

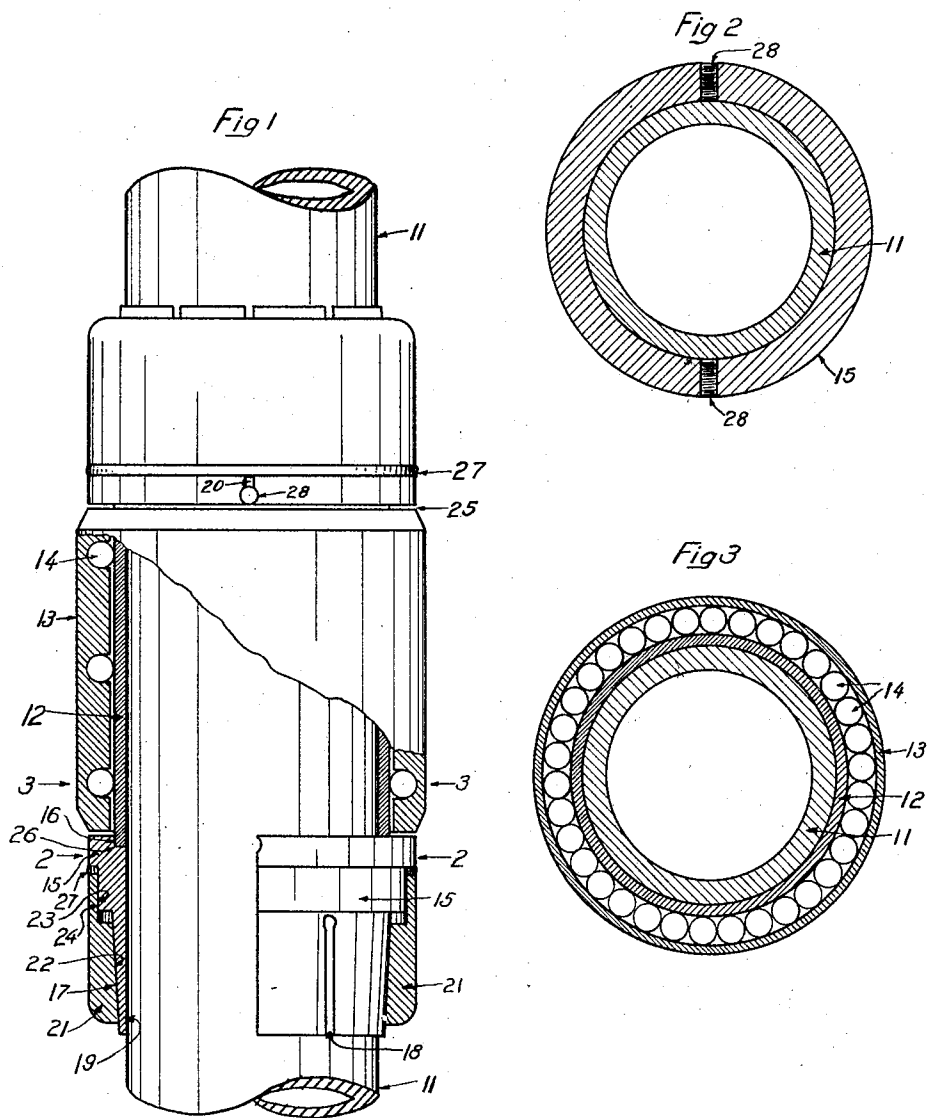
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ANTIFRICTION PIPE PROTECTOR

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UNITED STATES PATENT OFFICE

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ANTIFRICTION PIPE PROTECTOR

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My invention relates to the art of drilling oil wells, being more particularly a sleeve attachable to the ordinary drill pipe, commonly used in the rotary drilling of oil wells, which sleeve has mounted thereon a collar freely rotatable on the sleeve on balls or other anti-friction devices.

In the drilling of oil wells it commonly occurs that depths of several thousand feet are encountered, a casing being used for retaining the sides of the wells which also affords protection for the string of tools which is operated through the casing.

It is common practice to shut off water from entering the well by the usual methods of cementing, that is, charges of cement are forced through the bottom of the casing and up around the casing into the formation, which necessitates that the casing at all times remain tight and free from leaks. In drilling, however, the drill pipe frequently bends and rubs against the casing and, due to the rotation of the drill pipe, results in wearing holes in the casing, weakening the casing and permitting water to enter it and destroy the effectiveness of the cementing operation.

In my application filed December 18, 1926, Serial No. 155,675, I described and claimed an anti-friction device which can be placed on the drill pipe at any preferred point in its length without changing the ordinary equipment of drill pipe, collars or tool joints. My present invention is a device of similar character but is directed to an improved construction by which the costs of making and placing it in position are reduced and the effectiveness of the device increased.

Other objects and advantages will appear hereinafter from the following description.

Referring to the drawings, which are for illustrative purposes only,

Figure 1 is an elevation of my improved protector, mounted on a section of drill pipe, parts being broken away.

Figure 2 is a cross-section on the line 2—2 of Figure 1, and

Figure 3 is a cross-section on the line 3—3 of Figure 1.

Referring to the three figures, 11 is a section of the drill pipe over which is slipped

the inner sleeve 12, which is preferably made from seamless steel tubing of low carbon content. This sleeve should be machined outside to exact standard size the hole being left about $\frac{1}{8}$ " undersize, and then carbonized to a penetration of say $\frac{1}{16}$ ". The hole is then bored out to a standard inside diameter and the sleeve heat treated, bringing the outer surface on which the balls revolve to a hardness of 85/90 scleroscope while the body of the sleeve remains relatively soft. The standard inside diameter of this sleeve should be not less than the largest outside diameter of the nominal size drill pipe on which it is to be used, such drill pipes varying by as much as $\frac{1}{8}$ " in diameter in any one nominal size. The sleeve should be a loose fit or a slip fit on the pipe and should never be forced on, as, if distorted from a true circle by forcing, the ball race will not be true and will rapidly hammer out. The sleeve 12 is not fastened to the drill pipe.

The bearing sleeve 13 is preferably a ring forging of 40 to 50 carbon steel, machined to size and the ball grooves formed, heat treated and drawn to a hardness of 50 scleroscope. This sleeve thus has a uniform hardness inside and outside and will withstand the wear resulting from contact with the casing. The bearing sleeve, as shown in Figure 1, is of substantially less length than the sleeve 12.

The balls 14 are high-duty chrome or chrome-molybdenum steel balls of the best quality.

The split rings 15 are preferably made from soft steel ring forgings and are not hardened. The inside shoulder 16 should fit snugly over the sleeve 12. The tapered end 17 may desirably have a taper of about 1" per foot and is longitudinally split or kerfed at a plurality of points on its circumference, as at 18. The inside diameter 19 of these rings should be about $\frac{1}{2}$ " larger than the nominal outside diameter of the drill pipe. After being completely machined these rings may be split longitudinally into halves as at 20. The width of this opening is exaggerated in the drawing—it should be no more than a thick saw-kerf or the kerf of an oxy-acety-

lene cutting tool. The purpose of splitting the ring is to facilitate fitting it around the pipe, and is optional.

5 The compression rings 21 are also made from soft steel ring forgings and need not be hardened. The inside taper 21 should fit the taper 17 of the split ring, and both tapers should be true and smooth. At the opposite end of the compression-ring is formed a recess 23, which should be a slip fit on the shoulder 24 formed in the split ring 15.

10 In assembling this fitting the following steps are taken. The bearing sleeve 13 is upended and the inner sleeve 12 inserted in its lower end, up to the level of the first ball race. This ring of balls is inserted, the inner sleeve moved up to the second race and so on until all the balls are in place and the two sleeves in the position shown, after which the assembly may be slipped over the pipe into its preferred position.

15 The two split rings 15 are then placed around the ends of the sleeve 12 and retained in position by slipping the compression rings 21 over them. When the rings 15 are brought up solidly against the ends of the sleeves 12, the clearance 25 between ring 15 and bearing sleeve 13 should be no more than 2 or 3/1000 of an inch, to exclude solids from the ball chamber. This clearance is adjusted in advance, preferably on the length of the inner-sleeve 12.

20 A suitable split screw clamp, not shown, is now passed over the ends of the compression rings 29 and these rings are drawn toward each other, sliding up the taper 17 on the split rings 15, which are restrained from end-movement by abutment against the end of sleeve 12, as at 26. This relative movement up the taper collapses the kerfed ends of the split ring and clamps them firmly against and around the drill pipe. Finally, the compression rings are held in permanent position by welding or brazing them to the split rings as indicated at 27.

25 The division of the split ring into halves may leave an opening as at 20 through which sand or other abrasive material might enter the ball chamber and cause undue wear. This opening may be closed by drilling a hole as at 28, of a diameter materially greater than the width of the opening 20 as assembled, and plugging this hole with a flush screw or with welding steel or brass. This plug should reach to the surface of the inner ring 12 and will prevent any solid matter from passing through the slot 20 into the ball chamber.

30 This type of construction has material advantages over the types previously disclosed in which the inner sleeve on which the balls ride is in one piece with the split ends. By the construction here shown a very hard and durable inner ring may be used in combination with soft and easily clamped taper kerfed ends, no welding is done on hardened pieces,

and the single weld is applied to two soft steel rings and not at any point to the pipe. If a screw plug be used to close the slot the bearing ring is not heated at any point after hardening. These improvements add greatly to the durability of the fitting and also reduce the manufacturing and assembling cost. This fitting can also be assembled for shipment as a complete unit, ready to be put in place and clamped on the pipe.

70 While I have shown a preferred construction of my improved pipe protector in great detail, I do not wish to be limited to the exact construction shown, but solely by the attached claims.

I claim as my invention:

1. An anti-friction protector for attaching to drill pipe, comprising: a cylindrical inner sleeve fitting loosely on the pipe, a bearing sleeve circumferentially surrounding said inner sleeve and spaced therefrom by a plurality of circumferential rows of bearing balls, outside-tapered rings adapted to be placed abutting each end of said inner sleeve and closely approaching the ends of said bearing sleeve, said rings being nonintegral with said sleeve and being longitudinally kerfed through their tapered ends, and inside-tapered rings fitted over said kerfed ends and adapted to compress said ends against the pipe when said inside-tapered rings are drawn toward each other.

2. An anti-friction protector for drill pipe, comprising: a hardened steel cylindrical inner sleeve fitting loosely on the pipe, a hardened steel bearing sleeve circumferentially surrounding said inner sleeve and spaced therefrom by a plurality of circumferential rows of bearing balls, independent rings abutting each end of said inner sleeve and closely approaching each end of said bearing sleeve, the outer ends of said rings being of soft steel, outwardly tapered and longitudinally kerfed through said tapered ends, and inside tapered rings fitting over said tapered kerfed ends and adapted to compress said ends against the pipe when said inside tapered rings are drawn toward each other.

3. An anti-friction protector for drill pipe, comprising in combination: the cylindrical inner sleeve 12, the bearing sleeve 13, the bearing balls 14, the independent tapered rings 15 and the compression rings 21, substantially as described.

In witness that I claim the foregoing I have hereunto subscribed my name this 20th day of June, 1927.

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