastomer material dovetailed into the outer surface of the sleeve 20 in the manner shown at 26. Since the vanes are made of elastomer material, they may be deformed if they meet with an obstacle while descending in the well but will reassume their original configuration when the obstacle is passed. The vanes 25 are spirally arranged on the outer surface of the sleeve, whereby as the sleeve is lowered through the fluid in the well, the spiral of the vanes will tend to rotate the sleeve 20 in a direction to tighten the threaded connection 24a, 24 between the sleeve and mandrel.

In the use of the device, the parts are assembled in the relationship shown in Fig. 2 and the device is then lowered in the well. During the lowering, the threads 24a and 24 are prevented from unthreading by the well fluid acting against the spiral vanes 25, the pitch of which is such that the fluid flowing upwardly relative to the tool tends to rotate sleeve 20 in a direction to thread the parts together.

When the desired location is attained, the well string and with it mandrel 17 are rotated by the rotary table (not shown), and the fluid in the well bore acts on vanes 25 to retard the rotation of sleeve 20, thus causing the mandrel to rotate relative thereto to unthread the connection 24a, 24. When the threads 24a and 24 disengage, the spring 22 forces the sleeve 20 upwardly relative to the mandrel and the sleeve in turn forces slips 13 upwardly, and due to the tapered surfaces 18, the slips are forced outwardly into engagement with the well bore. Downward weight is then applied to the upper end of the packer 11 to set the packer in the well bore.

While I have shown and described the preferred form of my invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A slip actuating device for use in a borehole containing well fluid, comprising a mandrel, a plurality of downwardly and inwardly tapered surfaces on said mandrel, a plurality of slips having downwardly and inwardly directed surfaces in engagement with said tapered mandrel surfaces, said slips being movable outwardly to a borehole engaging position, a sleeve slidably and rotatably mounted on said mandrel and abutting the lower ends of said slips, said sleeve having an intermediate portion in spaced relation to said mandrel, said mandrel and said intermediate portion of said sleeve having complementary portions of threaded means for releasably interconnecting the intermediate portion of said sleeve and said mandrel, each of said portions being fixed to the corresponding one of said mandrel and said intermediate portion of said sleeve, a spring positioned above said threaded means and enclosed by said sleeve about said mandrel for urging said sleeve upwardly relative to said mandrel, and a plurality of vanes of elastomer material extending radially outwardly from the outer surface of said sleeve, whereby well fluid acting on said vanes retards rotation of said sleeve upon rotation of said mandrel to release said threaded means and set said slips.

2. A slip actuating device for use in a borehole containing well fluid, comprising a mandrel, a plurality of downwardly and inwardly tapered surfaces on said man-

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drel, a plurality of slips having downwardly and inwardly directed surfaces in engagement with said tapered mandrel surfaces, said slips being movable outwardly into engagement with the borehole, a sleeve abutting the lower ends of said slips, means including an inturned flange on said sleeve for rotatably and slidably mounting said sleeve on said mandrel, a spring enclosed by said sleeve and surrounding said mandrel for acting between said mandrel and said flange to urge said sleeve upwardly relative to said mandrel, annular threaded means on said mandrel positioned below said spring and threadably connected to said sleeve for retaining said sleeve against the action of said spring, and means including a plurality of spiral vanes of elastomer material extending radially outwardly from said sleeve for retaining said threaded means in engagement while the device is being lowered through the borehole and for promoting rotation of said sleeve relative to said mandrel when said mandrel is rotated, whereby said threaded means may be disengaged and said spring may slide said sleeve upwardly to set said slips.

3. A slip actuating device for use in a well containing fluid, comprising a mandrel having a downwardly and inwardly tapered surface portion, slips slidably mounted on said surface portion for movement outwardly thereof into a wall engaging position, a sleeve slidably and rotatably mounted on said mandrel and abutting the lower

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ends of said slips, said mandrel and said sleeve each having abutment means secured thereto in longitudinally fixed relation, a spring enclosed by said sleeve and acting between said abutment means of said sleeve and said mandrel for urging said sleeve to slide upwardly to move said slips into wall engaging position, said sleeve and said mandrel having complementary thread portions providing a threaded connection below said spring, said complementary thread portions being secured in fixed relation to the corresponding one of said mandrel and said sleeve to retain said sleeve against the action of said spring when said thread portions are engaged, and a plurality of vanes extending outwardly from the outer surface of said sleeve to retard rotation of said sleeve relative to said fluid and promote rotation of said sleeve relative to said mandrel to unthread said sleeve for movement of said slips into wall engaging position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,028,759	McKee	June 4, 1912
2,031,056	McKissick	Feb. 18, 1936
2,338,300	Rembert	Jan. 4, 1944
2,427,330	Spencer	Sept. 9, 1947
2,714,500	Snyder	Aug. 2, 1955