

April 16, 1940.

W. G. L. SMITH
 DRILL PIPE PROTECTOR
 Filed Jan. 12, 1938

2,197,531

Fig. 1.

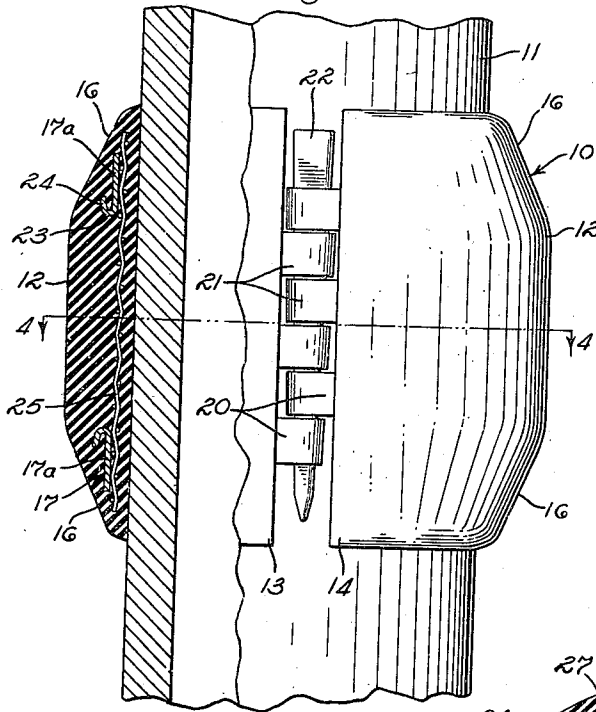


Fig. 3.

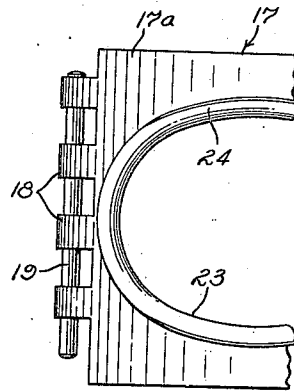


Fig. 4.

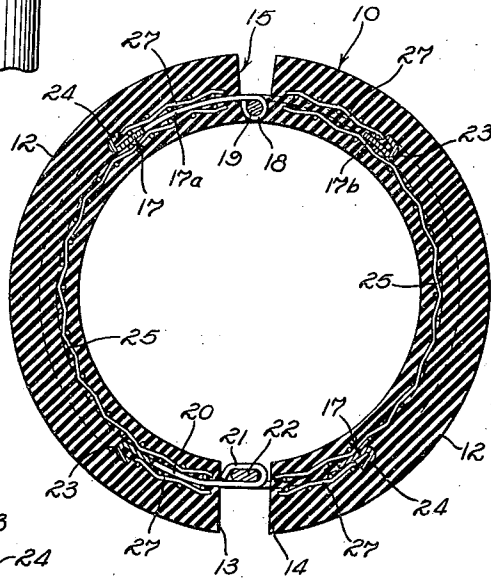
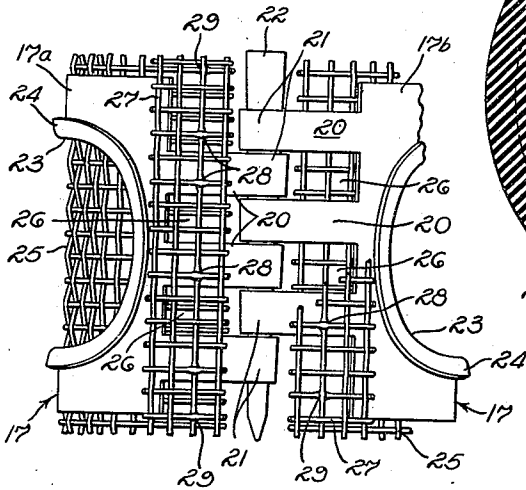


Fig. 2.



INVENTOR
 WALTER G. L. SMITH
 BY HARRIS, KIECH, FOSTER & HARRIS
For W. Harris
 ATTORNEYS.

UNITED STATES PATENT OFFICE

2,197,531

DRILL PIPE PROTECTOR

Walter G. L. Smith, Los Angeles, Calif.

Application January 12, 1938, Serial No. 184,571

3 Claims. (Cl. 308-4)

My invention relates to devices for protecting drill pipe, more specifically protective collars adapted to embrace drill pipe.

In the drilling of a well, a relatively long string of drill pipe rotating inside a larger casing will inevitably tend to frictionally engage the outer casing at random points. To prevent excessive resultant wear of the outer casing and of the couplings and tool joints in the drill string, it is customary to mount resilient collars or protectors at spaced points on the drill pipe, the protectors being larger in diameter than the couplings or tool joints of the drill string.

The present invention refers to a split pipe protector that may be opened and then releasably closed to avoid the necessity of slipping the protector over an end of the drill pipe. In a protector of this type, a metal reinforcement means having the character of a core or internal frame is embedded in the resilient body of the pipe protector to cooperate with means for releasably connecting the ends of the protector together. The embedded reinforcement takes care of various stresses exerted through the body, including the stresses engendered by the drawing together of the ends of the protector in mounting the device on drill pipe.

One of the difficulties heretofore encountered in this art is that the bulk required for adequate strength in the internal reinforcement has been so great as to leave insufficient room for adequate thickness of the resilient material forming the enveloping body. One of the objects of my invention is to provide a combination of internal reinforcement means adequate for all stresses met in service, but, nevertheless, relatively thin to permit maximum thickness of the surrounding resilient material. My invention in this aspect is characterized by the combination of a primary reinforcement in the form of an embedded band to receive longitudinal stresses through the drill pipe protector, together with secondary reinforcement means to take care of other stresses. I contemplate forming relatively large apertures in the band, thereby reducing the bulk of the band and relying upon the secondary reinforcement means disposed across said apertures. Certain additional advantages that will be apparent in my detailed description result from this.

Another problem commonly noted in the art is the tendency of the material of the resilient body of the protector to peel away from the internal reinforcement means, especially when such means comprises a band having extensive smooth

surfaces. This tendency has been especially troublesome in pipe protectors of the larger diameters. In fact, constructions successfully employed in protectors for three and four inch drill pipe have been found to be impractical for protectors large enough for mounting on five and six inch drill pipe. One of the objects of my invention is to avoid any such peeling action by providing means for effectively holding rubber-like material against a relatively smooth surface.

My invention is characterized by the conception that this object may be attained by combining with the smooth primary reinforcement a perforate or cribriform secondary reinforcement lying adjacent the smooth surface of the primary reinforcement and connected thereto at spaced points, so that the resilient material of the protector body may permeate the secondary reinforcement and have portions locked in a positive manner between the two reinforcements.

I have discovered that a bond of even greater efficiency between the cribriform means and the band may be attained if the band is discontinuous or apertured to provide spaces spanned by the cribriform means, an especially efficient bond being achieved if two layers of the cribriform material are provided to overlie both faces of the metal band. One of the objects of my invention is to apply this latter construction to the reinforcement of the resilient body adjacent the protruding ends of the embedded band to prevent peeling of the resilient material.

The above and other objects of my invention will be apparent from the detailed description to follow, considered with the accompanying drawing.

In the drawing:

Fig. 1 is a side elevation, partly in section, showing the protector mounted on a section of drill pipe.

Fig. 2 is a side elevation of the internal reinforcement, partly broken away, with the resilient body removed.

Fig. 3 is a side elevation of a portion of the internal reinforcing band.

Fig. 4 is a transverse section taken as indicated by the line 4-4 of Fig. 1.

Fig. 1 shows my protector, generally designated by the numeral 10, mounted on a drill pipe 11, the protector comprising a body 12 that is preferably molded from a resilient material, for example, rubber or the like. The body 12 is split to form two opposed ends 13 and 14, and has a longitudinal channel 15 to permit a hinge action when the two ends are spread apart for mount-

ing the protector on drill pipe. Preferably, the body is of streamlined contour, being tapered adjacent its upper and lower edges to provide conical surfaces 16.

5 Embedded in the resilient body 12 is a primary reinforcement means 17 having the character of a relatively rigid split band designed to withstand longitudinal stresses and also to serve as means for placing the protector under tension circumferentially. To provide for a hinge at the channel 15 of the body, the band 17 may be made in two sections 17a and 17b having dove-tailed tongues 18 looped to embrace a hinge pin 19.

15 For the purpose of securing the other ends of the band sections 17a and 17b together, they may be formed with dovetailed tongues 20, which are formed into flat loops 21 to receive a flat tapered locking pin 22. The flat loops 21 decrease in width from one end of the pipe protector to the other end in agreement with the taper of the pin 22, so that when the pin is driven into place toward the position indicated in Fig. 1, it draws the cooperating ends of the band together, thus producing circumferential constriction of the protector.

An important function of the band 17 is to take care of longitudinal stresses through the pipe protector, but I have found that the band may be substantially reduced in weight by apertures without interfering with that function. For example, each of the two collar sections 17a and 17b may be cut away to provide relatively large apertures 23. The edges of each aperture 23 may be strengthened by forming a flange 24, the flange being turned over to provide anchorage for the material of the resilient body 12.

I have found that if the secondary reinforcement to take care of various lateral stresses is in the form of a perforate or cribiform sheet laid along the band and attached thereto at spaced intervals, such secondary reinforcement will serve additionally as a mechanical bonding agent for holding the material of the resilient body against the band, the secondary reinforcement, in effect, anchoring the rubber body to the band. I have found that even if an attempt is made to fit such a secondary reinforcement uniformly snug against the smooth surfaces of the primary reinforcement, the material of the resilient body in the molding process will encase the perforate secondary reinforcement and have portions locked between the two reinforcements. Preferably, woven wire screen will be employed, one advantage being that wherever the wires cross in the weave, effective spacing for anchorage is insured, another advantage being that a round wire has an anchorage value even when it lies flat against a smooth surface with no intervening space.

20 In the drawing I show a sheet of woven wire 25 lying against the inner face of each of the band sections 17a and 17b, it being understood, of course, that the wire screen may lie against either face of the band. It will be noted that the screen spans each of the band apertures 23. The cross-section represented by Fig. 4 shows that in my construction the central portions of the protector have maximum resilient material with minimum embedded metal, and, since the embedded reinforcement is of reticulate character, the body 12 is not divided into independent inner and outer strata.

While it is apparent, as previously explained, that a wire screen or other perforate sheet lying against a smooth surface and attached thereto

at spaced points will anchor a surrounding resilient body to the smooth surface, nevertheless in such construction only relatively thin layers of the resilient material are locked between the wire screen and the primary reinforcement. A feature of my invention is the conception that the anchorage of the screen or perforate sheet in the resilient material may be made exceptionally effective by cutting away portions of the primary reinforcement so that substantial thicknesses of the resilient material may lie on both sides of the embedded screen or perforate sheet.

A further feature of my invention is the conception that by cutting away the primary reinforcement at spaced areas, I may provide a series of successive zones in which provision is made for attaching the secondary reinforcement to the primary reinforcement and alternately for anchoring the secondary reinforcement with maximum effectiveness in the resilient material. This construction involving a series of zones is employed preferably to insure an effective bond between the resilient material and the primary reinforcement where the primary reinforcement protrudes from the body of the protector, for example, in the vicinity of the hinge of the band near the loops 21 for securing together the open ends of the protector. The purpose of providing the relatively long tongues 18 at the hinge of the protector and the relatively long tongues 20 near the open ends of the protector is to provide in the assembled device a series of spaced openings 26, as indicated in Fig. 2.

In the preferred form of my invention, I provide two layers of the secondary reinforcement extending over such a zone, one layer being on each side of the primary reinforcement. Thus, in Figs. 2 and 4, I show strips 27 of the woven wire lying over the outside faces of the tongues of the bands opposite corresponding portions of the inner reinforcement sheet 25. The secondary reinforcement material may be attached to the bands 17a and 17b in any suitable manner, but, by preference, I simply spot-weld the screen material to the band at various points as indicated at 28, and where the two layers of screen extend beyond the edges of the band I may connect them together by spot-welding, as indicated at 29.

The specific embodiment of my invention shown for the purpose of this disclosure is illustrative only and suggests a wide range of changes and modifications within the spirit of my concept. I reserve the right to all such changes and modifications that are covered by my appended claims.

I claim as my invention:

1. A pipe protector of the class described, comprising: a split circular body of resilient material; a split band embedded in said body, said band having apertures; means to releasably connect the opposed ends of the band; and a perforate metal sheet embedded in said resilient body and spanning apertures of said band, said perforate sheet being attached to said band and being sufficiently coarse in its perforations to provide substantial bonding through the sheet of the portions of said body that lie on opposite sides of the sheet, whereby the perforate sheet will prevent said resilient material from peeling away from said embedded band.

2. A pipe protector of the class described, comprising: a split circular body of resilient material; a split band embedded in said body with its ends protruding from the body; means to releasably

connect said ends of the band; and cribriform material embedded in said body and attached to said band, said cribriform material lying on both the inner side and the outer side of said band, said cribriform reinforcement being of such coarseness in mesh that the portions of said body on the opposite sides of the reinforcement are interconnected therethrough with substantial bonds whereby said cribriform reinforcement anchors said body against said band.

3. A pipe protector of the class described, comprising: a split circular body of resilient material; a split band embedded in said body, said band having spaced tongues extending from the split ends of said body; and cribriform material embedded in said body and attached to said band, said cribriform material lying against both the inner side and the outer side of said band and extending over the spaces between said tongues, said cribriform material being of such coarseness in mesh that the portions of said body lying on opposite sides of the cribriform material are interconnected through the material.

4. A pipe protector of the class described, comprising: a split circular body of molded material, said body being cut away to form a longitudinal channel for hinge action; a split metal band embedded in said body with its split edges protruding from the ends of the body, said band having at least one relatively large aperture; means to releasably connect opposed ends of the band at the split thereof; and a metal cribriform reinforcement embedded in said body and spanning said aperture, said member being attached to said band, said cribriform reinforcement being of such coarseness that the portions of said body lying on opposite sides thereof are interconnected therethrough with substantial bonds whereby said cribriform reinforcement holds said body against said band.

5. In a device of the character described, the combination of: a molded body; a reinforcement member for said body; and means for anchoring the body to the reinforcement member, said means comprising a perforate member embedded in the body and overlying extensive surfaces of the reinforcement member, said perforate member being attached to the reinforcement member at spaced points and out of contact with the reinforcement member between said spaced points, the perforations of said perforate member being dimensioned to provide substantial bonding through the perforate member of the portions of said body that lie on opposite sides of

the perforate member to prevent the material of the molded body from peeling away from said reinforcement member.

6. In a device of the character described, the combination of: a molded body; a reinforcement member embedded in said body, said reinforcement member having a series of spaced openings; and means for anchoring the body to the reinforcement member, said means comprising a perforate member embedded in the body and extending over said openings, said perforate member being attached to said reinforcement member intermediate said openings, the perforations of said perforate member being dimensioned to provide substantial bonding through the perforate member of the portions of said body that lie on opposite sides of the perforate member, whereby the perforate member prevents material of said body from peeling away from said embedded reinforcement member.

7. In a device of the character described, the combination of: a molded body of annular configuration; a relatively rigid metal wall member embedded in said body for the reinforcement thereof, said wall member being cut away to provide an opening therethrough; and means to anchor said molded body to said wall member to prevent the molded body from being separated outwardly from the wall member, said means comprising a perforate metal sheet embedded in said body on the inner side of said wall member in a position extending over said opening, the perforations of said sheet being dimensioned to provide substantial bonding through the sheet of the portions of said body that lie on opposite sides of the sheet.

8. A pipe protector of the class described, including: a split circular body of resilient material; a split band embedded in said body; means to releasably connect the opposed ends of the band together; and a metal reinforcement embedded in said body to prevent the material of the body from peeling away from said band, said reinforcement having numerous apertures to give it a perforated character, said apertures being large enough that portions of said body on opposite sides of the reinforcement are interconnected therethrough with substantial bonds, said reinforcement being attached to said band at spaced points, said reinforcement being spaced from the band and separated from the band by the material of said body intermediate said points of attachment.

WALTER G. L. SMITH.