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CUTTER FOR DRILL PIPE PROTECTORS

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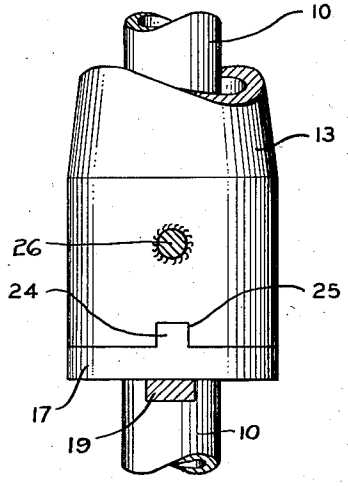


FIG. 2.

FIG. 1.

FIG. 3.

INVENTOR.
CLYDE R. SIMPSON

BY Lyon & Lyon ATTORNEYS.

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CUTTER FOR DRILL PIPE PROTECTORS

Clyde R. Simpson, Los Angeles, Calif., assignor to Thomas P. Pike Drilling Co., Los Angeles, Calif., a corporation of California

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1

This invention relates to rotary well drilling equipment and is particularly directed to a device for reducing the outside diameter of drill pipe protectors while they are in position on the pipe.

In the art of well drilling by the rotary process, annular rubber protectors are often mounted on the drill pipe and held in position by the resilience of the rubber material. These rubber protectors act as wear-receiving elements while the drill pipe is turning within casing previously mounted in the well bore. The protectors which are initially installed on the drill pipe are of a size corresponding to the inside diameter of the casing in which the drill pipe is to be run. Should it be desired to use the drill pipe later in another well having smaller casing, it has been necessary heretofore to remove the protectors and install new ones of smaller outside diameter. This entails waste of material and involves considerable time for applying the new protectors to the pipe.

In accordance with my invention, I provide apparatus for trimming the outside diameter of rubber drill pipe protectors so that they may operate in smaller casing. Accordingly, it is the principal object of my invention to provide a simple and rugged device which may be used within the well drilling derrick for quickly reducing the outside diameter of rubber protectors while they are in position on the pipe.

Another object is to provide a device of this type which may be employed during the normal operation of lowering the drill pipe into the hole.

Another object is to provide a device of this type having an integral shell or body provided at one end with a circular knife edge and adapted to receive segmental bushings at the other end for maintaining the shell or body in coaxial position with respect to the pipe.

Other and more detailed objects and advantages will appear hereinafter.

In the drawings:

Figure 1 is a sectional elevation showing a preferred embodiment of my invention.

Figure 2 is a side elevation partly broken away.

Figure 3 is a perspective view of one of the segmental bushing elements.

Referring to the drawings, the drill pipe 10 is provided with one or more encircling rubber protector collars 11 held in place by the resilience of the rubber material. The drill pipe is provided with the usual tool joints 12 which are of larger diameter than the pipe and are used for threadedly connecting adjacent pipe sections.

2

In accordance with my invention, I provide a cylindrical shell or body 13 tapering at its upper end to a circular knife edge 14. The body 13 is provided with an axial opening 15. The portion of the opening adjacent the cutting edge 14 is reduced in diameter as shown at 16. The bore 16 is sufficiently large to pass the tool joint 12.

A pair of segmental bushings 17 and 18 are insertable into the lower end of the body 13 and into the opening 15. These bushing segments fit closely within the opening 15 and have running clearance with the outside diameter of the pipe 10 so that the body 13 and cutting knife 14 are maintained in a coaxial position with respect to the pipe 10. Each of the bushings 17 and 18 is provided with a laterally projecting ear 19. The ear 19 may be attached to the bushing in any convenient fashion such as, for example, by welding. The ears 19 extend outwardly beyond the outer diameter of the body 13 and may be looped as shown at 20. Each of the bushing segments may include a segmental annular portion 21 having a flange 22 adjacent the ear 20. The flange 22 is adapted to engage the lower end of the body 13. The ears 19 act as pendent support elements for supporting the entire assembly from a pair of tension lines 23.

Means are provided for preventing rotation of the bushing segments 17 and 18 with respect to the body 13 when the pipe 10 is rotated. As shown in the drawings, this means includes a key 24 on the bushing segment 17 which is received within a slot 25 provided on the lower end of the body 13. Since the bushing segments completely encircle the pipe 10, locking one of them with respect to the body 13 serves to lock the other.

Horizontally extending torque-resisting handles 26 are provided on the body for preventing rotation of the body when the knife 14 engages the rotating collar 11.

In operation the device is suspended on the pendent lines 23 which in turn may be connected to the usual cat line (not shown) employed in connection with the drilling rig. The drill pipe is handled in the conventional fashion and is connected section by section or stand by stand by threading together complementary halves of the tool joints. A section or stand is hoisted in the usual way by means of an elevator (not shown) and then the cutter device embodying my invention is swung under the lower end of the pipe while thus suspended in the elevator. The handles 26 are gripped manually to move the cutter device over the tool joint on the lower end of the suspended pipe section or stand. When the body

13 has been raised above the position of the tool joint the segmental bushings 17 and 18 are installed in the lower end of the opening 15, and the weight of the assembly is supported by means of the pendent lines 23. The pipe section is then threadedly connected to the next lower section in a conventional manner. The rotary table (not shown) employed in connection with conventional rotary drilling rigs is then turned to cause the newly added pipe section to rotate. While the pipe is rotating the cat line (not shown) is tensioned to lift the cutter assembly upwardly along the pipe 10 to bring the circular knife 14 into engagement with the oversize rubber protector 11. The sharpened edge 14 is held concentric with the pipe by reason of the running fit between the bushing segments 17 and 18 and the outer diameter of the pipe 10. The cutter assembly is moved upwardly as the pipe and bushing rotate, thereby trimming off a section of the outer diameter of the rubber protector 11. The portion trimmed off remains on the outside of the upper tapered portion of the body 13 while the collar as trimmed passes into the bore 16. When the cutting operation has been completed the outer ring encircling the upper portion of the body is cut away and the body 13 is moved upwardly to position the protector ring as trimmed within the opening 15 which is somewhat larger in diameter than the bore 16. The body 13 is then supported by means of the handle 26 while the segmental bushings 17 and 18 are removed to permit the pipe 10 and reduced collar 11 to move downwardly through the opening 15. The segmental bushings 17 and 18 are reinserted for trimming any additional protector collars on that particular stand of drill pipe. When the upper end of the pipe is lowered to a position near the rotary machine (not shown), the usual slips are inserted in the rotary machine to support the pipe and the elevator is disconnected. The body 13 may then be passed upwardly over the tool joint on the upper end of the pipe.

If additional sections or stands are to be added the body 13 may be allowed to rest on the rotary table encircling the pipe section which is held by the slips. After the new section of pipe has been threadedly connected the body is moved upwardly over the connected tool joints. The segmental bushings are then reinserted and the cutting operations on the rubber protector collars proceed in the manner described above.

It will be understood from this description that the protector collars 11 may be trimmed to the desired outside diameter during the normal operation of lowering the drill pipe into the hole. Very little additional time is required over that consumed in the normal operation of going into the hole.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. A cutter assembly for reducing the outside diameter of protectors encircling a pipe, comprising the combination of a body having a central opening extending therethrough through which the pipe may pass, said central opening being large enough to pass a tool joint, one end of the body being provided with a knife, and a plurality of bushing segments insertable into the other end of the opening around the pipe to maintain the body and knife concentric with respect to the pipe.

2. A cutter assembly for reducing the outside diameter of protectors encircling a pipe, comprising the combination of a body having a central opening extending therethrough through which the pipe may pass, said central opening being large enough to pass a tool joint, one end of the body being provided with a circular knife, a pair of semi-circular bushing segments insertable into the other end of the opening around the pipe to maintain the body and knife concentric with respect to the pipe, and pendent support elements on each of the bushing segments extending laterally beyond the body.

3. A cutter assembly for reducing the outside diameter of protectors encircling a pipe, comprising the combination of a body having a central opening extending therethrough through which the pipe may pass, one end of the body being tapered to form a circular knife, a bushing insertable into the other end of the opening around the pipe to maintain the body and knife concentric with respect to the pipe, said bushing being split on axially extending lines into a plurality of segments, whereby the bushing may be applied laterally to the pipe, means for preventing relative rotary movement between the bushing segments and the body, and pendent support elements on certain of the bushing segments extending laterally beyond the body.

4. A cutter assembly for reducing the outside diameter of protectors encircling a pipe, comprising the combination of a body having a central opening extending therethrough through which the pipe may pass, said central opening being large enough to pass a tool joint, one end of the body being tapered to form a circular knife, the portion of the body opening adjacent the knife being cylindrical and of reduced diameter, a pair of bushing segments insertable into the other end of the opening around the pipe to maintain the body and knife concentric with respect to the pipe, key means for preventing relative rotary movement between one of the bushing segments and the body, and a pendent support element on each of the bushings.

5. A cutter assembly for reducing the outside diameter of rubber protector collars encircling a pipe, comprising the combination of a body having a central opening extending therethrough through which the pipe may pass, one end of the body being tapered to form a continuous circular knife, the portion of the body opening adjacent the knife being cylindrical and of reduced diameter, a bushing insertable into the other end of the opening around the pipe to maintain the body and knife concentric with respect to the pipe, said bushing being split on axially extending lines into a plurality of segments, whereby the bushing may be applied laterally to the pipe, a key for preventing relative rotary movement between one of the bushing segments and the body, and pendent support elements on certain of the bushing segments extending laterally beyond the body.

6. A cutter assembly for reducing the outside diameter of rubber protector collars mounted upon a rotating drill pipe, comprising in combination: a body having a central opening large enough to pass a tool joint, one end of the body having a knife for cutting the rubber protector collars, a plurality of bushing segments insertable laterally around the pipe and into the other end of the central opening to maintain the body and knife concentric with respect to the rotating

pipe, and pendent support elements on the bushing segments.

7. A cutter assembly for reducing the outside diameter of rubber protector collars mounted upon a rotating drill pipe, comprising in combination: a body having a central opening large enough to pass a tool joint, one end of the body having a knife for cutting the rubber protector collars, a plurality of bushing segments insertable into the other end of the central opening around the pipe to maintain the body and knife concentric with respect to the rotating pipe, each of the bushing segments having a flange adapted to

engage the end of the body, and pendent support elements on the bushing segments.

CLYDE R. SIMPSON.

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