April 11, 1939. J. D. NIXON 2,153,770

SLIP ASSEMBLY

Filed July 9, 1936 2 Sheets-Sheet 1

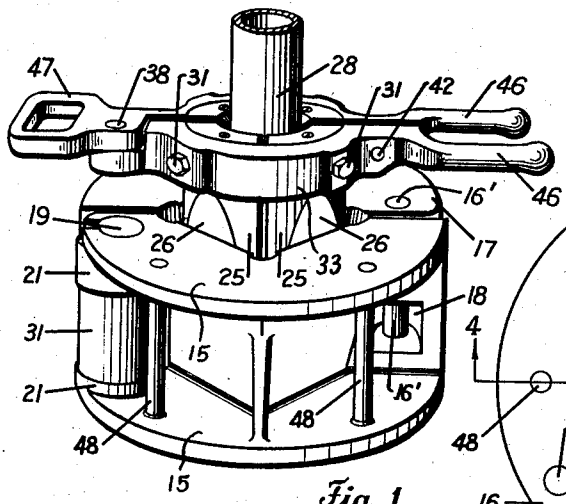


Fig. 1

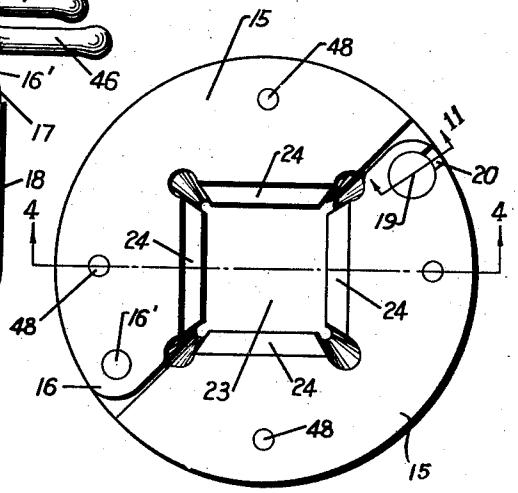


Fig. 3

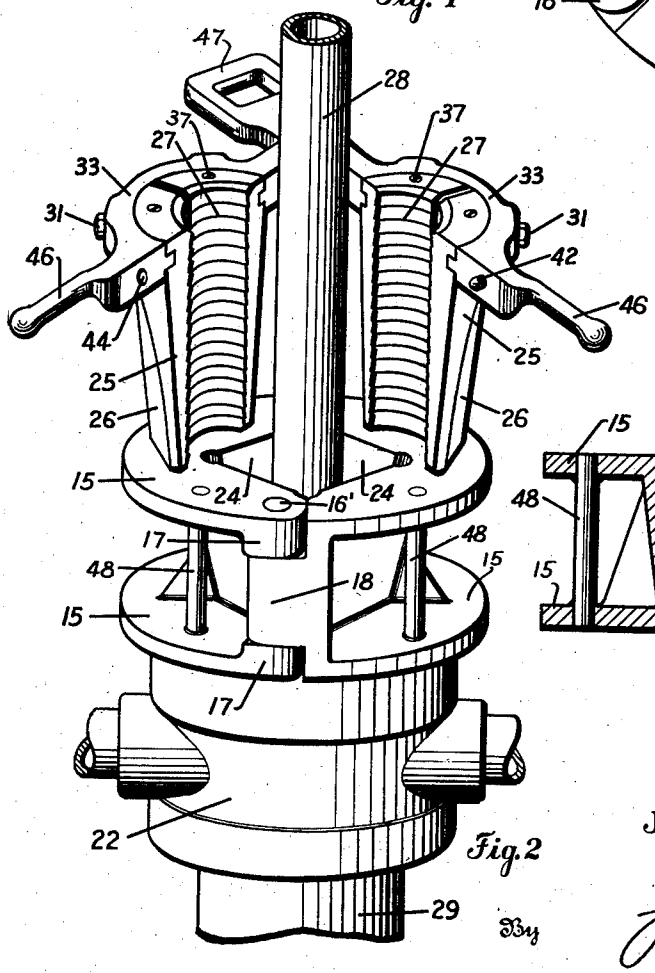


Fig. 2

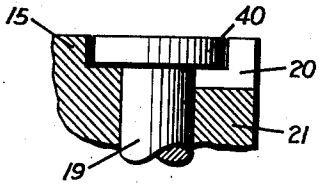


Fig. 11

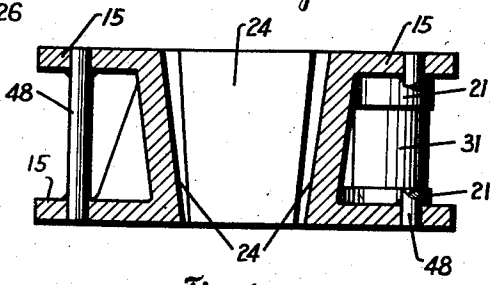


Fig. 4

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SLIP ASSEMBLY

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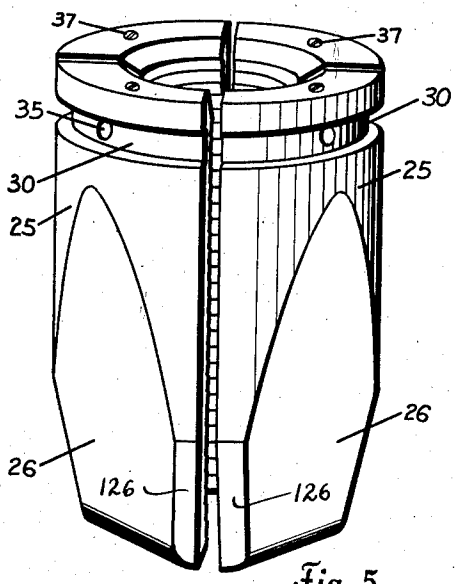


Fig. 5

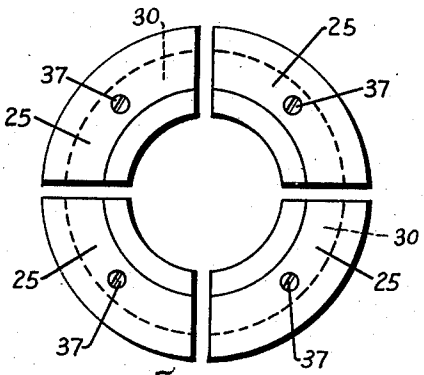


Fig. 6

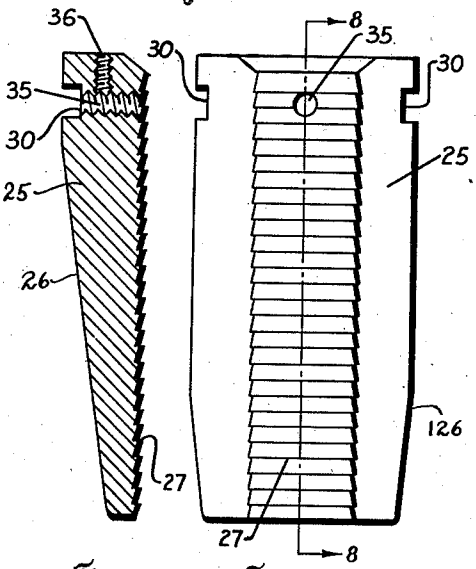


Fig. 8 Fig. 7

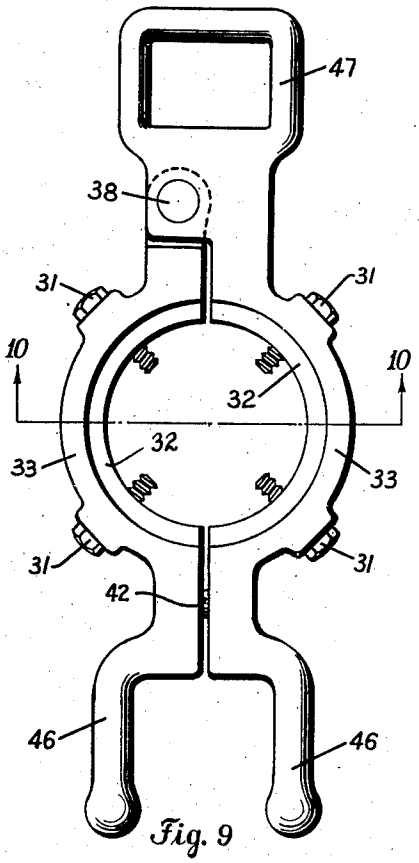


Fig. 9

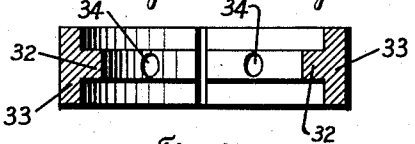


Fig. 10

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UNITED STATES PATENT OFFICE

2,153,770

SLIP ASSEMBLY

Jeddy D. Nixon, Houston, Tex., assignor, by mesne assignments, of fifty per cent to Wilson Supply Company

Application July 9, 1936, Serial No. 89,842

5 Claims. (Cl. 24—263)

This invention relates to new and useful improvements in slip assemblies.

With the ordinary slips now in common use, one of the main disadvantages is that the slips stick in the bowl of the bushing or head, and in order to be loosened therefrom, the slips have to be hammered or knocked loose. One of the reasons the slips stick in the bowl is that the transverse arc and inclination of the back of each slip and the arc and inclination of the bowl do not register, as the arc of the bowl is struck on a greater radius than the arc of the slip. It is pointed out that the slips have only a minor portion of their arcuate surface contacting the bowl, and therefore, due to the excessive weight of the spring of pipe supported by the slips, the small bearing surfaces of the slips on the bowl will have a tendency to freeze or stick the slips. In addition, an excessive amount of wear occurs, so that in a relatively short time the back of the slips are so worn as to impair their efficiency.

As this wearing continues, the freezing or sticking of the slips in the bowl is accentuated. When the point is reached where the inclination of the back of the slips and of the bowl, actually match or correspond, and the transverse arc of the back of the slips and that of the bowl register, then the slips cease to hold. An excessive amount of forcing or hammering is required to make the slips hold, because with the inclination and arc of the slips and bowl registering, the binding and gripping action of the slips is reduced to such an extent that to obtain a gripping of the slips the same has to be forced or hammered; which has the usual detrimental results of battering, damaging and breaking the slips, whereby their life is materially shortened and their period of usefulness reduced.

One object of the invention is to provide an improved slip assembly, so constructed that the slips may be readily inserted into the bowl to grip a pipe in the well, or withdrawn to release said pipe.

Another object of the invention is to provide a slip assembly so designed that the slips will not stick in the bowl and may be easily withdrawn, so as to release the pipe.

Still another object of the invention is to provide an improved slip assembly having an angular tapered or inclined bowl, the slips being so constructed as to conform to the angularities of said bowl, whereby the manual removal of the slips from said bowl may be readily accomplished, and the use of a tool, such as a hammer or the like, is not required.

A further object of the invention is to provide a slip assembly having a slip so constructed with a flat surface on its back, so as to conform to the flat surfaces of the bowl of the bushing, whereby the complementary angularities of the back of the slips and of the bowl, provide a positive gripping of the pipe at all times.

Another object of the invention is to provide an improved slip assembly having amplified contacting surfaces so that the slip has a full and true bearing surface with the bowl and a complete contact between said bowl and slip is obtained, whereby the life and period of usefulness of the slip and bowl are materially increased.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is an isometrical view of a slip assembly constructed in accordance with the invention, and a pipe being gripped by the slips,

Figure 2 is a similar view of a slip assembly mounted on a casing head and showing the slips removed from the bowl,

Figure 3 is a plan view of the bushing,

Figure 4 is a transverse vertical sectional view taken on the line of 4—4 of Figure 3,

Figure 5 is an isometrical view of the slips without the handles,

Figure 6 is a plan view of the slips as shown in Figure 5,

Figure 7 is an elevation of one of the slips, showing the gripping surface,

Figure 8 is a vertical sectional view taken on the line 8—8 of Figure 7,

Figure 9 is a plan view of the handles,

Figure 10 is a transverse vertical sectional view taken on the line 10—10 of Figure 9, and

Figure 11 is a vertical sectional view taken on the line 11—11 of Figure 3.

In the drawings the numeral 15 designates an annular bushing, adaptor ring, or head formed preferably of two semicircular sections. These sections are hinged together by a hinge 16, comprising two laterally projecting ears 17 on one section and a horizontally extending tongue 18 on the other section projecting between said ears. A pintle 16' is passed through the ears and the tongue, so as to hinge the same together. Diametrically opposite the hinge, the sections are latched together by a somewhat similar arrange-

ment to the hinge 16, including a lock pin 19 extending through a pair of laterally projecting ears 21 on one section and a horizontally extending tongue 31 on the other section. Thus, by swinging the sections together on the hinge 16 and inserting the lock pin 19 the sections are latched together and to open the adaptor the above operation is reversed. The lock pin 19 is provided with an angular flat head 40 which is countersunk in the top of the adaptor and has a portion disposed in a short, shallow channel 20, which extends from the countersink to the periphery of the adaptor and is a little deeper than the countersink, in order that a pointed instrument may be inserted under the head of the bolt 19 to lift the same. The bottom of the adaptor is substantially flat, so that it may be readily seated or placed on a casing head 22 (Figure 2), or if desired, on a rotary table or other suitable support.

The adaptor is provided axially with an inclined or wedged shaped opening 23 preferably extending therethrough, which is angular in plan (Figure 3). For the purpose of illustration, the opening 23 has been shown and described as in the form of a square, but it is to be clearly understood that said opening may be triangular or any suitable polygonal shape desired. The opening 23 is provided with flat, smooth, upwardly inclined sides or faces 24 (Figures 3 and 4), which converge downwardly. It will be seen that the degree of inclination of the bowl is somewhat smaller than ordinarily occurs in the bowl of usual adaptors, but without the usual detrimental results. In the usual slip and bowl now in common use, when the degree of inclination is increased the slips fail to hold the pipe, and when the degree of inclination is decreased the slips stick in the bowl and have to be knocked loose. In Figures 3 and 4, it will be noticed that the inclination or pitch of the bowl is relatively steep, but the slips will grip the pipe and will not stick in the bowl, regardless of the length of use or amount of wear.

When the slips 25 are placed together, as shown in Figures 5 and 6, it will be seen that their upper portion is circular and that their lower portion is formed to conform to the faces 24 of the bowl 23. As will be seen in Figures 1, 2, 5 and 8, the slips are provided with a large, flat bearing surface 26 on their backs for engaging the faces 24. It is pointed out that the large, flat bearing surfaces 26 of the slips 25 engaging the faces 24, provide an ample support and guide for the slips. When an oil or lubricant is placed on the faces 24 of the bowl 23, the flat bearing surfaces of the slips will not destroy the film of lubricant on the faces 24, as would occur if a small bearing surface were presented, such as happens with the slips now in common use. The lower portion 126 of each edge of each slip is inclined on a downwardly reducing taper, so that when the slip segments are fitted into the slip bowl, the two lower corners of each slip will not contact nor interfere with the proper functioning of any of the other slips. The faces 126 and the edges of the slips will fit into the enlargements or spaces 127 provided in the opening 23 of the bowl between each face 24, whereby the segments will not interfere with each other and the opening 23 does not need to be as large as otherwise would be needed.

In the drawings, the slips are illustrated as being made into the same number of sections as there are faces provided in the bowl 23 of the bushing 15, which in this instance is four sections, though it is to be understood that the slips may be so constructed that two flat bearing surfaces may be provided on each of the slips, whereby only a half of the number of slips are used in accordance with the number of faces of the bowl presented. As will be seen in Figures 5 and 6, these sections when placed together are provided with an axial, circular opening extending therethrough. The inner face of these slips is provided with teeth or serrations 27 for gripping the pipe or tubing 28 extending through the slips and down into the casing 29 of the well.

In Figures 1, 2, and 9 are shown slip handles 33 which may be used with the slips. These handles are provided internally with an annular boss 32, so that when the handles are placed around the slips, said boss will mesh with an annular circumferential groove 30 provided in the upper end of the slips. The handles and boss 32 are drilled or provided with bolt openings 34, one for each slip, and suitable bolt 31 may be inserted through the opening and threaded into an internally screw-threaded opening 35 in the periphery of each slip. The bolt openings 34 are made a little larger than the bolt 31 to be inserted therethrough, in order to permit a small amount of movement of said bolt in said openings. Thus, it will be seen that the bolt will draw the slips onto the boss and it is preferable that the slips are not drawn tight, but a very small space or amount of play is left between the slips and the boss 32, whereby a certain amount of play or movement of the slips is had. The top of each slip is provided with an internally screw-threaded opening 36 into which is inserted a short screw 37, preferably provided with a bronze plug (not shown) on its lower end, so as to engage the threads of the bolt 31 and lock the same in the opening 35.

The slip handles 33 are made into two sections and are hinged together at 38. The handles may be suitably latched together. A dowel pin 42 on one of the sections of the slip handles co-acts with a port or hole 44 in the other section, so as to facilitate the aligning of the sections in order that they may be readily latched together. The slip handles are provided with hand holds 46 and 47 on each end, so as to swing and lift the slip handles, as desired.

Attention is called to the fact that it is possible to make the slips with two or more flat surfaces on their backs so as to fit and co-act with two or more of the flat sides of the bowl of said head 15, without departing from the spirit of the invention. Thus, it will be seen that the number of slips could be reduced, in accordance with the number of flat faces in the bowl 23. Various modifications of the invention are possible.

In operation, the sections of the head or bushing 15 are swung together and placed above or on a casing head 22, (Figure 2) a rotary table, (not shown) or any other suitable support, as desired. When the two sections of the head 15 are swung together, the lock pin 19 is inserted so as to lock the two sections together, as is the usual practice. The flat bottom of the head 15 permits the ready placing or installation of the head upon any suitable surface or support. The head is now ready to receive the slips 25.

As will be seen in Figures 1 and 2, the slips are mounted on the slip handles 33 by means of the boss 32 fitting within the annular groove 30 on the upper end of the slips 25, and the bolts 31 extending through the bolt holes 34 to fasten the

slips to the handle. A lock screw 37 is threaded through the bolt holes 36 and a suitable bronze plug (not shown) on the bottom of the screw 37 contacts the threads of the bolt 31, so as to fasten the same in said bolt holes 34.

In making up a string of tubing 28, the slips 25 are engaged around the upper end of the string of tubing suspended through the bowl of the head 15, the tubing and slip are lowered and the flat bearing surfaces 26 of the slips engaging the faces 24 of the bowl 23, will force the slips into gripping engagement with the tubing. An additional joint of tubing is then screwed onto the upper end of the string, and said string is elevated, whereby the slips are carried upwardly with said string. When the slips are sufficiently above the head 15, a workman may open the same by gripping the handles 47 and swinging them apart.

The slip assembly may be placed upon the upper face of the head 15, as shown in Figure 2, and the lower end of the slips being at right angles to each other, will form a brace or support for said slip assembly. With the slips placed upon the head 15, it will be seen that the slip assembly is in a very convenient position, so as to be in readiness to be again applied to the tubing. The entire string is then lowered until its upper end is opposite the tubing slips 25, and the workman may then grip the handles 47 and 46 and seat the slips 25 of the slip assembly in the bowl 23 in tubing holding position around said tubing 28, as above described. Thus, it will be seen that said string of tubing is completed, as is the usual practice, by repeating this operation.

In breaking out a string of tubing, the upper joint to be unscrewed extends above the tubing or casing head 22 with the slips 25 engaging the string of tubing beneath the joint. When the joint is unscrewed and removed, the string is elevated, carrying the slip assembly upwardly with it until they clear the upper end of the head 15, and then the slip assembly is removed from around the tubing as has been described. Again the slip assembly is placed upon the top of the head 15, as shown in Figure 2, where it is in readiness to be used again. This operation is continued until the string is completely broken out or made up, whichever operation is in progress.

Thus, it will be seen that the broad, flat bearing surfaces 26 of the slips 25 engaging the faces 24 of the bowl 23 can not bind, scrape, or wear unduly, whereby the slips will not stick in the head 15. The greater pitch or inclination of the faces 24 and of the back of the slips 26 will permit the slips to hold as long as the teeth 27 will engage the tubing 28, because the inclination of the back of the slips and the inclination of the bowl will never meet or correspond, so that a further gripping action on the tubing can not be obtained.

What I claim and desire to secure by Letters Patent is:

1. A slip assembly including, a head having a vertical tapered opening therein of polygonal cross-section and having enlarged spaces at the corners of said opening to provide outstanding inclined flat faces, and arcuate slips fitting in said head opening and having inclined flat back faces engaging the flat faces of the opening.

2. A slip assembly including, a head having a vertical tapered opening therein of polygonal cross-section and having enlarged spaces at the corners of said opening to provide outstanding continuous inclined broad flat faces free from projections and arcuate slips fitting in said head opening and having continuous inclined broad flat back faces free from wedges engaging the flat faces of the opening.

3. An arcuate slip member of the type having arcuate gripping teeth on its inner surface provided with a flat inclined face on the lower portion of each edge thereof, and having a flat outer surface inclined toward one end, whereby a bearing surface is provided for engagement with a slip bowl.

4. A slip assembly including, a head having a vertical tapered opening therein of polygonal cross section and having outstanding inclined flat faces and spaces between the upright edges of the faces, and arcuate slips fitting in said head opening and having inclined flat back faces engaging the flat faces of the opening, the upright intersections between the flat faces of the slips standing in the spaces between the upright edges of the flat faces of the opening without contact with the head, whereby the flat faces of the slips are free to firmly contact the flat faces of the opening without limitation by the upright edges of said slips.

5. A slip assembly including, a head having a vertical opening therein provided with angular sides having flat faces with their upright edges spaced apart, and slips fitting in said head opening and having inclined flat back faces angularly disposed and engaging the flat faces of the angular sides of the opening, the upright intersections between the flat faces of the slips standing in the spaces between the upright edges of the faces of the opening without contact with the head, whereby the flat faces of the slips are free to firmly contact the faces of the opening without limitation by the upright edges of said slips, the lower end of each slip section being reduced and the major portion of each slip being arcuate, said arcuate portion partially surrounding the upper portion of the flat slip face, the inclined flat slip face extending from the arcuate portion to the bottom of the reduced portion at a single continuous pitch.

JEDDY D. NIXON.