June 10, 1969 B. S. MINOR 3,449,022

DRILL PIPE PROTECTOR

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Fig. 1

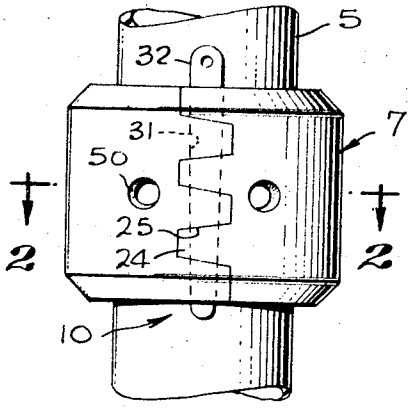


Fig. 2

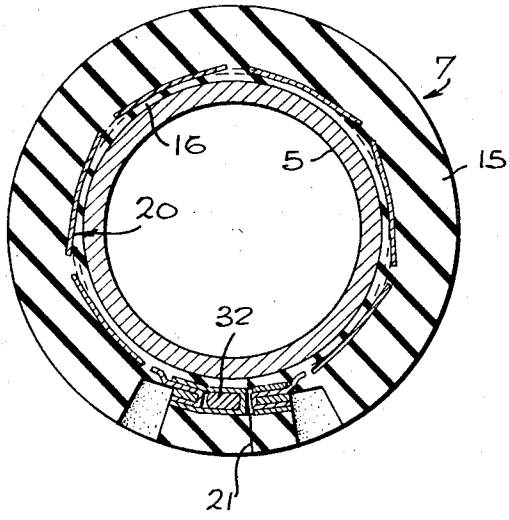


Fig. 3

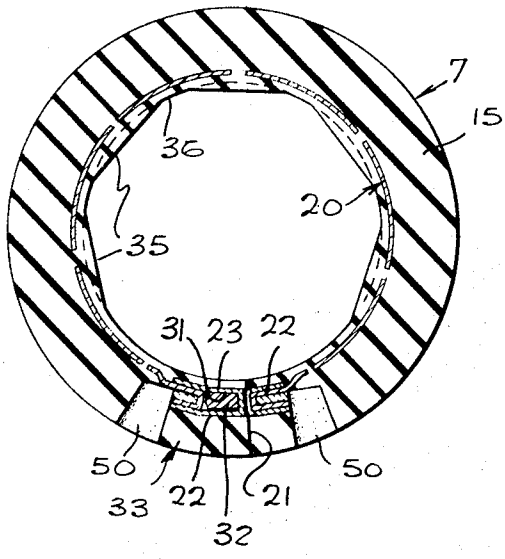
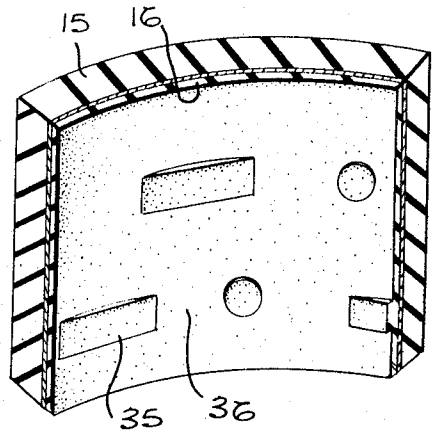


Fig. 9



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Fig. 4

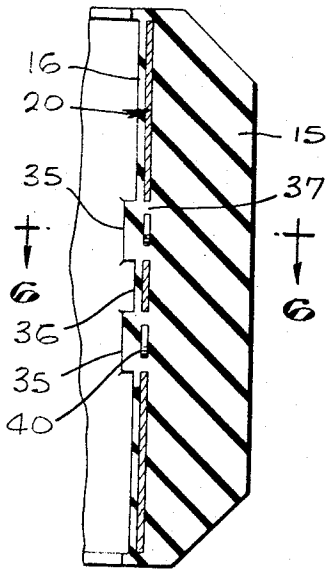


Fig. 5

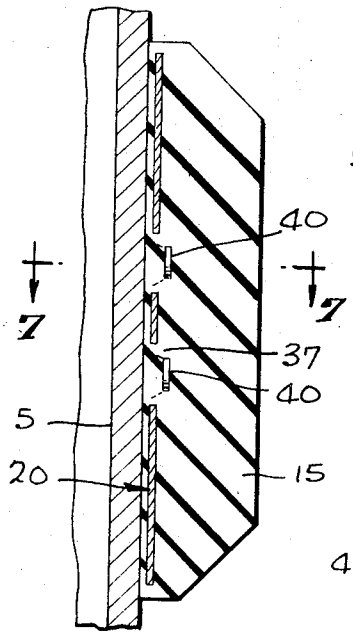
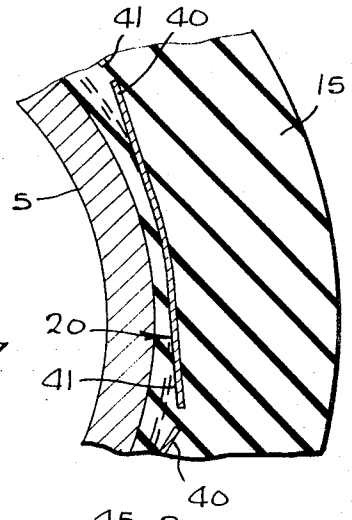


Fig. 7



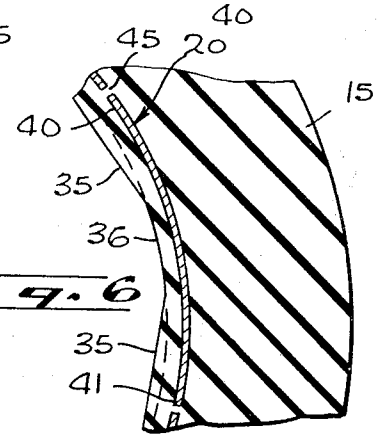


Fig. 6

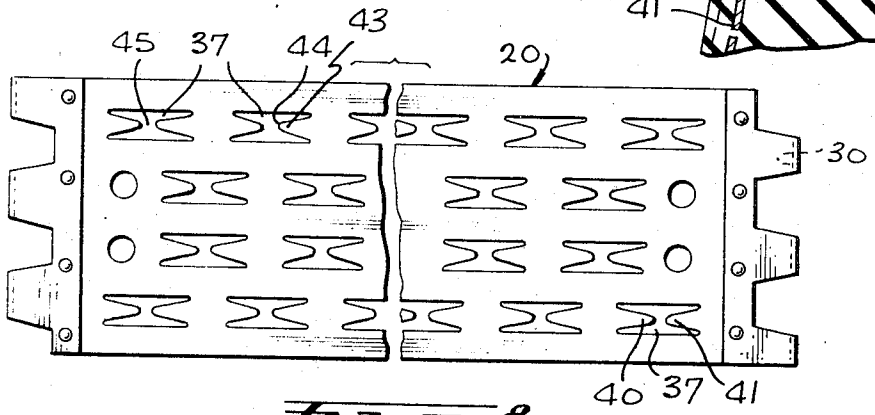


Fig. 8

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3,449,022

DRILL PIPE PROTECTOR

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Continuation-in-part of application Ser. No. 573,706, Aug. 19, 1966. This application May 27, 1968, Ser. No. 732,336
Int. Cl. F16c, *1/26, 17/00, 21/00*
U.S. Cl. 308—4 6 Claims

ABSTRACT OF THE DISCLOSURE

My invention comprises a longitudinally split annual elastomeric drill pipe-protecting body having a metallic reinforcing band embedded in and bonded thereto, and is characterized by having partially resiliently interrupted elongated slots through the reinforcing band in critical relationship to particularly shaped, radially compressibe, stem-engaging boss portions of the body whereby to enable said boss portions to be compressed into adequate frictional engagement with the stem without compressing them beyond their maximum moduli of elasticity.

This application is a continuation-in-part of my copending application Ser. No. 573,706, filed Aug. 19, 1966, and relates to improvements on the invention described in application Ser. No. 490,878, filed Sept. 28, 1965, both of which are now abandoned.

In drilling deep bore holes such as in oil well drilling, the drill holes are usually of such depth that the metal drill stem or pipe which carries the drill tends, during rotation in the hole, to whip laterally into abrasive engagement with the metallic well casing lining the hole; and consequently it is customary to prevent such abrasive metal-to-metal engagement between the drill stem and well casing by means of constricting a pipe protecting device about the drill stem.

In broad essence, such protectors conventionally comprise an annular elastomeric sleeve-like body having a metalic reinforcing band embedded therein. The outer layer or portion of the elastomeric body on the outside of the reinforcing band is usually substantially thicker than the inner layer and therefore possesses relatively more elasticity. When applied to a drill stem, the inner layer must have such frictional engagement with the drill stem as will prevent the protector from slipping on the drill stem. Conventionally, this friction is obtained by tensioning the protector about the drill stem, which radially compresses the inner layer between the drill stem and the reinforcing band of the protector. In most protectors, the annular body and its embedded reinforcing sleeve are longitudinally split, the protector being constricted about the drill pipe by a latch mechanism which draws the ends of the protector together at the split.

A major problem inherent in the use of conventional protectors is the difficulty of obtaining such frictional engagement of the inner layer against the drill stem as will effectively prevent such relative slippage, without compressing the inner layer beyond its maximum modulus of elasticity. When there is such excessive compression of the inner layer, the elastomeric material of that layer rapidly deteriorates by losing its elasticity, resiliency and recovery capabilities, and my present invention has for its main object the overcoming of that problem.

More particularly, it is my object to provide a protector so constructed that when the inner layer of the elastomeric body is under compression, the compression may be kept below the maximum modulus of elasticity of the material by extruding some of the material outwardly through critically shaped and located, resiliently interrupted slots in the reinforcing band; and the opposition

to this extrusion provided by the resilient slot interruptions and the resilience of the outer layer assures the necessary frictional engagement of the inner layer with the drill stem.

It is a further and more particular object to concentrate the compressive forces by applying them directly against the resilient slot interruptions.

It is a still further and more particular object to so proportion the said boss portions and slots that they will have substantially the same length and width dimensions.

Still further and subordinate objects and advantages will become apparent to those skilled in the art from the following detailed description of a presently preferred embodiment of my invention wherein I shall refer to the accompanying drawings in which:

FIG. 1 is a side elevation of my protector constricted about a conventional metallic drill stem;

FIG. 2 is an enlarged cross-section taken on line 2—2 of FIG. 1;

FIG. 3 is similar to FIG. 2, but shows the device detached from the drill stem;

FIG. 4 is a section on line 4—4 of FIG. 3;

FIG. 5 is a section on line 5—5 of FIG. 2;

FIG. 6 is an enlarged fragmentary section on line 6—6 of FIG. 4;

FIG. 7 is an enlarged fragmentary section on line 7—7 of FIG. 5;

FIG. 8 is a free face view of the reinforcing band; and

FIG. 9 is an enlarged fragmentary elevational view of the inside surface of my protector.

In the drawings, **5** denotes a conventional metallic drill stem about which is constricted, by a latching mechanism **10**, my improved split protector body **7**.

The protector comprises an annular body of elastomeric material having a relatively thick outer layer **15** and a relatively thinner inner layer **16**, reinforced by metallic band **20** sandwiched between and bonded to those layers.

The body and band are longitudinally spit at **21**, the extremity portions of the band along the split being backwardly bent upon the reinforcing strips **22**. Secured to said extremity portions, as by riveting (not shown), the extension or keyway-forming members **23** provide, at and adjacent the split, interengaging, circumferentially opposed, tongue and recess portions **24**, **25**, extending across the split. The extension members **22** are of U-shaped cross-section so that when the tongue and recess portions are interengaged, they define a keyway **31** extending longitudinally along the split for the reception of a metallic latching key **32**. The elastomeric body has side extremity portions **33** at the split in which the extension members **23** of the band are embedded.

The inner layer **16** of the elastomeric material is so formed or molded as to define spaced drill stem-engaging boss portions **35** and intervening web-like portions **36**. The boss portions are each generally chordal in shape, being of maximum thickness between their ends and becoming gradually thinner toward their ends.

The reinforcing band **20** is provided with spaced elongated slots **37** directly outwardly of and in registering communication with respective boss portions **35**; each of said slots being interrupted by a pair of circumferentially opposed resilient fingers **40**, **41**, the outer ends of which fingers are preferably formed integral with the band, that being the only point at which the respective fingers are attached to the band and the point about which the fingers resiliently flex as will be hereinafter described. The outer or free ends **43** of the fingers are preferably rounded at **44** and terminate in circumferentially spaced relationship to provide a small space **45** therebetween. The width of the respective bosses is substantially the same as the width of the bosses although preferably the width of the bosses is of the order of 1/16" less than that of the slots. The

chord length of the respective bosses **35** is preferably the same or at least no greater than the length of the respective slots.

When my protector is tensioned about a drill stem, that compression of the inner body layer **16** comprising the bosses **35** is compressed between the drill stem and the resilient fingers **40, 41** while the relatively thin or web-like portions **36** of the inner layer are compressed between the drill stem and the portions of the band between the slots **37**. The compression of the bosses extrudes elastomeric material of the bosses against the inner surfaces of the resilient fingers **40, 41**, flexing those figures outwardly as best shown in FIG. 7. Some of the extruded material passes into the outer layer **15** through the spaces **45** between the respective pairs of fingers, becoming dispersed in and commensurately increasing the resiliency of the outer layer.

While this outward extrusion sufficiently relieves the compression of the bosses to avoid their elastomeric material being excessively compressed, the resultant lessening of the frictional engagement of the inner surface of the protector with the drill stem is compensated for by the opposite or inward pressure exerted on the outer surfaces of the resilient fingers, so that the desired frictional engagement is maintained.

The bosses **35** and the slots **37**, being in direct register and communication with each other, the extrusion is greatly enhanced and facilitated since the compressive forces are concentrated on the slots and the resilient fingers.

The chordal shape of the bosses causes the greatest outward extrusive force to be applied to the fingers at and adjacent their free outer ends, where they offer the least opposition to the extrusion.

To install my protector on the drill stem, it is manually spread apart sufficiently to enable the protector to be applied laterally about the drill stem. After the extremity portions of the band are interengaged at the split **22**, which is accomplished by a conventional clamping tool, not shown, whose jaws are inserted in the holes **50**, opening through the periphery of the body, the latching key **32** is inserted through the registering holes or loops **30** in the interengaging portions of the band, to latch the protector in tension about the drill pipe.

I claim:

1. A protector device for preventing abrasive contact between a metallic drill stem and a drill hole metallic casing, comprising an annular, longitudinally split body of elastomeric material having concentric inner and outer elastomeric layers, and a longitudinally split metallic reinforcing band mounted between and bonded to said layers; the inner layer of said body presenting spaced drill stem-engaging, radially compressible and extrudable boss portions thickest medially between their ends and of gradually decreasing thickness toward their ends; and means for constricting said band about said drill stem whereby radially to compress said respective boss portions and to extrude the material thereof; and means associated with said band for relieving said radial compression of said boss portions and for maintaining frictional engagement of said boss portions with said drill stem; said latter means comprising spaced, extrusion-passing, elongated slots through said band directly opposite and in register with said respective boss portions; said respective slots being yieldably interrupted by circumferentially opposed pairs of resilient fingers secured to the band only at the ends of said respective slots, whereby to be flexed outwardly at and adjacent their inner ends in response to the extrusion resulting from the radial compression of said respective bosses, and whereby to be flexed inwardly in response to the combined resiliency of said fingers and the elasticity of said outer layer.

2. The device of claim **1** wherein said fingers are unattached to said band except at their inner ends.

3. The device of claim **1** wherein each of said fingers has curved outer end edges.

4. The device of claim **1** wherein said fingers, when unflexed, are substantially in the plane of the contiguous portions of said band.

5. The device of claim **1** wherein the respective inner end portions of said fingers are integral with said band.

6. The device of claim **1** wherein said respective boss portions are substantially of the same width and circumferential length as said respective slots.

References Cited

UNITED STATES PATENTS

1,965,998	7/1934	Williams.	
2,002,893	5/1935	Holt.	
2,251,428	8/1941	Smith.	
2,380,715	7/1945	Aker	308—238
2,897,016	7/1959	Baker.	
3,051,532	8/1962	Collett.	
3,054,646	9/1962	Minor.	
3,094,360	6/1963	Collett.	
3,147,963	9/1964	Frazier.	

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U.S. Cl. X.R.

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