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A. L. STONE

2,719,025

SAFETY COLLAR

Filed Aug. 22, 1951

FIG. 2.

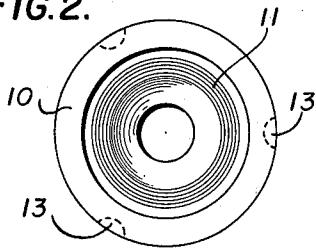


FIG. 1.

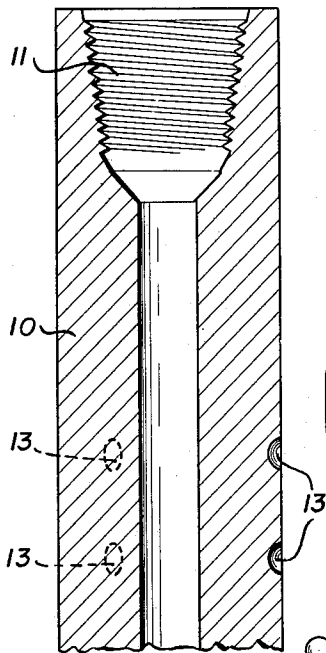


FIG. 8.

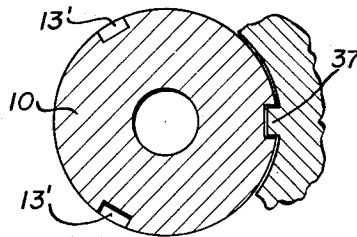


FIG. 9

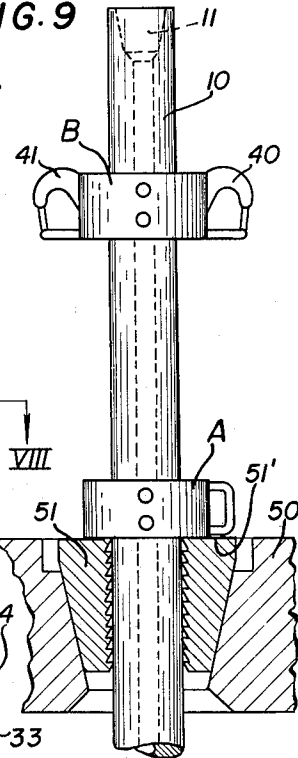


FIG. 7

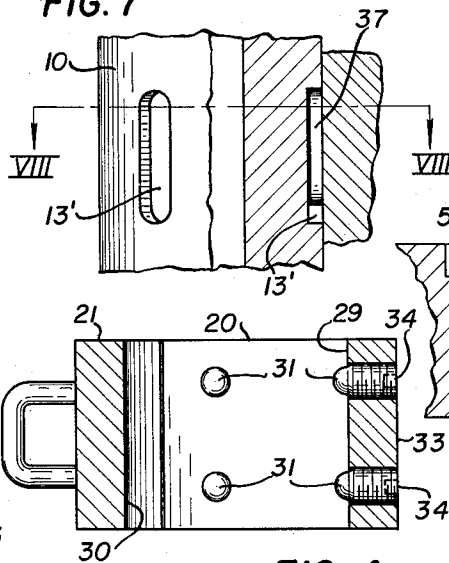


FIG. 4.

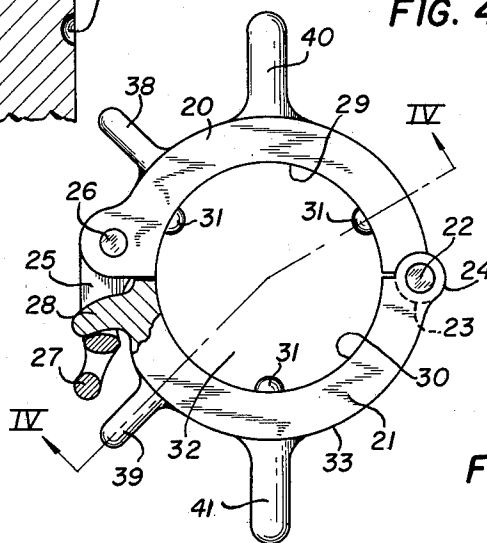


FIG. 5.

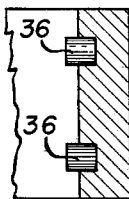
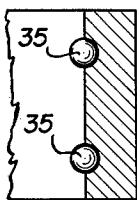
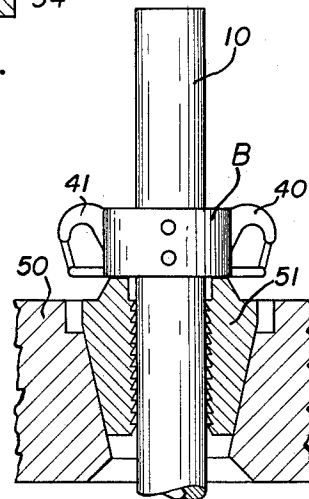


FIG. 6.

FIG. 3.

FIG. 10



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SAFETY COLLAR

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2 Claims. (Cl. 255—23)

The present invention relates to a safety collar of the type adapted to be engaged with a specially prepared drill collar in order to support the drill collar in an oil well derrick.

An object of the present invention is to provide a safety collar for use in conjunction with a drill collar to prevent the loss of the drill collar in the hole due to release of the slips supporting the drill collar from the rotary table. A further object of the present invention is to provide a safety collar which can be employed for grasping the drill collar for raising and lowering the drill collar in the borehole. A further object is to provide a safety collar which is incapable of sliding longitudinally along the drill collar and which can be applied to the drill collar without resorting to the usual friction clamps used for this purpose.

Briefly, the safety collar in accordance with my invention comprises a plurality of jaws hingedly connected together and adapted to be closed or opened to engage or to release a drill collar having recesses in its outer surface for receipt of load carrying members carried by the jaws. For securing the jaws in the closed position, an ordinary latch is employed which is capable of being easily latched and unlatched so that little, if any, time is wasted in engaging the jaws with and disengaging them from the drill collar. It is further contemplated that my safety collar may be equipped with a pair of lifting ears secured to the jaws so that the collar may be lifted by a suitable hoisting device. For the purposes of my invention, it makes no difference whether both these ears are secured to one jaw or whether one ear is secured to one jaw while the other is secured to another jaw so long as the two ears are located at diametrically spaced points on the collar.

The use of the safety collar of the present invention eliminates a number of serious disadvantages inherent in the usual practices of handling drill collars. For example, in order to avoid loss of drill collars into the borehole, it has been the common practice to attach to the drill collar a toothed clamp such as the "safety clamp" shown in the Composite Catalog, 1948 ed., on page 354. This toothed clamp is attached above the slips in order to provide pressure on top of the tapered slips in case the slips tend to release their grip at the time strain is being applied thereto. Not only is much time consumed in setting and tightening this clamp but it may fail to hold if it is applied at an angle while being tightened in place. In addition to these disadvantages which are inherent in the clamp itself, it is still necessary, after the clamp is affixed to the drill collar, to attach an adapter to the drill collar and to tighten the adapter with power tongs. This adapter remains attached to the stand of drill pipe in which the drill collar is arranged while the stand is set back in the derrick, thus keeping idle for long periods of time a costly piece of equipment on each such stand. It is necessary, however, to use this adapter inasmuch as the aforementioned clamp cannot be used as a

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grasping means for lifting the drill pipe stand in which the drill collar is arranged.

Another difficulty inherent in the modern drill collar comes about because of the form in which it is made. The modern drill collar is a uniform cylinder of hardened steel with screw threads at both ends. Because it is of uniform diameter through its outer length, it possesses no shoulder of enlarged diameter which can be relied upon to strike the upper surface of the tapered slips and cause the slips to reset in case the slips momentarily release their grip on the drill collar. Neither does the modern drill collar possess an area of smaller diameter on its outer surface so that it can be easily grasped with a hoisting device although at one time it was the practice to provide drill collars with an annular groove and shoulder so that they could be easily grasped with an elevator or a fishing tool. This older type cannot, of course, be used in areas where excessive stresses on drill collars are common because such drill collars fail at the points where they are grooved inasmuch as stresses are concentrated in this area. Accordingly, the modern practice of using an adapter screwed into the drill collar for providing a shoulder which may be grasped by an elevator has been adopted in place of providing a groove and shoulder on the drill collar itself. The safety collar of my invention makes possible the use of modern drill collars, only slightly modified, without resort to an adapter or a safety clamp of the kind hereinbefore mentioned.

A description of drill collars will be found in the Composite Catalogue of Oil Field and Pipe Line Equipment, 18th edition (1951), published by World Oil, Houston, Texas, on pages 393 and 2432. In the Composite Catalogue, supra, a discussion is given of the desirable characteristics of drill collars.

My invention will be explained in detail hereinafter with reference to the drawing which illustrates several embodiments of the invention and in which:

Fig. 1 is a cross-sectional view of a conventional drill collar altered to include spaced recesses in its outer surface;

Fig. 2 is an end view of the drill collar shown in Fig. 1;

Fig. 3 is a plan view of the safety collar of my invention with certain parts cut away to better show details of construction, the clamp being in the closed position;

Fig. 4 is a sectional view taken along the line IV—IV of Fig. 3;

Fig. 5 is a view similar to that of Fig. 4 but illustrating a different embodiment of the present invention;

Fig. 6 is a view similar to that of Fig. 4 but illustrating a different embodiment of the present invention;

Fig. 7 is a part-sectional view illustrating another embodiment of the present invention;

Fig. 8 is a sectional view taken along the lines VIII—VIII of Fig. 7;

Fig. 9 illustrates one manner in which the device of the present invention may be used in conjunction with slips for supporting a drill collar of the type shown in Fig. 1; and

Fig. 10 illustrates another way in which the device of the present invention may be employed with slips and in conjunction with a drill collar of the kind illustrated in Fig. 1.

Referring to the drawing, and particularly to Figs. 1, 2, and 7, the numeral 10 designates a conventional drill collar having an upper threaded end 11 and equipped with a plurality of spaced recesses 13. In Figs. 1 and 2, recesses 13 are shown as shallow depressions or holes not unlike the holes drilled in a shaft for receipt of a set screw. In Fig. 7 recesses 13' are shown in the form of longitudinal slots. In any event, the shape, size, and position of the recess is important. The recess

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should be shaped and located in such a manner that it does not produce a notched effect in the stress plane of the drill collar. This means that the recess should be placed in the heavy section of the drill collar well below the normal point of stress in the threaded area. It is preferable to locate these recesses some distance from the threaded ends so that the threaded ends may be recut and rethreaded from time to time as required. Furthermore, the recess should be of sufficient size and sufficient in number to transmit the load from the drill collar through the load carrying elements to the safety collar.

The safety collar of the present invention comprises a first jaw 20 forming the body of the device and a second jaw 21 comprising the gate. The first and second jaws are pivoted to one another by hinge pin 22 which passes through the knuckles 23 forming part of gate 20 and knuckles 24 forming part of gate 21. Jaws 20 and 21 pivot about the longitudinal axis of hinge pin 22.

A latch mechanism for holding jaws 20 and 21 in the closed position is provided, this latching mechanism comprising a latch 25 pivotally mounted on a latch hinge pin 26 to gate 20 and a latch handle 27, which handle abuts upon a cooperating latching projection 28 for holding jaws 20 and 21 in the closed position, as shown. Jaws 20 and 21 may be allowed to move in the open position by moving latch handle 27 outwardly about pivot pin 26 to disengage handle 27 from cooperating latching projection 28.

The inner surface 29 of jaw 20 and the inner surface 30 of jaw 21 are each semi-cylindrical. Load carrying members 31 project inwardly from jaws 20 and 21 past cylindrical surfaces 29 and 30, respectively, and into the central opening 32 formed by said cylindrical surfaces when jaws 20 and 21 are closed. These load carrying members may consist of set screws as shown in Fig. 4 which extend transversely through jaws 20 and 21 to the outer surface 33 thereof. When so arranged, the distance set screws 31 project beyond surface 29 may be altered from time to time as desired by applying a suitable tool to slotted head 34 and rotating the screw. These load carrying members may also suitably be a metal ball 35, as shown in Fig. 5, or a metal cylinder 36, as shown in Fig. 6, properly imbedded in the jaws. In any event, these load carrying members are located in jaws 20 and 21 so that they project into recesses 13 carried on the outer surface of drill collar 10 when jaws 20 and 21 are in the closed position. It will be also understood that rather than the load carrying members being in the forms illustrated in Figs. 4 to 6, inclusive, the load carrying member may be in the form illustrated in Figs. 7 and 8 and designated by the numeral 37. However, a safety collar equipped with load carrying members of the shape illustrated in Fig. 8 can be used only if the drill collar has recesses shaped to receive them as are the recesses illustrated in Fig. 7.

While Figs. 3 to 6, inclusive, and Fig. 8 illustrate a safety collar having a plurality of load carrying members, it will be understood that the safety collar of my invention may be equipped with as few as one such member. This is particularly true where a single drill collar is being lifted. Of course, a safety collar having a single load carrying member can be used in conjunction with a drill collar having only one recess.

For convenience in opening and closing jaws 20 and 21, handles 38 and 39, respectively, may be provided. In order to render the safety collar of my invention useful for lifting the drill collar as well as using it for causing the slips to set to prevent the drill collar from dropping, I provide lifting ears 40 and 41. It will be noted that lifting ear 40 is affixed to jaw 20 while lifting ear 41 is affixed to jaw 21, the two ears being positioned at diametrically opposed points on the collar. These lifting ears may be conventional in design and, accordingly, their construction will not be described in detail. It will

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be understood, however, that rather than having these two lifting ears on the two jaws, both of these ears may be located on the same jaw.

One way in which the safety collar of my invention may be utilized is illustrated in Figs. 9 and 10. Fig. 9 illustrates a drill collar 10 held in place in a rotary table 50 by means of slips 51. Mounted on drill collar 10 immediately above slips 51 is a safety collar A while a safety collar B provided with lifting ears 40 and 41 attached thereto is mounted adjacent the upper end of the drill collar 10 but below the threaded section 11 thereof. In this arrangement safety collar B can be used as an elevator by attaching lifting links to ears 40 and 41 while safety collar A impinges upon the upper surface 51' of slips 51 causing slips 51 to set.

Instead of providing two safety collars, as indicated in Fig. 9, a single safety collar may be employed, as indicated in Fig. 10. Fig. 10 shows a drill collar 10 grasped by means of slips 51 positioned in rotary table 50. A safety collar B having lifting ears 40 and 41 is mounted on drill collar 10. In this arrangement if slips 51 momentarily release drill collar 10 and the drill collar 10 moves downwardly therethrough, safety collar B will strike the upper surface 51' of slips 51 causing said slips to set, that is, again to grasp firmly drill collar 10. Ears 40 and 41 permit safety collar B to be employed as an elevator by attaching lifting links thereto. Thus, the safety collar may be used as an elevator as well as a means for causing slip segments to reset when and if they momentarily release their grip on a drill collar to which the safety collar is connected.

It will be apparent that various modifications of the disclosed device may be made without departing from the spirit of the present invention. What I wish to claim and to secure by Letters Patent is:

1. In an apparatus for supporting a string of drill pipe having a drill collar thereon from a rotary table having conventional slips, bushing, and gearing therein for rotating said string of pipe, said drill collar being provided on its exterior surface with at least one preformed recess, the combination with said apparatus of a safety collar attached to said string of pipe and designed to contact said slips and bushing in the event of failure of said slips, said safety collar comprising a plurality of jaws pivotally connected to one another, latching means carried by said jaws for securing said jaws together for encircling the drill collar, and at least one member on said jaws extending inwardly from the inner surface thereof and adapted to fit matingly in a recess on the exterior surface of said drill collar when said jaws encircle said drill collar.

2. In an apparatus for supporting a string of drill pipe having a drill collar thereon from a rotary table having conventional slips, bushing, and gearing therein for rotating said string of pipe, said drill collar being provided on its exterior surface with at least one preformed recess located in an unthreaded portion of the drill collar, said recess being elongated longitudinally of the drill collar with a surface defining said recess being normal to the outer surface of said drill collar, the combination with said apparatus of a safety collar attached to said string of pipe and designed to contact said slips and bushing in the event of failure of said slips, said safety collar comprising a plurality of jaws pivotally connected to one another, latching means carried by said jaws for securing said jaws together for encircling the drill collar, and at least one member on said jaws extending inwardly from the inner surface thereof and adapted to fit matingly in a recess in the exterior surface of said drill collar when said jaws encircle said drill collar.

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