

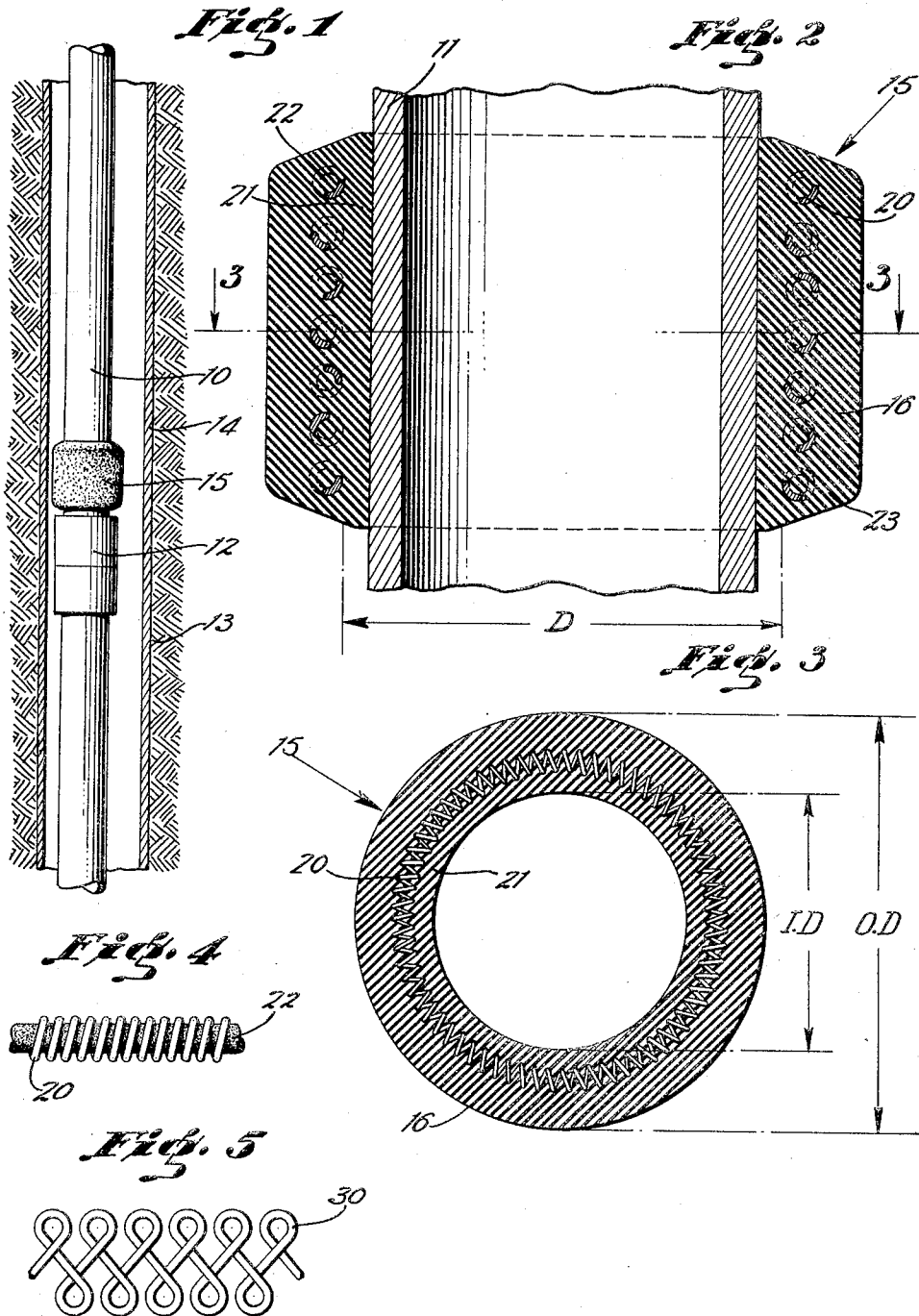
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DRILL PIPE PROTECTOR

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DRILL PIPE PROTECTOR

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My invention relates to drill pipe protectors for preventing or minimizing engagement of a string of drill pipe with the interior of a well casing or well in which the string of drill pipe is being operated.

My invention has its principal use in the rotary system of well drilling, in which a well is bored by the use of a drill bit secured to the lower end of a string of drill pipe rotated by a power device situated adjacent to the upper end of the well. Owing to the characteristic conditions encountered in rotary well drilling, among which is the bending of the string of drill pipe due to the superposed weight thereof, it is impossible to rotate the string of drill pipe in centralized position within the well casing or bore of the well, this resulting in the drill pipe frictionally engaging the well casing or the open bore of the well so as to cause a very rapid wearing away of the drill pipe couplings and tool joints. The engagement of the drill pipe with the interior of a casing often results in wearing a hole in the casing, which allows water to enter the interior of the well. These holes are very difficult to locate, and great care must be exercised in cementing-off the adjacent earth structure so as to stop leakage into the interior of the well.

My invention comprehends a device which may be placed on a drill pipe structure having a resilient cylindrical wearing surface of larger diameter than the couplings and tool joints employed in the drill pipe structure so as to prevent engagement of the metal parts of the drill pipe structure with the well casing and also with the wall of an opened well bore. The resilient material employed is preferably a rubber composition having wear resisting characteristics and being especially adapted for lubrication by water or drilling mud. By use of this device, wearing away of the drill pipe structure and well casing is minimized.

It is an object of my invention to provide a cylindrical body of resilient, wear resisting material adapted to be secured on the drill pipe structure as a result of the contractile characteristics of the cylindrical body.

It is an object of my invention to provide a

cylindrical body of rubber compound with circular resilient reinforcing members therein which will supplement the natural resilience of the rubber body and will therefore cause the drill pipe protector to adhere securely to the drill pipe on which it is mounted. It is known that at the present time drill pipe protectors are employed in the form of a cylindrical body of resilient rubber. In order to procure a practical degree of resilience in the cylindrical body, expensive materials must be selected, and often best frictional characteristics of the rubber compound must be sacrificed in order to attain the desired degree of resilience, for if the cylindrical body has not sufficient resilience and strength, it will not remain in operative position on the drill pipe but will be moved over couplings and tool joints by engagement with the surface of the casing or the wall of a well when the drill pipe structure is being raised, lowered, or operated. My present invention, as the result of the use of strong and very resilient springs therein, grips the drill pipe securely and permanently, so that it is caused to remain in the position of operation in which it is originally placed on the drill pipe. The structure is of such strength that in use of the drill pipe my drill pipe protector will not be moved over couplings and tool joints.

An object of the invention is to provide a drill pipe protector consisting of a cylindrical body of rubber material, selected principally for its wear resisting and non-frictional characteristics, having therein resilient spring members to provide ample resilience for causing the protector to grip the drill pipe securely.

An advantage of my invention is that a rubber compound may be selected for its frictional and wear resisting characteristics and the lack of resilience thereof may be more than compensated for by a circular reinforcement of strong spring members.

Further objects and advantages of the invention will be made evident throughout the following part of the specification.

Referring to the drawing which is for illustrative purposes only,

Fig. 1 is a partly sectioned elevation showing my invention in use on a drill pipe within a well casing.

Fig. 2 is an enlarged, vertical diametral cross section through my new drill pipe protector and a portion of drill pipe on which it is mounted.

Fig. 3 is a horizontal cross section substantially on a plane represented by the line 3—3 of Fig. 2. In this sectional view a spring reinforcing element of the drill pipe protector is shown in elevation.

Fig. 4 is a fragmentary detail view showing a reinforcing spring which may be employed in the practice of the invention.

Fig. 5 shows a flat type of reinforcing spring which may be employed in the practice of the invention.

In the utility view, Fig. 1, I show a drill pipe structure 10 consisting of lengths or joints of pipe 11 secured together by couplings and by tool joints 12. In the drilling of a well 13, the drill pipe 10 is extended within the well and through a casing 14 set therein. To prevent engagement of the drill pipe structure 10 and its couplings and tool joints 12 with the well casing or wall of the well, my drill pipe protector 15 is mounted on the drill pipe structure 10 in substantially the manner shown, it being preferable to place the protector 15 adjacent to a coupling or tool joint 12 and surrounding or mounted upon a length of pipe 11 adjacent to such coupling or tool joint 12. As shown in Figs. 2 and 3, the drill pipe protector 15 consists of a cylindrical body 16 of resilient, wear resisting material, preferably having an internal diameter ID smaller than the external diameter of the drill pipe 10 on which it is to be mounted and having an external diameter OD which is greater than the external diameter of the tool joint 12 and such sleeve couplings as are employed in the drill pipe structure or drilling string 10. The cylindrical body 16 has a circular reinforcing means therein in the form of springs 20 which are placed side by side within the body 16, as best shown in Fig. 2.

The drill pipe protector 15 is made in the following manner. An inner annular wall or tube 21 of relatively raw, or vulcanizable, rubber compound of the desired length is first formed, this wall having a diameter D and being of a thickness equal to approximately $\frac{1}{16}$ of an inch. Springs 20 having a central core 22 of vulcanizable rubber extending therethrough are then wound upon the inner wall 21, it being preferable to exert a pull on the springs 20 so as to place an initial tension therein. A series of springs 20 may be employed in side by side position, or a single long spring may be wound spirally from one end to the other of the inner wall 21. After the placement of the springs 20, vulcanizable rubber is then applied over the springs 20

and the wall 21 to form an outer annular wall 23, thus completing in unvulcanized state the cylindrical body 16, which may then be placed in a mold and vulcanized so as to cause the rubber of the inner and outer layers 21 and 23 to form a homogeneous body having circularly resilient reinforcing elements therein.

As herein set forth, it is preferable to make the internal diameter ID of the protector 15 smaller than the external diameter of the pipe 11 on which it is to be mounted so that in placing the protector on the drill pipe it is necessary to stretch it and thus place the vulcanized rubber material of the inner and outer walls 21 and 23 and the springs 20 under tension, this tension thereafter being exerted circularly so as to tend to produce a return of the drill pipe protector 15 to its original diameter, with the result that the pipe 11 is securely and forcibly gripped thereby. Although in the preferred form of the invention I prefer to use a helically wound spring 20, as shown in Fig. 4, other forms of springs may be employed in the circular, resilient reinforcement of the drill pipe protector 15. Illustrative of this, I have in Fig. 5 shown a flat form of spring 30 which may be satisfactorily employed in the practice of the invention. The presence of the metal springs in the structure of the drill pipe protector produces a permanent resilience therein even though a portion of the resilience of the rubber employed should be lost due to the pounding action on the protector during its use in a well.

In a drill pipe protector such as shown, the rubber compound may be selected for its durability and non-frictional characteristics, and the necessary resilience for gripping a drill pipe may be produced therein by selecting spring reinforcing elements of proper strength, or a rubber compound of maximum strength and resilience may be selected and the total resilience of the protector increased by use of spring reinforcing means of the character herein disclosed.

I claim as my invention:

1. A drill pipe protector of the character described, comprising: a body of resilient, wear resisting material in the form of a cylinder having an opening to fit a drill pipe and an external diameter greater than the coupling means for joining such drill pipe; and circularly resilient reinforcement members within said body of resilient material.

2. A drill pipe protector of the character described, comprising: a body of resilient, wear resisting material in the form of a cylinder having an internal diameter smaller than the external diameter of a drill pipe structure on which said protector is to operate and an external diameter greater than the coupling means of such drill pipe structure; and circularly resilient metallic rein-

forcement members within said body of resilient material.

3. A drill pipe protector of the character described, comprising: a body of resilient, wear resisting material in the form of a cylinder having an internal diameter smaller than the external diameter of a drill pipe structure on which said protector is to operate and an external diameter greater than the coupling means of such drill pipe structure; and circularly resilient metallic reinforcement members within said body of resilient material, said resilient reinforcement members being under tension so as to produce a tendency to circularly constrict said resilient body and to cause same to forcibly grip said drill pipe structure.

4. A drill pipe protector of the character described, comprising: a cylindrical body of resilient, wear resisting rubber compound having an internal diameter to fit a drill pipe structure on which said protector is to be employed and having an external diameter greater than the coupling means of said drill pipe structure; and spring means extending circularly within said cylindrical body.

5. A drill pipe protector of the character described, comprising: a cylindrical body of resilient, wear resisting rubber compound having an internal diameter to fit a drill pipe structure on which said protector is to be employed and having an external diameter greater than the coupling means of said drill pipe structure; and a plurality of circular metal springs placed side by side within said cylindrical body.

6. A drill pipe protector of the character described, comprising: a cylindrical body of resilient, wear resisting rubber compound having an internal diameter to fit a drill pipe structure on which said protector is to be employed and having an external diameter greater than the coupling means of said drill pipe structure; and spring means extending circularly within said cylindrical body, said spring means having an initial tension therein for producing a circular constriction of said cylindrical body.

7. A drill pipe protector of the character described, comprising: a cylindrical body of resilient, wear resisting rubber compound having an internal diameter to fit a drill pipe structure on which said protector is to be employed and having an external diameter greater than the coupling means of said drill pipe structure; and a plurality of circular metal springs placed side by side within said cylindrical body, said springs having an initial tension therein for producing a circular constriction of said cylindrical body.

8. A drill pipe protector of the character described, comprising: a cylindrical body of resilient, wear resisting rubber compound having an internal diameter smaller than a drill pipe structure on which said protector

is to be employed and having an external diameter greater than the coupling means of said drill pipe structure; and spring means extending circularly within said cylindrical body.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 21st day of January, 1930.

WALTER G. L. SMITH.