May 15, 1962 G. G. HEBARD 3,034,187

DUAL STRING TUBING CLAMP

Filed Aug. 14, 1959

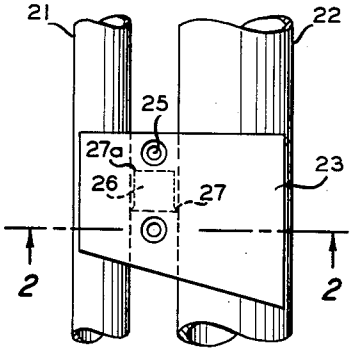


FIG. 1

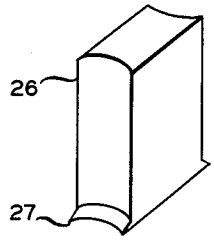


FIG. 4

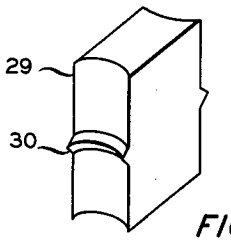


FIG. 5

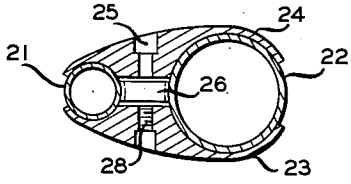


FIG. 2

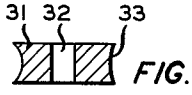


FIG. 7

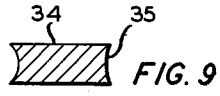


FIG. 9

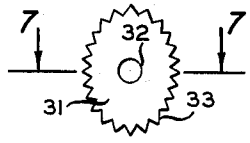


FIG. 6

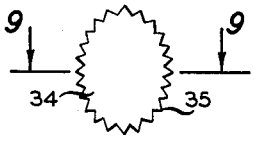


FIG. 8

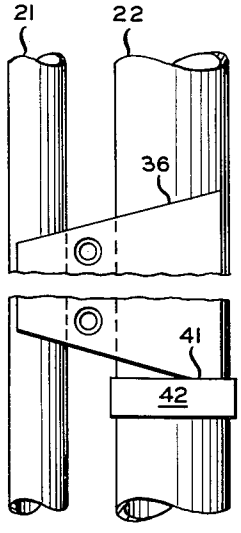


FIG. 3

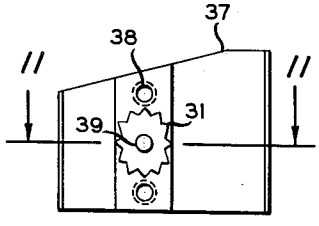


FIG. 10

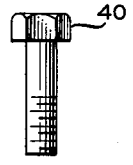


FIG. 12

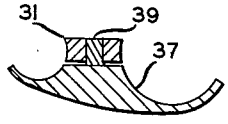


FIG. 11

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DUAL STRING TUBING CLAMP

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7 Claims. (Cl. 24—81)

This invention relates to an improved dual string tubing clamp. In one aspect it relates to a tubing clamp particularly constructed to support one string of tubing by a second string of tubing of larger diameter than the first string in deep wells. In another aspect it relates to a tubing clamp so constructed as to prevent downward slippage of one string of tubing with respect to the other string of tubing.

The tubing clamp of this invention is intended to be used in such deep wells as oil and gas wells in which two strings of tubing are employed. In wells embodying two separate tubing strings, ordinarily one string of tubing is of larger diameter than the other. In some cases one string is inside the other, but for the present invention the tubings are suspended side by side in a well. In such cases and particularly under the condition that the small tubing is of such small diameter as, for example, about two inches or less, for example, one inch, such a tubing string is frequently not self-supporting. Under this condition the present tubing clamps attach the small diameter tubing to the larger diameter tubing for suspension of the small diameter tubing. Large diameter tubings, that is those of about 2½ inches diameter and larger, ordinarily can support a weight greater than their own weight. Small diameter tubing can, however, be made self-supporting by use of upset ends and proper thread design. The present invention can be used with such self-supporting tubing, but is particularly intended for use with tubing which is not fully self-supporting.

Tubing clamps are used when a bottom hole hydraulic pump is employed, the small tubing supplying the power liquid and the larger tubing is a passageway for exhaust power liquid and pumped oil. The clamps transmit weight from the small tubing to the large to make certain that the threads at the small tubing joints are not stripped because of the weight of the pump, tubing and power liquid.

An object of this invention is to provide a dual string tubing clamp for rigidly attaching a small diameter tubing to a larger diameter tubing for support of the former. Still another object of this invention is to provide such a tubing clamp which does not permit appreciable slippage of the string of small tubing with respect to the larger tubing. Yet another object of this invention is to provide such a tubing clamp which is relatively simple and inexpensive to construct. Still other objects and advantages of this invention will be realized upon reading the following description which, taken with the attached drawing, forms a part of this specification.

In the drawing

FIGURE 1 is an elevational view of one embodiment of tubing clamp of my invention.

FIGURE 2 is a sectional view, taken on the line 2—2 of FIGURE 1.

FIGURE 3 is an elevational view of another embodiment of my invention.

FIGURE 4 is a view, in perspective, of a die block member of the tubing clamp of FIGURE 1.

FIGURE 5 is a view, in perspective, of an alternate embodiment of die block.

FIGURE 6 is a side view of still another embodiment of die member.

FIGURE 7 is a sectional view taken on the line 7—7 of FIGURE 6.

FIGURE 8 is a side view of still another embodiment of die member.

FIGURE 9 is a sectional view taken on the line 9—9 of FIGURE 8.

FIGURE 10 is an elevational view of still another embodiment of this invention.

FIGURE 11 is a sectional view, in part, taken on the line 11—11 of FIGURE 10.

FIGURE 12 is an elevational view of a piece of apparatus suitable for use with the embodiments of FIGURES 1, 3 and 10.

In the drawing, reference numeral 21 refers to a small diameter tubing such as would be employed in a deep well for production of oil or gas. Reference numeral 22 identifies a tubing of larger diameter than tubing 21 such as is used in deep wells for oil or gas production. Such a tubing combination is common in dual production wells and also in a well producing oil and gas in which the oil and gas are separated prior to production.

The clamp of this invention is composed of a pair of jaw members such as paw members 23 and 24 which are clearly illustrated in FIGURE 2. Each of these clamp members is so shaped at its ends to accommodate the small diameter tubing 21 and the larger diameter tubing 22. In FIGURE 1 reference numeral 25 identifies openings for insertion of bolts such as bolt 40, illustrated in FIGURE 12. Between the two bolts 40 and between the jaw members 23 and 24, is positioned a die 26. The die 26, as illustrated, is substantially a solid rectangular block of metal having lips 27 extending outward from opposite faces. These lips are illustrated in FIGURES 1, 2 and 4. The die is constructed so that upon assembling the tubing clamp assembly, the edges of the lips 27 bear tightly against the tubing surfaces. In this manner, as can be seen on reference to FIGURE 1, if tubing 21 moves downward with respect to tubing 22, the upper edge 27*a* of the die bears tightly against tubing 21 and tends to prevent further downward movement thereof. Upon further tendency of tubing 21 to move downward, this die tends to rotate further in an anticlockwise direction thereby tending to move the two tubings farther apart. Such tendency obviously tightens the hold of the clamp assembly on the two tubings thereby preventing further movement. On reference to FIGURE 2, the position of the die or die block is shown between the two strings of tubing. In this particular embodiment bolts 40 are inserted into bolt holes 25. The bolt opening in jaw member 23, as illustrated, is threaded so that separate nuts are not needed for tightening the bolts in place. Upon assembly of the apparatus with the die in place, the ends of the bolts can be upset or notched in a manner so that they cannot become unthreaded to loosen the two jaw members with respect to each other. The smaller number of apparatus parts which can be used in such an assembly is preferable to the use of a larger number of apparatus parts because if, for some unexplained reason, the assembly becomes loosened and falls to the bottom of the well, there is a smaller number of parts to be fished from the well.

FIGURE 4 illustrates the appearance of the lips 27 extending outward from the body of the die block 26. This figure further illustrates the shape of the lips for conforming to tubing strings of different diameters. In some instances it may be desired that a die block analogous to that of FIGURE 4 be relatively short vertically. Such a die block is believed to have an advantage in some cases over die blocks which are longer in their vertical dimension. FIGURE 5 illustrates an alternate type of die block 29 in which lips 30 are positioned at about the center of the die block vertically.

FIGURES 6, 7 and 10 illustrate an entirely different type of die block. This die block is an elliptical wheel with a plurality of gripping lips or teeth disposed around its periphery. This eliptical die is identified by reference numeral 31. This particular block has an opening 32

through its center for mounting on a spindle or shaft 39 as illustrated in FIGURE 11. Shaft 39 preferably is supported by only one jaw member, as jaw member 37. To be inoperable, the elliptical toothed type of die block is assembled in the clamp with its short axis positioned horizontally. With the apparatus assembled in this manner, as illustrated in FIGURE 10, upon either downward or upward movement of the smaller diameter tubing, the elliptical die block rotates and any rotation causes an effective increase in the diameter of the die block between adjacent surfaces of the two strings of tubing. As will be realized, the further one tubing moves with respect to the other, the harder the elliptical die block will press against the adjacent tubing surfaces and accordingly the tighter the two tubings will be held in the clamp assembly.

It is not essential that an elliptical die block such as die block 31 be supported on a shaft such as shaft 39; and in case an elliptical die is not supported by such a shaft, an opening such as opening 32 need not be provided therefor. Such an elliptical die block is illustrated in FIGURES 8 and 9. This die block 34 is provided with a plurality of circumferentially spaced teeth 35 similar to teeth 33 of FIGURE 6. In assembling a clamp assembly employing the elliptical die block of FIGURE 8, after inserting the lower bolt through the two jaw members the elliptical die block is dropped into its position between the two jaw members with its smallest diameter being arranged horizontally. Then the upper bolt is inserted as through bolt holes 38 of FIGURE 10. The actual operation of the elliptical die block 34 is the same as the operation of die block 31, that is, upon movement of one tubing string with respect to the other, the elliptical die block rotates thereby increasing its effective diameter between the two tubing strings which operation presses the tubing strings more tightly against the outer ends of the jaw members.

In the embodiment of tubing clamp illustrated in FIGURE 3, a portion of the lower surface of jaw members 36 is flat, as flat surface 41. In such a case a tubing clamp with jaw members 36 is frequently positioned immediately above a coupling 42 connecting two sections of the larger diameter tubing 22 and the clamp assembly obviously cannot move downward on tubing 22. Thus, in this case, tubing 22 can fully support the weight of the clamp and tubing 21.

When running such tubings in a deep well, it may be desired to use two or more of the clamp assemblies, as illustrated herein, for supporting the small diameter tubing by the larger diameter tubing. It is common to use a clamp at each joint of the large diameter tubing.

By using at least a pair of bolts 40 on opposite sides of the die blocks, and because of the principle of operation involved in the use of the die blocks herein disclosed, the bolts employed for holding the two jaw members together can be made more ductile material than when the die block principle as disclosed herein is not employed. In prior art, when a pair of jaw members operate to clamp two tubing strings so tightly as to prevent relative slippage, hard and relatively nonductile material should be used in fabricating the bolt or bolts. Such nonductile material is more subject to breakage than a ductile material. Thus, by using a die block of this invention to bear tightly against the two tubing strings when slippage occurs, slight elongation of bolts 40 can be tolerated because the further one tubing moves with respect to the other, the more firmly the die block tends to hold the tubings against opposite ends of the jaw members.

The mechanical principle involved in the support of the small tubing member 21 by the larger tubing member 22 is that of a cantilever beam.

While certain embodiments of the invention have been described for illustrative purposes, the invention obviously is not limited thereto.

I claim:

1. A dual tubing clamp comprising, in combination, a pair of jaw members, each jaw member having opposite arcuate ends, said arcuate ends having approximately the same curvature as the outer surfaces of tubings to be clamped, means retaining said jaw members in operable clamping position with respect to said tubings, said jaw members being spaced a sufficient distance from each other that a space is provided between adjacent surfaces of the intermediate sections of said members, a die positioned between said jaw members and between the opposite arcuate ends of each jaw member in said space, a separate gripping lip extending outward from each of the sides of said die adjacent one of the arcuate ends of said jaw members, the shape of the lips being substantially concentric with the outer surfaces of the tubings to be clamped, and said lips extending outward from said die toward the tubings sufficient distances so that upon assembling said clamp in its operable position around said tubings said lips bear tightly against said tubings.

2. In the clamp of claim 1 wherein said means retaining said jaw members in operable clamping position comprises a pair of bolts, one bolt of said pair being positioned above said die and the other therebelow.

3. A dual tubing clamp comprising, in combination, a pair of jaw members, each jaw member having opposite arcuate ends, said arcuate ends having approximately the same curvature as the outer surfaces of tubings to be clamped, said jaw members being spaced a sufficient distance from each other that a space is provided between adjacent surfaces of the intermediate sections of said members, a pair of bolts extending through both jaw members retaining said jaw members in operable clamping position with respect to said tubings, a die positioned in said space between said jaw members, between said bolts and between the opposite arcuate ends of each jaw member, said die being rotatable with respect to said jaw members, a separate gripping lip extending outward from each of the sides of said die adjacent one of the arcuate ends of said jaw members, the shape of said lips conforming with the outer surfaces of the tubings to be clamped, and said lips extending outward from said die sufficient distances that upon assembling said clamp in its operable position around said tubings said lips bear tightly against said tubings.

4. In the clamp of claim 3 wherein said die is substantially rectangular in cross section in a plane of the axes of the tubings to be clamped and said lips are positioned near one of the top and the bottom of said die.

5. In the clamp of claim 3 wherein said die is substantially rectangular in cross section in a plane of the axes of the tubings to be clamped and said lips are positioned approximately at mid section vertically of said die.

6. In the clamp of claim 3 wherein said die is an elliptical wheel, the axis of rotation of which is horizontally disposed, the plane of said wheel including the plane of the axes of the tubings to be clamped, said wheel having a rim provided with teeth, the shape of which conforms in general with the outer surfaces of the tubings to be clamped, and the shortest diameter of said wheel being positioned horizontally in its inoperable position.

7. In the clamp of claim 6 wherein said wheel is provided with an opening along the axis of rotation, and a spindle is provided and supported by at least one of said jaw members, the axis of said spindle being horizontally disposed, and said wheel being mounted on said spindle and being adapted to rotate thereon.

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