April 6, 1954 A. L. STONE 2,674,034

DRILL PIPE PROTECTOR APPARATUS

Original Filed Nov. 12, 1948

2 Sheets-Sheet 1

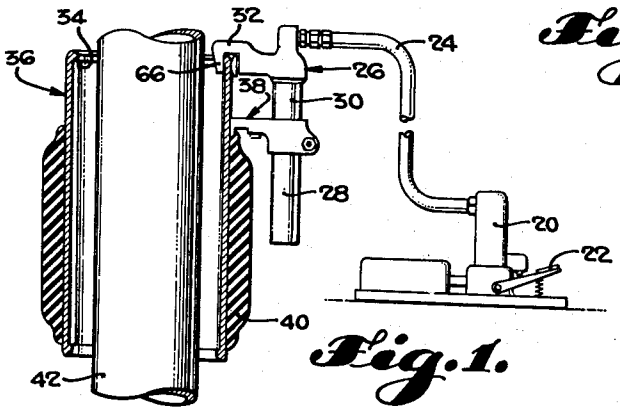
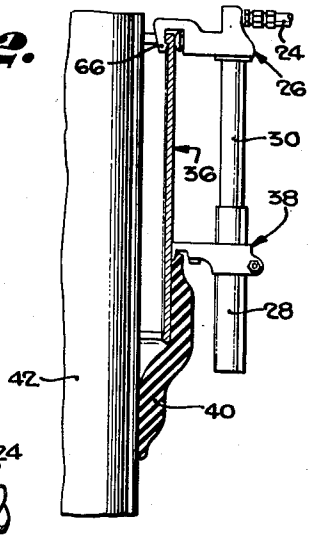


Fig. 1.

Fig. 2.



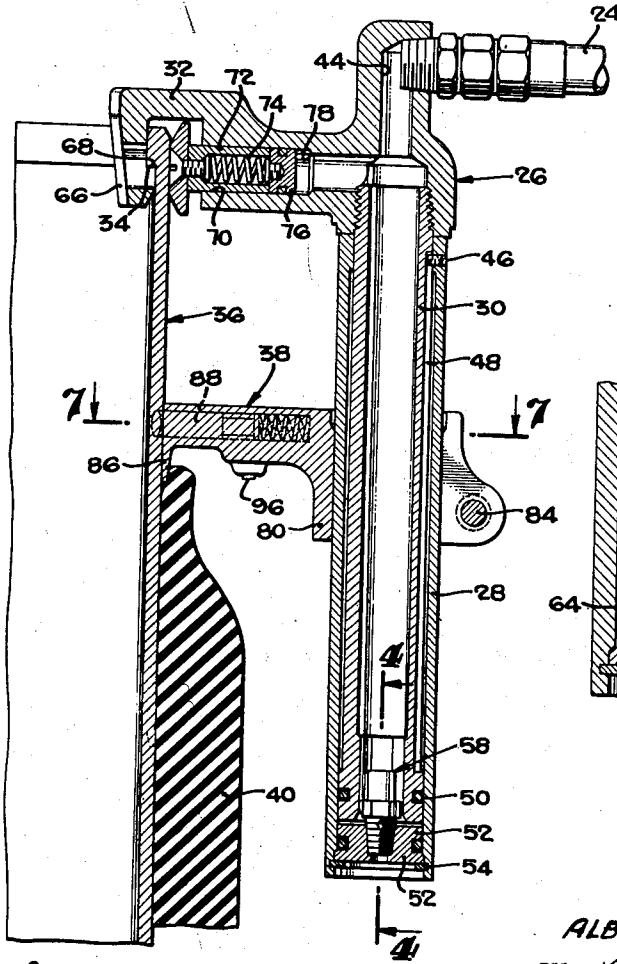
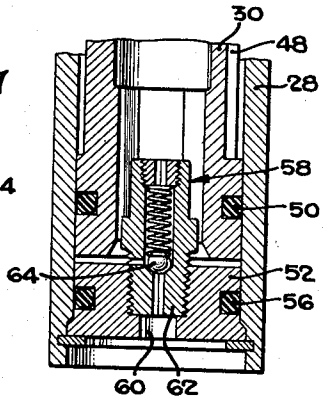


Fig. 3.

Fig. 4.



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Original Filed Nov. 12, 1948 2 Sheets-Sheet 2

Fig. 5.

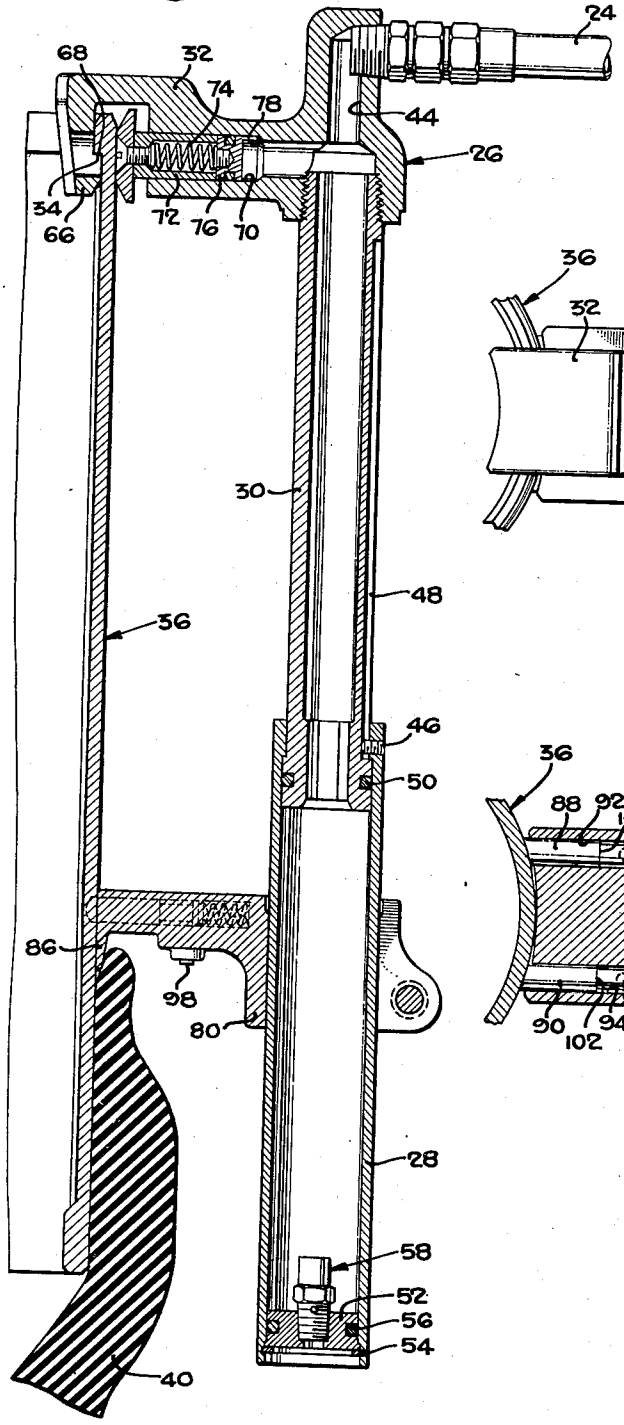


Fig. 6.

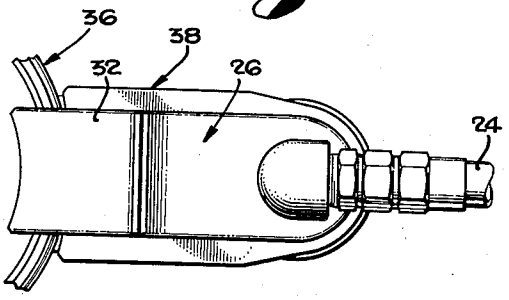
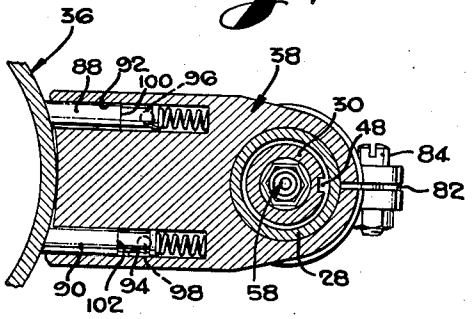


Fig. 7.



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DRILL PIPE PROTECTOR APPARATUS

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Division of application Serial No. 99,074, June 14, 1949. Continuation of application Serial No. 59,567, November 12, 1948. This application March 6, 1952, Serial No. 275,136

8 Claims. (Cl. 29—236)

1

This invention relates to apparatus for installing drill pipe protectors and particularly to apparatus for forcing protectors off of transfer sleeves and onto drill pipes.

It is common practice in the rotary well drilling art, wherein there always exists the problem of wear on the drill pipe and on the metal wall of the casing installed in the well, to provide on said drill pipe at proper intervals resilient protectors, usually composed of rubber or rubber compound. In order that such protectors, which comprise cylinders about the pipe, may tightly grip said pipe to avoid slippage, the protectors are molded with their internal diameters smaller than the external diameter of the pipe, there thus being a requirement that the protectors be stretched to permit their being slipped over the pipe.

As it is generally unfeasible to directly stretch and apply the protector to the pipe without intermediate transfer means, common practice in the art is to first stretch the protector and slip same over a cylindrical metal sleeve having an inside diameter slightly larger than the outside diameter of the drill pipe and to then remove the protector directly from said cylindrical sleeve to the drill pipe. Such cylindrical sleeve transfer means are commonly known as transfer sleeves, and it is with mechanism for removing the protector from the transfer sleeve to the drill pipe that the present invention is concerned.

Several devices have heretofore been used for this purpose comprising, among others, mechanical screw-jack means adapted to push the protector from the transfer sleeve onto the drill pipe by the abutment of pressure rings and the like. However, the difficulty with this and similar expedients is that such means comprise heavy, unwieldly articles. Since frequently a string composed of many stands of drill pipe must be fitted with protectors adjacent each tool joint, and since this entails a lifting of each protector bearing transfer sleeves, a placing of same over the drill pipe, a removal of the protector to the drill pipe, and a removal of the transfer sleeve from the drill pipe, any excessive additional weight which must be applied to the transfer sleeve and used to remove the protector therefrom causes considerable loss of time, increased labor expense, and is productive of accident. Additionally, expedients prior to the present invention, such as the means outlined above, are slow to act and difficult to operate, and prior devices have not been suitable for use with the different sized transfer sleeves necessitated by different sized drill pipe, being rather limited to a single size transfer sleeve.

2

It is the principal object of this invention to provide means for removing protectors from the transfer sleeve onto the drill pipe, which means is light, easy to handle but yet positive in its operation.

Another of the objects of this invention is to provide such protector apparatus which is not only light, but of such construction and having such operational advantages as to be handy, fast operating, and absent the necessity of a number of adjustments and hand operations by the operator once the apparatus has been affixed to the transfer sleeve, it being a particular feature of the apparatus contemplated by the present invention that said apparatus is actuable by the operator in simple and quick manner to promptly remove the protector from the transfer sleeve, and thus save time at a critical point in the cycle of protector application, i. e., when the transfer sleeve and associated mechanism is suspended about the drill pipe immediately preparatory to removal of the protector onto the said drill pipe.

Another object of this invention is to provide such protector apparatus operable with different sized transfer sleeves so that it is unnecessary to change the protector apparatus to another size to accommodate a changed size of transfer sleeve applicable to a changed size of drill pipe.

A further object of this invention is to provide protector apparatus not only light and handy of use, but compact whereby to minimize possible interference between said apparatus and elements associated with the drill pipe, such as tool joints and the like.

Yet another object of this invention is to provide in the aforesaid apparatus a combination of elements operable to perform the above-described functions, but, whilst doing this, operable to avoid damage to said elements associated with the drill pipe.

Still another object of this invention is to pro-

vide said apparatus easily controllable with respect to the protector immediately preceding and during its removal from the transfer sleeve, said protector necessarily being of high strength and therefore requiring considerable pressures and forces in removal from the transfer sleeve onto the drill pipe.

And another object of the invention is to provide means on said apparatus to facilitate its easy and quick removal from the transfer sleeve after the aforesaid operations.

Further objects of the invention will appear hereinafter.

In the drawings:

Figure 1 shows a side elevational view of an apparatus incorporating the present invention affixed to the transfer sleeve and in position to exert pressure on a protector to remove same from said transfer sleeve onto the drill pipe.

Figure 2 shows a similar enlarged view of said apparatus midway in its protector-removing operation.

Figure 3 shows an enlarged longitudinal sectional view of said apparatus shown in the position assumed in Figure 1.

Figure 4 shows a longitudinal section taken on the line 4—4 of Figure 3.

Figure 5 shows an enlarged longitudinal sectional view of the apparatus in the operative position shown in Figure 2.

Figure 6 shows a partial top plan view of said apparatus.

Figure 7 shows a cross-sectional view of the apparatus taken on the line 7—7 of Figure 3.

Referring to the drawings, and particularly to Figures 1 and 2, the general assembly of the apparatus consists of a source of fluid pressure 20 which may be operated by a foot pedal 22 to deliver fluid through a conduit 24 to a head 26 to force outwardly a cylinder 28 mounted slidably on a stationary plunger 30. Integral with the head 26 is a retaining arm 32 which is adapted to grasp an upper lip 34 of the transfer sleeve 36, and carried by the cylinder 28 is a protector-engaging arm 38 adapted, as shown in Figure 2, to force the protector 40 from the said transfer sleeve 36 to the drill pipe 42 upon the application of fluid pressure.

More particularly, the stationary plunger 30 is threadedly secured to the head 26 into which leads the conduit 24. Said stationary plunger 30 is hollow and open at both ends and forms a continuous passage with the bore 44 in the head 26. Slidable on the plunger and splined thereto through a threaded pin 46 and slot 48 is the said cylinder 28, the outer end of said plunger 30 being sealed to the inner wall of the cylinder 28 by an O-ring 50. A cylinder head or plug 52 closes the outer end of said cylinder 28 and is held in place by a snap ring 54 and sealed by an O-ring 56, thus providing a reactive surface to enable the fluid pressure upon application to slide the said cylinder 28 outwardly on the plunger 30. It will be noted that a check valve 58 is provided associated with the cylinder head 52 to permit bleeding of entrapped air from the cylinder when desired, which comprises a bore 60, a bored plug 62 threadably received in the cylinder head 52, and a spring-loaded ball 64 within said plug adapted to be removed from its seat by the insertion of a suitable tool.

Integral with the head 26 of the apparatus and extending transversely therefrom is provided the arm 32 which includes a hooked or depending portion 66 having a shoulder 68 adapted to cooperate with the lip 34 of the transfer sleeve 36. In order to hold the said arm 32 secured to the transfer sleeve, there is provided a bore 70 in the said arm 32 connecting with decreased diameter to the bore 44 in the head 26 and receiving slidably a plunger 72. The plunger 72 is hollow and is provided with a compression spring 74 which abuts at one end against said plunger and at the other end against a piston 76 slidable in the bore 70 and seatable on the shoulder 78 thereof. Thus, where fluid pressure is lacking, the plunger 72 is spring-urged against the transfer sleeve 36, but upon the admission of fluid pressure into the bore 44, the hollow plunger 30 and the bore 70, the plunger 72 clamps the arm 32 hard about the transfer sleeve 36 to prevent relative movement between the said plunger 30 and transfer sleeve 36.

Adjustably affixed to the cylinder 28 which, as aforesaid, is slidable outwardly on the plunger 30 in response to fluid pressure, is the single projecting arm 38, said arm including a hub portion 80 bored to receive the cylinder 28, split at 82 and provided with a clamping bolt 84. The protector-engaging arm 38 has a lip 86 adapted to insert under the edge of the protector 40 and thus assure positive coaction between said protector and said arm 38. The arm 38 also is provided with a pair of spring-urged plungers 88 and 90 mounted in the bores 92 and 94, respectively, whereby to abut against the side of the transfer sleeve, maintaining the axes of the cylinder 28 and plunger 30 parallel with that of the transfer sleeve 36 and providing a secondary protector-engaging means to accommodate different sized transfer sleeves, said plungers being adapted to engage portions of the resilient protector which might otherwise, in the use of out-sized transfer sleeves, creep up between the sleeve and arm and bind the apparatus. It is to be noted that the outward movement of the plungers 88 and 90 is limited by the keys 96 and 98 engageable in slots 100 and 102 in the said plunger.

In the operation of removing a protector 40 from a transfer sleeve 36 onto a pipe 42, the said transfer sleeve is ordinarily first placed about said pipe preferably somewhat adjacent a tool joint. The aforedescribed apparatus is then brought up to the transfer sleeve and the hooked portion 66 of the arm 32 hooked about the lip 34 of said transfer sleeve, the plunger 72 abutting resiliently against the transfer sleeve and aiding in holding the apparatus in its position with respect to the transfer sleeve. In this position of the apparatus, the protector-engaging arm 38 abuts the side of the transfer sleeve 36, and the plungers 88 and 90 assist in aligning the apparatus. Since there are ordinarily a number of protector-bearing transfer sleeves from which the protectors must be removed onto the drill pipe, it will be understood that the herein-described operation constitutes a continuous cycle, and ordinarily it will be found that each batch of protector-bearing transfer sleeves will have their protectors mounted in approximately the same place with respect to the upper lip 34 of said transfer sleeve. Occasionally, however, as with the introduction of a new batch of protector-bearing transfer sleeves, it will be found that the protectors are in different positions, and since it is desirable that before the application of fluid pressure the lip 86 of the arm 38 be closely adjacent or touching the protector, the bolt 84 may be loosened to slide the said arm 38 on the cylin-

der 28 to its proper position, as shown in Figures 1 and 3, preparatory to the application of fluid pressure.

Proper positioning of the apparatus having been accomplished, the operator presses upon the foot pedal 22 admitting fluid pressure into the bores 44 and 70 and into the hollow plunger 30. The fluid pressure accomplishes two things: first, clamping the plunger 72 hard against the transfer sleeve 36, whereby relative movement between the plunger 30 and transfer sleeve 36 is made impossible; and second, sliding outwardly the cylinder 28 upon the plunger 30. Since the cylinder 28 carries the arm 38, the said arm 38 forces the protector outwardly on the transfer sleeve until the elasticity of the protector material snaps said protector over the end of the transfer sleeve and onto the drill pipe, it having been found in the operation of this device that abutment of the single arm 38 is sufficient to remove the protector. Immediately upon such removal of the protector onto the drill pipe, the operator releases the foot pedal 22, releasing the fluid pressure. The lip 86 of the arm 38 being free of the protector, and since no fluid pressure exists on the piston head 76, the entire apparatus may be pivoted around the lip 34 of the transfer sleeve and removed.

It will be apparent from the foregoing description that the circumferential extent of application of axial force to the protector is confined to a minor segmental portion of the protector. It is only by reason of my conception of the idea of thus confining the application of force to the protector, that it became possible to provide the light-weight, easily manipulable, and fast-operating device described hereinabove.

This application is a divsion of application Serial Number 99,074, filed June 14, 1949, and a continuation of application Serial Number 59,567, filed November 12, 1948, now abandoned.

While there has been described what is at present considered a preferred embodiment of the present invention, it will be apparent to those skilled in the art that various modifications and changes may be made without departing from the essence of the invention, and it is intended to cover herein all such modifications and changes as come within the true scope and spirit of the appended claims.

I claim:

1. Apparatus for forcing an elastic drill pipe protector axially off a transfer sleeve and onto a pipe encompassed thereby, comprising: extensible force-applying means having relatively rectilinearly movable members, anchor means carried by one of said members, pusher means carried by the other of said members, said anchor means and pusher means extending in the same direction laterally of the direction of relative movement of said members, said anchor means having a relatively small abutment surface adjacent the outer end thereof releasably engageable with a cooperating abutment surface on the transfer sleeve, said pusher means having a relatively small surface adjacent the outer end thereof engageable with an end portion of said protector, said anchor and pusher means being substantially in alignment in the direction of relative movement of said members whereby said apparatus may be engaged with or disengaged from said sleeve and protector from one side and entirely within a narrow sector thereof.

2. An apparatus as defined in claim 1 wherein said members comprise, respectively, a cylinder and a piston therein relatively movable in protector-pushing direction upon application of fluid pressure thereto.

3. Apparatus as defined in claim 1 wherein said pusher means has a portion adapted to be disposed in laterally interlocking relation to said protector to restrain said pusher means against laterally outward movement relative to said protector.

4. Apparatus as defined in claim 1 wherein said pusher means has a substantially wedge-shaped portion adapted to be forced between said transfer sleeve and a portion of said protector to restrain said pusher member against laterally outward movement relative to said protector.

5. Apparatus as defined in claim 1 wherein said force-applying means includes means operable to maintain said anchor member and said pusher member substantially in alignment.

6. Apparatus as defined in claim 1 including restraining means on said pusher means adapted to engage said protector to prevent outward movement of said pusher means relative to said transfer sleeve, said pusher means also having a surface thereon slidably engageable with the outer surface of said transfer sleeve and cooperating with said restraining means to maintain the direction of said rectilinear movement substantially parallel to said sleeve.

7. Apparatus for forcing an elastic drill pipe protector axially off a transfer sleeve and onto a pipe encompassed thereby, comprising: extensible force-applying means having relatively rectilinearly movable members, anchor means carried by one of said members, pusher means carried by the other of said members, said anchor means and pusher means extending in the same direction laterally of the direction of relative movement of said members, said anchor means having a relatively small abutment surface adjacent the outer end thereof releasably engageable with a cooperating abutment surface on the transfer sleeve, said pusher means having a relatively small surface adjacent the outer end thereof engageable with an end portion of said protector, said anchor and pusher means being substantially in alignment in the direction of relative movement of said members whereby said apparatus may be engaged with or disengaged from said sleeve and protector from one side and entirely within a narrow sector thereof, said force-applying means comprising a piston connected to said anchor means and a cylinder enclosing said piston, said pusher means being adjustably mounted on said cylinder for adjustment therealong in an axial direction.

8. Apparatus for forcing an elastic drill pipe protector axially off a transfer sleeve and onto a pipe encompassed thereby, said apparatus being portable and being engageable with and removable from said sleeve entirely from one side thereon, comprising: extensible force-applying means having relatively rectilinearly movable members, anchor means carried by one of said members, pusher means carried by the other of said members, said anchor means and pusher means extending in the same direction laterally of the direction of relative movement of said members, said anchor means having an abutment surface adjacent the outer end thereof releasably engageable with a cooperating abutment surface on the transfer sleeve, said pusher means having a surface adjacent the outer end thereof engageable with an end portion of said protector, said anchor and pusher means being substantially in

alignment in the direction of relative movement of said members whereby said apparatus may be engaged with or disengaged from said sleeve and protector from one side, said force-applying means comprising a piston connected to said anchor means and a cylinder enclosing said piston, said pusher means being adjustably mounted on said cylinder for adjustment therealong in an axial direction.

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