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F. N. CRIPPEN

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TUBING CATCHER

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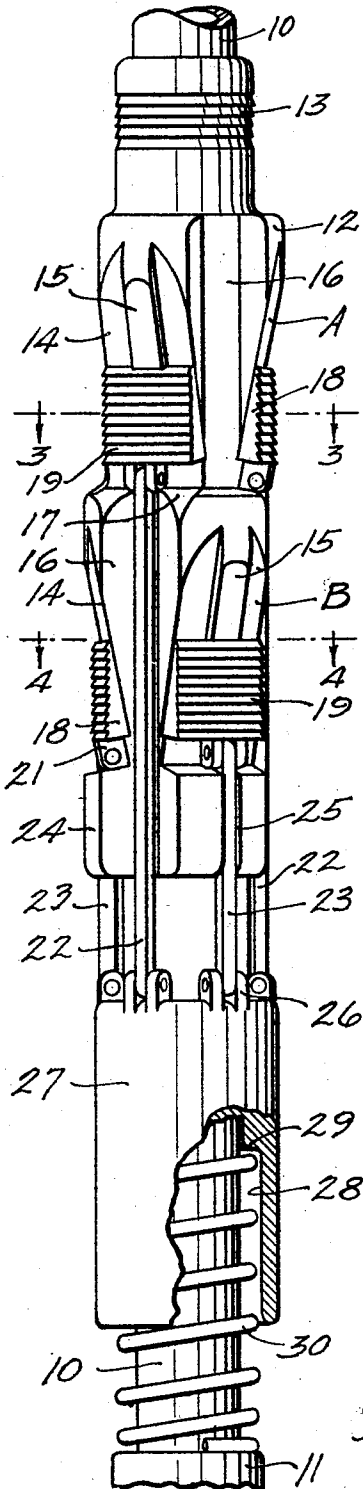


Fig. 1 334

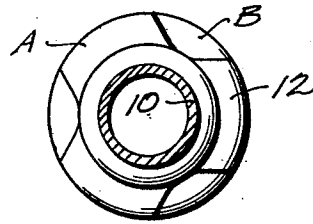


Fig. 2

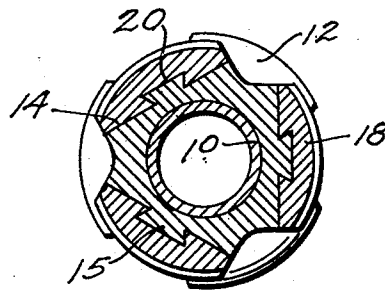


Fig. 3

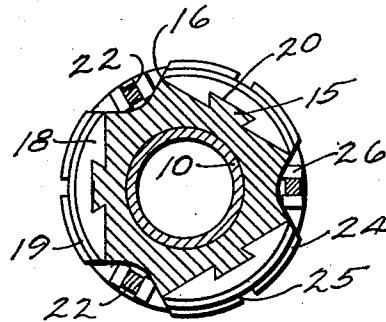


Fig. 4

Inventor
F. N. Crippen

Jack A. Ashley
Attorney

UNITED STATES PATENT OFFICE

FREDERICK N. CRIPPEN, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO WILLIAM R. GUIBERSON, OF LOS ANGELES, CALIFORNIA

TUBING CATCHER

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This invention relates to new and useful improvements in tubing catchers.

Tubing catchers are connected in a line of oil well tubing for the purpose of catching or arresting the tubing should it fall or break while being lowered into the well or while being elevated therefrom. The casing through which the tubing passes may have its inner surface coated with mud, oil, grease or the like, thus making it difficult for the slips to catch.

It is obvious the quicker the catch, the shorter the fall. Many times the string of tubing may be from four to six thousand feet deep, or deeper and an actual fall of one foot may mean a movement of several feet of the upper end of the tubing, because of the taking up of the stretch when the tubing is caught. The catcher must operate in a restricted area which is controlled by the diameter of the casing. This diameter at four thousand feet may be approximately six inches more or less. A failure of the slips to catch would be fatal to the tubing.

One object of the invention is to provide amplified or positive gripping means for a tubing catcher, whereby circumferential gripping teeth, having a combined circumferential length equal to or greater than the inner circumference of the casing, are provided.

An important object of the invention is to provide a head having inclined slip actuating faces at different elevations but adjacent to each other, whereby slips may be used thereon and the casing gripped at different elevations or points one above the other, thus assuring a more positive catching action.

A further object of the invention is to provide casing gripping slips disposed in staggered relation so as to individually engage separate vertical paths along the inner wall of the casing and also so as to actuate in overlapping vertical paths, whereby the entire inner circumference of the casing is employed for gripping purposes.

A still further object of the invention is to provide a tubing catcher having superposed groups of slip faces in staggered relation and arranged so as to provide continuous fluid passages when in the casing.

One of the advantages of the invention is that by employing amplified gripping areas, the toothed faces of the slips may be set back or inwardly so as to give more clearance between said teeth and the inner wall of the casing when the slips are dormant. The result of this is that shimmying of the weight 27, due to its spring poise, will not displace the slip enough to cause the teeth to grip the casing walls and interfere with the easy lowering or raising of the tubing in the well.

Another object of the invention is to connect all of the slips with a common operating means, whereby said slips will not operate successively but simultaneously, and also whereby if one slip is actuated all of the slips will be actuated.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings in which an example of the invention is shown, and wherein:

Figure 1 is an elevation of a tubing catcher constructed in accordance with the invention, a portion of the weight member being shown in section,

Figure 2 is a plan view of the same,

Figure 3 is an enlarged horizontal cross-sectional view taken on the line 3—3 of Figure 1, and

Figure 4 is an enlarged horizontal cross-sectional view taken on the line 4—4 of Figure 1.

In the drawings the numeral 10 designates a tubular section which may form part of the well tubing. The section 10 has a collar 11 at its lower end and it may have a suitable coupling means at its upper end for connecting with a string of tubing. A head 12 is rigidly fastened on the tubing and provided at its upper end with the usual reduced fishing neck 13.

The head is formed with two sets of inclined guide faces A and B, respectively. As illustrated, each set comprises three downwardly and inwardly inclined faces 14 equally spaced on the sides of the head. A

guide rib 15 extends down the center of each face and each rib is dove-tailed in cross-section. The faces of one set are disposed in staggered relation to the faces of the other set. Between each pair of faces is a vertical concaved channel 16. The channels 16 of the upper set A are immediately over the inclined faces of the lower set B, while the channels of the lower set are immediately under the faces 14 of the upper set A. In order to provide free passage of the fluid from the upper to the lower channels the head is shouldered at 17 and these shoulders are rounded off.

On each face 14 is mounted a slip 18 having its inner side or back flat so as to lie against and slide upon the guide face 14. The outer side or front of each slip is curved transversely in an arc substantially concentric to the tubing section 10 and is provided with the usual gripper teeth 19. Each slip is also given a wedge shape, being reduced from its bottom to its top. It is preferable to give the back of each slip the same angle of inclination as its correlated face 14 and to make the front of the slip on the same radius throughout, thereby positioning the teeth parallel to the inner wall of the casing at all elevations of adjustment.

Each slip is formed with a dovetailed recess 20 complementary to and receiving the guide rib 15. By this arrangement each slip is free to slide vertically on its guide face, but is held against relative outward and circumferential displacement and the equal spacing of the slips is also maintained. Each slip has a pair of spaced ears 21 on its bottom. The slips of the upper set A receive the upper ends of links 22 and are pivoted thereto, while the ears of the slips of the lower set B receive and are pivoted to the upper ends of links 23. The shoulders 17 also extend across the bottoms of the upper faces 14 and normally the lugs of the upper set rest on these shoulders. Bosses 24 are provided at the bottom of the head and at the lower ends of the lower guide faces and form supports for the lower slips.

The bosses 24 are formed with vertical slots 25 and the links 23 extend through these slots. The outer faces of the bosses 24 and the upper end of the head may be rounded circumferentially to conform to the curvature of the well casing in which the catcher is used. The links 22 extend down through the channels 16 of the lower set of faces B and leave sufficient space on each side for a free passage of the fluid.

When the slips are supported on the shoulders 17 and the bosses 24 and are in their normally inactive position, the lower ends of the links 22 and 23 will terminate in substantially the same horizontal plane. The lower ends of these links are pivoted between ears 26 of a cylindrical weight member 27,

which is freely slidable on the tubing section 10. The weight member has a counterbore 28 extending upwardly from its lower end which terminates in an annular shoulder 29. This shoulder rests upon the upper end of a coiled spring 30 surrounding the section 10 and supported on the collar 11.

By telescoping the spring into the lower end of the weight member the length of the catcher is reduced and a more compact device is had. The spring is of such length as to be compressed to a slight extent by the weight member when it is in its lowermost position; however, the load is carried by the shoulders 17 and the bosses 24 rather than by the spring so that the parts are positively sustained when inactive and will not unduly vibrate when the catcher is being lowered into the well.

In using the catcher it is connected in the string of tubing, as by the collar 11 and other similar connections, and is located in the string wherever found desirable. Usually the catcher is located near the bottom of the string, but its location may be changed and more than one catcher may be used in a string if desired. However, the catcher is always located within the casing. Normally the slips 18 will be withdrawn within the diameter of the head 12 and will not engage the casing when in such position, thus permitting the catcher and the string of tubing to be freely moved up and down in the casing.

If the tubing above the head 12 should break at any point in the string or should one of the couplings of the string be stripped, or should the string be dropped, the operation will be as follows. The inertia of the weight member 27 accentuated by the tendency of the spring 30 to expand, will cause said weight to momentarily remain relatively stationary and thus maintain its position. The head 12 and tubing section 10, however, being attached to the falling string of tubing, will tend to descend more rapidly and consequently the links 22 and 23, being sustained by the inert weight member 27, will support the slips 18, whereby the latter will be relatively displaced radially of the head by the downward movement of the inclined faces 14 and the ribs 16.

This outward displacement of the slips will cause the sharp teeth 19 to quickly bite into the inner wall of the casing and thus arrest the parts and hold the catcher against a further drop. This action may be very rapid or it may not, according to conditions. Wells from four thousand to seven thousand feet in depth have become quite common in the oil fields and the stretch in a string of tubing of this length may amount to considerably more than a foot. It is, therefore, obvious that even though the slips may catch on the wall of the casing after the head has traveled downward a few inches, the stretch in the tubing will be taken up so that at the top

of the well a fall of two or three feet may be registered. Casing is often dented or otherwise distorted and its inner surface is frequently coated with heavy oil or paraffin.

By employing the upper and lower set of slips ample gripping surface is provided. The slips are not only staggered but relatively overlap circumferentially of the head and thus operate in overlapping vertical paths, thereby acting on the entire inner wall of the casing. Should the casing be bent or bulged so that one slip would be substantially inactive, the overlapping slips will assure a catch, particularly because of their location at a different elevation. Should a slip, for any reason, be broken or fail to act, the slips of the other set will carry out the catching operation effectively. By providing amplified gripping faces the strain on individual teeth is reduced and injury to the casing is less likely, as well as a more positive catch is assured in coated or greasy casings.

Where spaced slips in the same circumferential area are used, it has been customary to allow a very limited clearance between the teeth and the inner wall of the casing when the slips are dormant, and consequently a slight agitation of the weight will cause the slips to shimmy and frequently unintentionally engage the wall of the casing when the catcher is being raised or lowered. By the present arrangement where amplified gripping teeth are provided in two circumferential areas a more certain gripping is assured and, therefore, a greater clearance can be given between the teeth and the casing with the result that the catcher may be run in and out of the casing much faster and with less danger of accidental catching.

Various changes in the size and shape of the different parts, as well as modifications and alterations, may be made within the scope of the appended claims.

What I claim, is:

1. In a well tubing catcher, a support adapted to be connected to a string of tubing, a head mounted on said support and having inclined guide faces at different elevations, gripper slips mounted to slide on the faces of said head, whereby they are displaced radially thereof, and means for automatically displacing all of said slips in unison when the catcher is dropped.

2. In a well tubing catcher, a support, a head mounted on the support, a plurality of individual slips mounted at different elevations intermediate the ends of the head, and means for automatically and simultaneously displacing said slips radially due to its own inertia when the catcher is dropped.

3. In a well tubing catcher, a support, a head mounted on the support and having two sets of inclined guide faces, one above the other, gripper slips mounted to slide on said faces, a weight member slidable on the sup-

port, and means for making connection between the weight member and all of the slips for actuating the latter.

4. The combination set forth in claim 3, with the inclined faces and slips of one set being staggered with relation to the faces and slips of the other set.

5. The combination set forth in claim 3, with staggered fluid channels extending vertically of the head between the faces and communicating with each other.

6. In a well tubing catcher, a support adapted to be connected to a string of tubing, a head mounted on said support, outwardly displaceable slips mounted on said head and disposed at different elevations, and a weight slidable on said support and connected with each slip.

7. In a well tubing catcher, a support adapted to be connected to a string of tubing, a head mounted on said support, outwardly displaceable slips mounted on said head and disposed at different elevations, a weight slidable on said support and individual connections between each slip and the weight, whereby the weight is connected in common with all slips.

8. In a well tubing catcher, a support adapted to be connected to a string of tubing, gripper slips mounted one above the other for outward displacement on the support, and a weight slidable on the support and directly connected with each slip.

9. As a subcombination in a well tubing catcher, a head having two sets of inclined slip faces disposed circumferentially thereof and one set being above the other set and in staggered relation thereof.

10. In a well tubing catcher, a support, a head mounted on the support, and outwardly displaceable gripper slips are mounted on the head, some of said slips being mounted at a higher elevation on the head than the other slips.

11. In a well tubing catcher, a head adapted to be connected to a string of tubing and having integral inclined slip faces, some of said slip faces being at a higher elevation on the head than the other slip faces, and gripper slips mounted on said faces for outward displacement when slid upwardly on said faces and whereby said slips will grip at different elevations.

12. In a well tubing catcher, a support adapted to be connected to a string of tubing, a head mounted on said support, outwardly displaceable slips mounted on said head and disposed at different elevations, and means connected with all of the slips and causing the same to operate in unison.

13. In a well tubing catcher, a support, two sets of gripping slips slidably mounted and carried by the support for radial displacement, the slips of one set being above those of the other set and in staggered relation

thereto, and means for automatically operating said slips when the tubing is dropped, the slips of one set relatively circumferentially overlapping the slips of the other set, whereby the entire circumferential surface of the casing is gripped.

In testimony whereof I affix my signature.

FREDERICK N. CRIPPEN.