Sept. 15, 1970 C. H. COLLETT 3,528,499

PLASTIC FLOATING DRILL PIPE AND SUCKER ROD PROTECTOR

Filed March 25, 1969

Fig. 1

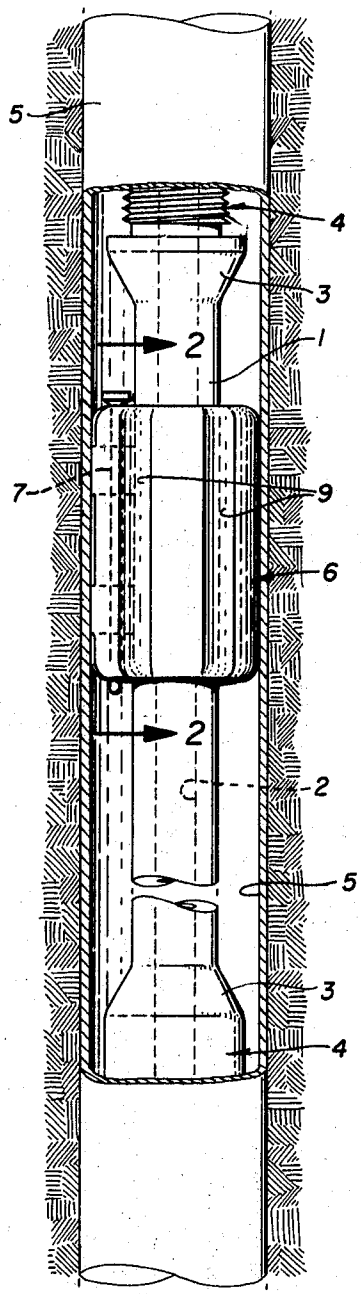
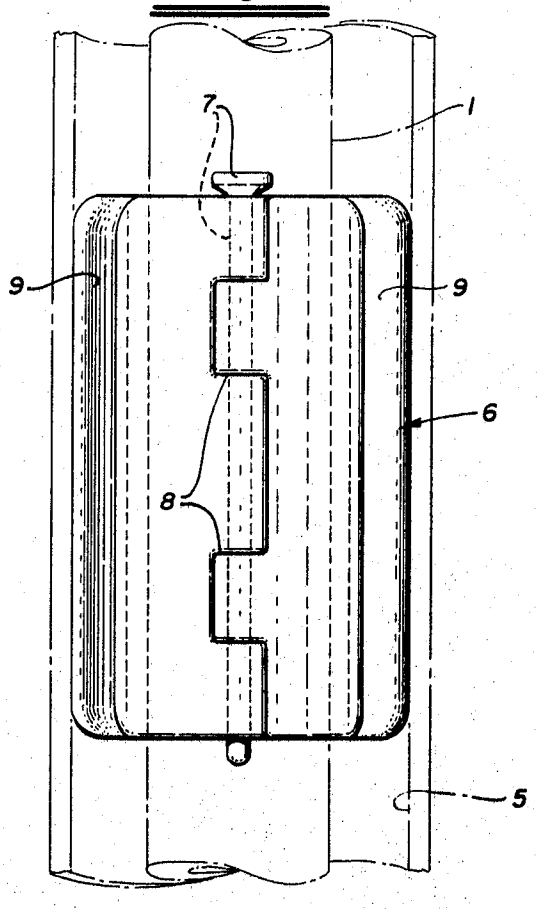


Fig. 2



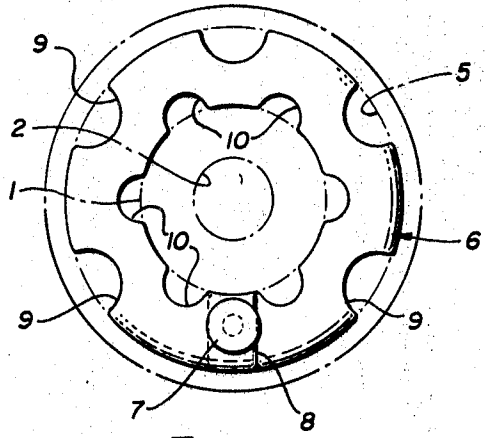


Fig. 3

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PLASTIC FLOATING DRILL PIPE AND SUCKER ROD PROTECTOR

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ABSTRACT OF THE DISCLOSURE

A protector for an oil well bore tube and casing for use in combination with an oil well drill pipe or sucker rod utilizes a novel construction which makes possible taking advantage of the unusual benefits of all plastic material in its construction. This combination further makes possible successful utilization of a floating relationship between the bore tube and the drill pipe or sucker rod. The construction permits rapid installation and replacement of the protector, increases its effectiveness with use, avoids jamming in the tube and on the pipe or rod. and permits elimination of metallic components in the protector and their attendant hazard to the well in case of failure of the protector.

BACKGROUND OF THE INVENTION

The drilling or pumping of oil wells has for many years presented a difficult problem of maintaining the proper relationship between the drill pipe or the sucker rod and the well bore tube or casing. The basic problem arises from the great depths, temperatures, and pressures involved in these operations, the difficulty of avoiding bends and crookedness in the bore hole and consequently in maintaining proper alignment between the drill tube or sucker rod and the bore tube or casing to insure proper operation of these devices.

Some of the more specific problems well known to those skilled in the art and which have been worked on many times, and the attempts made to solve them may be briefly summed up as follows:

(A) Drill tube or sucker rod must have flexibility to permit smooth operation in the tube or casing, which latter is often in a bad state of alignment or crookedness.

(B) The protectors used must not bind against the sides of the tube during operation.

(C) The protectors must not jam up against the tapered end of the tube or rod causing their expansion and binding in the tube.

(D) The protectors must permit free flow of drilling mud or oil through or around them and hence through the casing.

(E) The protectors should permit of easy installation on the pipe or rod, as well as ready removal and replacement.

(F) The protectors should be preferably free of metallic components which would jam the operation in the event of failure of the protectors.

One basic method of attempting to solve some of these problems was concerned with use of elastomeric materials for fabrication of the protectors. This method alone had many shortcomings in that most rubber, or similar compounds, must be made oil, heat, and cold resisting in order to be serviceable in this application. Ordinary rubber, of course, is not satisfactory. In addition the material must be flexible and have a low coefficient of friction. The configuration also must be such as to avoid jamming either in the casing or up against the tapers on the rods and to overcome this and related problems metallic inserts have been used in combination with elastomeric material. This, of course, created a problem of difficulty in

installing and replacing the protectors, as well as the hazard of introducing foreign metal into the well as mentioned above.

In the case of drill pipes, the principle of a floating protector in which the latter has sufficient clearance to permit it to ride up and down along the drill rod and thus avoid binding at any one particular point has been used. While this represented some improvement, there was still the problem of the protector rising up against the tapered section of the rod spreading out because of the relationship at that point and thus eliminating the clearance and resulting in jamming again. Protectors of this type, which are sometimes referred to as "stabilizers" in the art, when used in connection with drill pipes, have never been applied to sucker rods. The tremendous forces encountered during the upward motion of the sucker rod in particular causes such a floating protector to travel downwards during the upstroke of the sucker rod and invariably swell out over the taper and jam in the tube. On drill pipes, of course, the effect is the opposite due to circulation of drill mud.

Among the many attempts to overcome these problems some of the outstanding ones are represented by my Pat. No. 3,019,063 and my copending patent application No. 701,641 filed Jan. 30, 1968. While these have been quite successful, the problems enumerated above still exist to a considerable degree and have not been solved until my present invention which is described more fully below.

SUMMARY OF THE INVENTION

I have discovered that by the use of the all plastic one piece construction of my invention, together with my joining method, I am able to finally solve the problems enumerated above. More specifically, I have discovered that the use of such an all plastic construction of the type and configuration which I disclose below, in combination with metallic drill pipes and sucker rods, produces an unusual result insofar as the relationship between the plastic construction and the well elements themselves is concerned.

I have discovered further that the method of my invention which relates to the joining of my protector when placed in operation in combination with oil well elements as well as the effects of the oil itself and/or the drilling mud used, produces still further unusual results in connection with the solution of the problems.

I have discovered further that the combination of materials and construction which I disclose herein makes it possible to utilize a floating protector and realize the benefits thereof, not only in a drill pipe protector but in a sucker rod protector as well.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal section through a well casing or bore showing a typical drill pipe or sucker rod in position with the protector of my invention.

FIG. 2 is a longitudinal elevation of the protector of my invention in the direction 2—2 of FIG. 1.

FIG. 3 is a top view of the protector of my invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing, there is seen the shaft 1 of the drill pipe or sucker rod, as the case may be. A central channel 2 comprises a hollow concentric section in rod 1 for the purpose of circulating drill mud in the case of drill rod applications. Tapered sections 3 which join with the shaft section 1 provide the necessary increase in diameter for coupling members 4. The latter are threaded members used for interconnecting successive sections of drill pipe or sucker rod, as is well known to those skilled in the art.

The bore tube or well casing **5** is likewise an element of the well, well known to the art.

The protector body itself **6**, is provided with a connecting pin **7** which serves to lock in position the interlocking joint **8**. The latter is of irregular or staggered construction to provide overlapping or interlocking between opposite faces of the split in the body **6** of which it comprises the connecting or adjoining edges.

Outer grooves **9**, which comprise a series of longitudinal grooves in the outer surface of body member **6**, and inner grooves **10** which provide corresponding grooves on the inner surface of body member **6**, provide for circulation of drilling mud in the case of drill pipes, and for the flow of oil in the case of sucker rods.

It should now be apparent to those skilled in the art that body member **6** is capable of easy opening or flexing about its central axis and thus is placed in position around the shaft **1** of a drill pipe or sucker rod. Because of its resiliency body member **6**, after being placed around shaft member **1**, may be brought together so that its lengthwise split or joint **8** may come together and interlock as shown. Connecting pin **7** may then be inserted through suitably aligned holes in joint **8**, thus fixing protectors **6** in relation to shaft **1**.

Body member **6** and pin **7** are made of plastic materials. These may be any one of a number of suitable plastics, but I have discovered that those of the Plaskon type which are compounded from urea, formaldehyde resin are especially suitable. One particular type known as Plaskon 8200 HS manufactured by Allied Chemical Company, well known to the plastic art, is especially suitable for this purpose.

In addition to the ease of installation, replacement and removal of my protector, which should now be evident from the disclosure above, I am able with this construction and combination to maintain proper clearances between my shaft **1** and the central opening of my body member **6** as well as between the outside diameter of my body member **6** and the inside diameter of bore tube or well casing **5**. This permits me to employ the floating relationship between drill pipe or sucker rod and the well casing discussed above. I have found, for example, that a clearance of approximately 1/16 of an inch between shaft **1** and the central opening of member **6** when used in combination with the materials disclosed herein, provides adequate clearance for the floating of member **6** upon shaft **1**. I have found further that a clearance of approximately 1/4 of an inch to 1/2 of an inch between the outside diameter of member **6** and the inside diameter of bore tube **5** is adequate to take care of most conditions encountered in bore tubes.

What is of significant importance is, I have discovered that when using a plastic material of the class described herein in combination with the metallic elements of the drill shaft **1** and well casing **5**, plus the effect of the drill mud or oil, a strengthening or stabilizing effect is produced on the plastic materials which tend to strengthen them against deformation. This applies equally to the connecting pin **7** so that the entire assembly of my protector acquires greater strength against deformation while retaining its inherent flexible properties so important in this operation as disclosed above.

The foregoing has two very important and unusual effects in the solution of the problems which this invention solves. The strengthening effect of the combination of plastic, metal, and oil upon the properties of the plastics I employ permits my protector **6** to travel up in the case of sucker rods or down in the case of drill pipes with

proper frictional relationship on all surfaces and yet prevents it from expanding unduly, or even noticeably when it strikes the tapered sections **3**. The other effect of this result which my combination produces is that the strength of my protector thus attained precludes the necessity of use of any metallic inserts or supplementary elements to achieve the mechanical strength required. The ease of installation and removal which has been disclosed above is still present and evident to those skilled in the art.

I claim:

1. A plastic protector for drill pipes or sucker rods in oil wells comprising:

a hollow cylindrical body member having a single lengthwise split therein;

said lengthwise split characterized by a broken line defining interlocking sections in said body member on opposing sides of said split;

a longitudinal hole running lengthwise through said body and through said interlocking sections;

a plastic pin member disposed for insertion in said hole and through said interlocking sections;

a plurality of longitudinal grooves around the outer circumference of said body member and extending through the length thereof;

a plurality of longitudinal grooves around the inner circumference of said body member and extending through the length thereof;

said protector being further characterized by the absence of any metallic parts whatsoever.

2. The protector of claim **1** in which said body member and said pin member are composed of a plastic material compounded from urea-formaldehyde resin.

3. The protector of claim **1** in which said body member and said pin member are composed of one of a class of plastic materials known as Plaskon.

4. The protector of claim **1** in which said body member and said pin member are composed of a plastic material known as Plaskon 8200 HS.

5. The protector of claim **1** in combination with an oil well drill tube and casing in which the clearance between the inside diameter of said protector and the outside diameter of said tube is approximately one-sixteenth of an inch and the clearance between the outside diameter of said protector and the inside diameter of said casing is approximately one-half inch.

6. The protector of claim **1** in combination with an oil well sucker rod and casing in which the clearance between the inside diameter of said protector and the outside diameter of said tube is approximately one-sixteenth of an inch and the clearance between the outside diameter of said protector and the inside diameter of said casing is approximately one-half inch.

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U.S. Cl. X.R.

166—176; 308—4