United States Patent

[11] **3,566,962**

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Continuation-in-part of application Ser. No. 763,245, Sept. 27, 1968, now abandoned.

[54] **PIPE AND TUBING CATCHER**
13 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **166/121,** 166/131, 166/202, 166/209
[51] **Int. Cl.** **E21b 33/129,** E21b 40/00
[50] **Field of Search** ..... 166/121, 131, 184, 185, 192, 202, 209—212; 103/225 (A); 277/212 (C)

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ABSTRACT: Apparatus for stopping the fall of a suspended weight in a cased area or tubing including a reinforced flexible sealing chamber having a central opening therein and a plurality of circumferentially spaced steel guides in said central opening, with the sealing chamber being hollow and having a dependent skirt therearound, and a sealing surface on the upper portion thereof adapted to abut a stop on a mandrel upon which the sealing chamber is disposed.

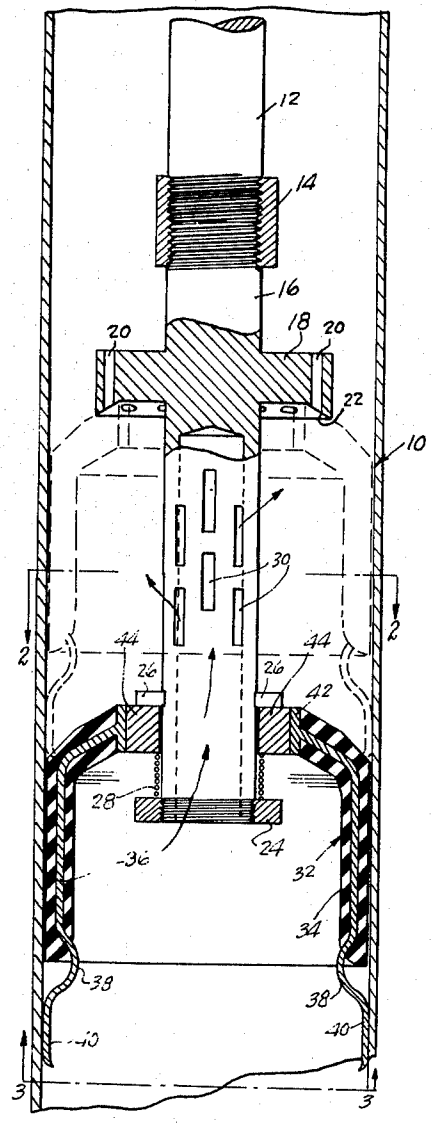
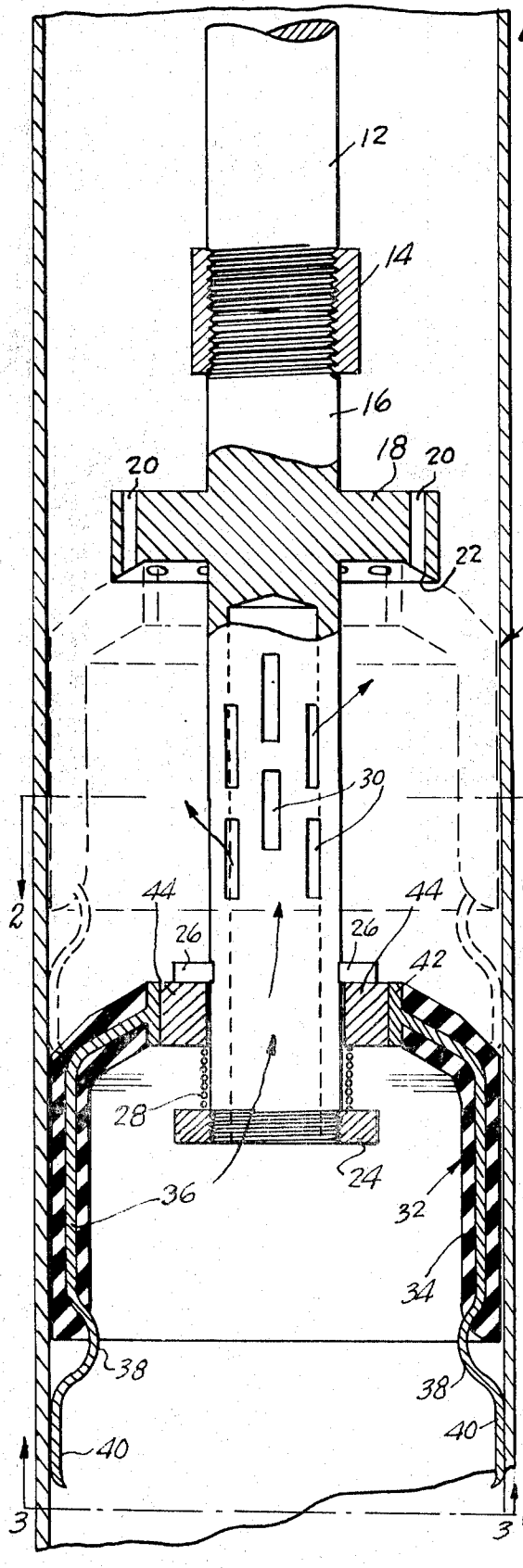


FIG. 1.



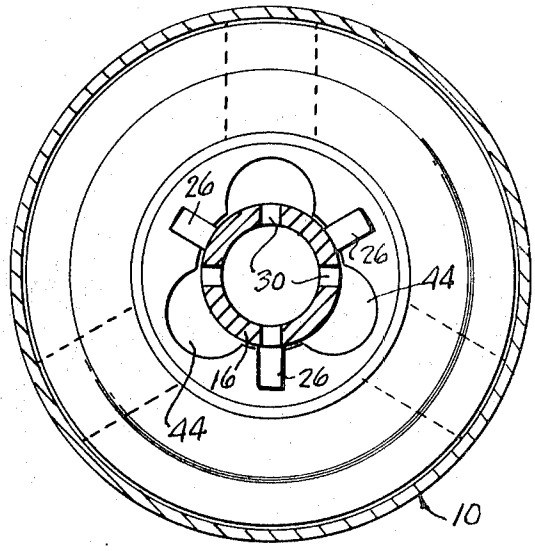


FIG. 2.

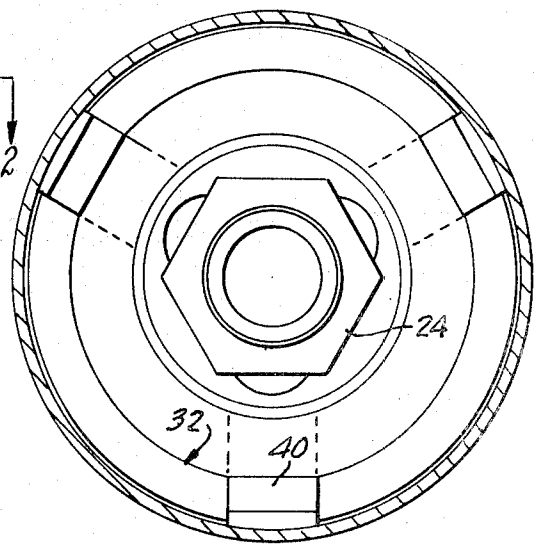


FIG. 3.

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FIG. 4.

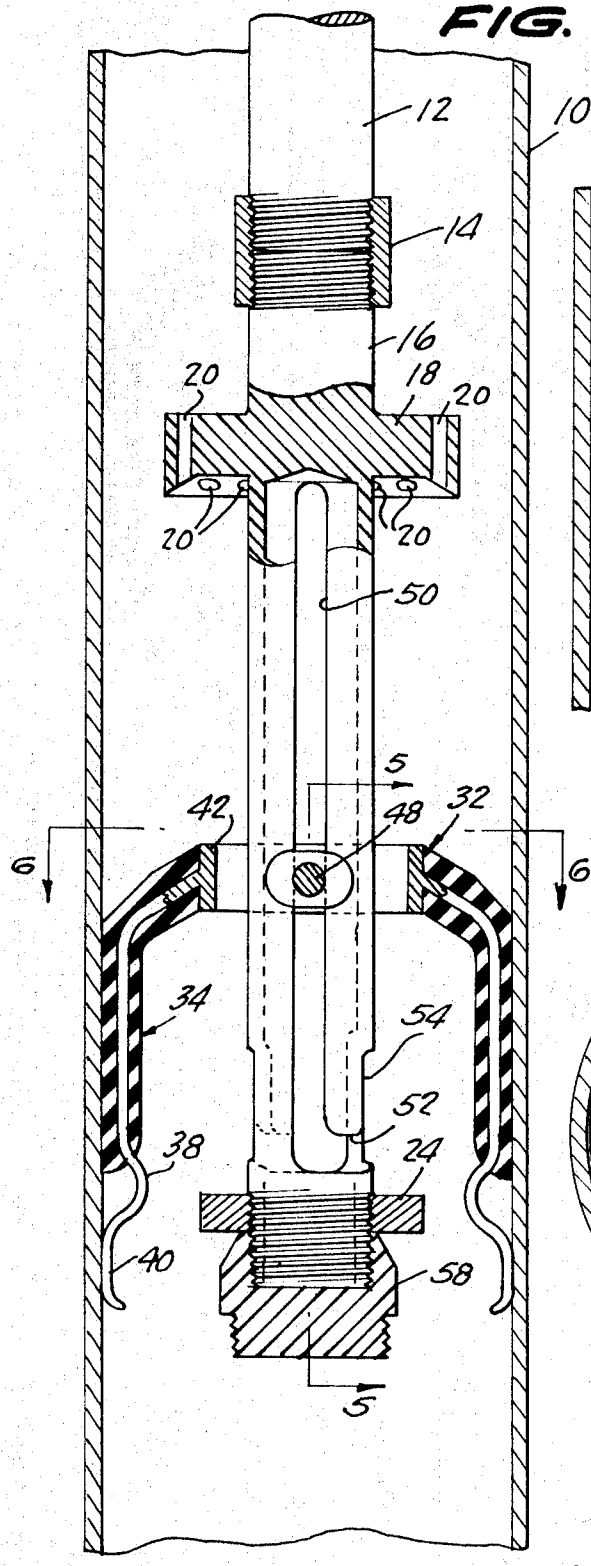


FIG. 5.

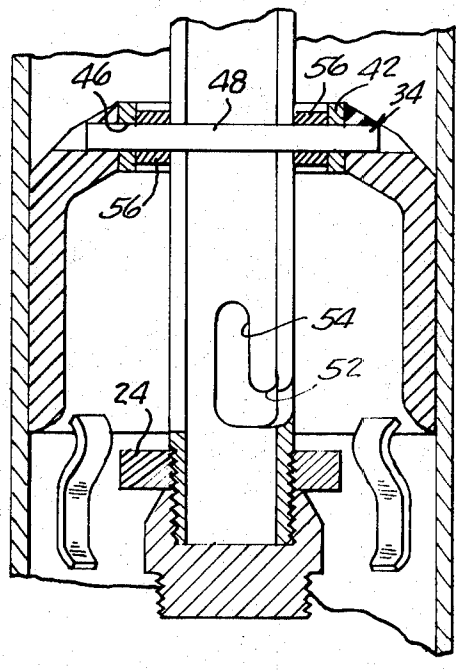
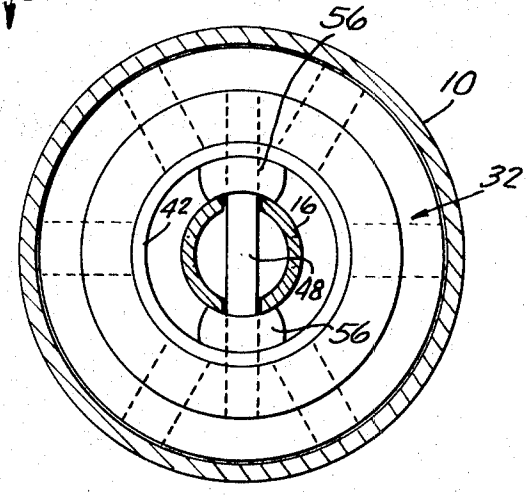


FIG. 6.



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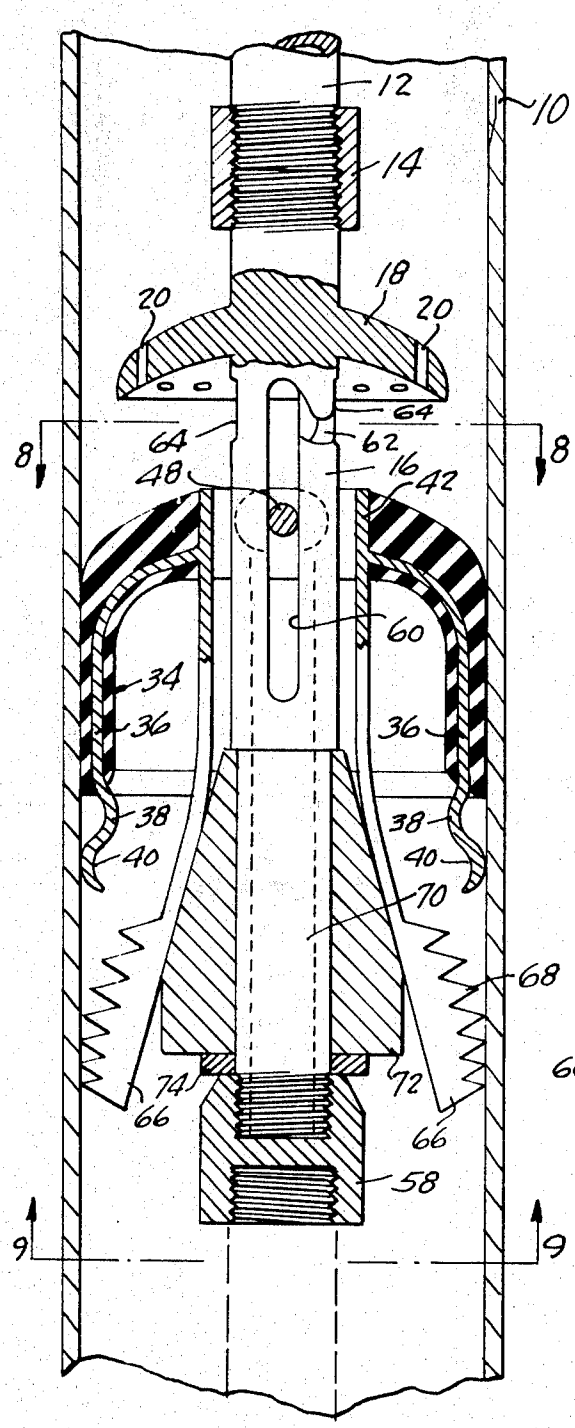


FIG. 7.

FIG. 8.

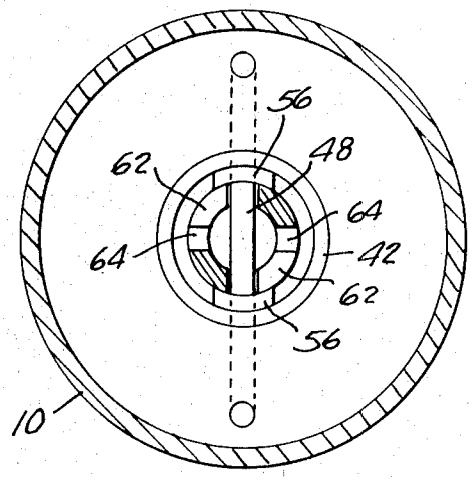
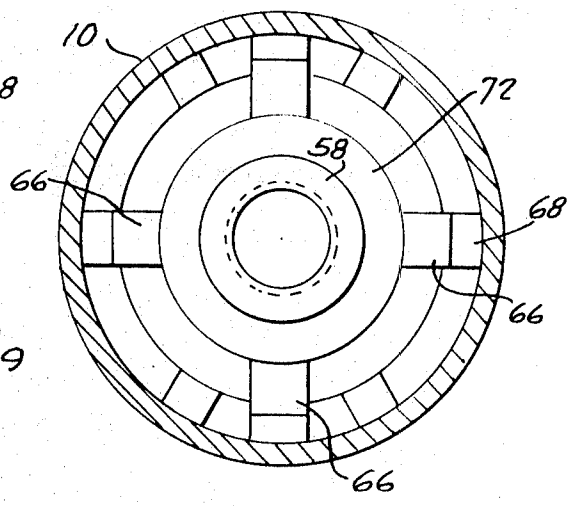


FIG. 9.



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PIPE AND TUBING CATCHER

The present invention is a continuation in part of our application Ser. No. 763,245, filed Sept. 27, 1968 now abandoned.

The present invention relates to a safety device that is attached to the bottom of pipe or tubing which is suspended in a large diameter pipe or hole, so as to prevent the pipe or tubing from rapidly falling in the hole should it become detached from drilling apparatus and the like.

It is an object of the present invention to provide a catcher which will slow down or stop the fall of a suspended weight in a cased area, such as oil well drilling equipment and the like, when rapid falling may damage the dropping weight.

It is another object of the present invention to provide a simple and compact and rigid sealing chamber structure or assembly for slowing down and stopping the fall of a detached piece of piping or the like that is used in oil drilling equipment.

It is yet another object of the present invention to provide an economical and positive prevention of damage or loss of a suspended tubing, pipe or other similar material in a restricted area, such as, for example, a string or length of tubing or pipe suspended in an area of a larger pipe or casing, such as in oil well drilling equipment, to prevent damage to the inadvertently detached falling detached falling weight or pipe or tubing.

Various other objects and advantages of the present invention will be readily apparent from the following detailed description, when considered in connection with the accompanying drawing forming a part thereof, and in which:

FIG. 1 is a sectional view illustrating the catcher device embodying the present invention;

FIG. 2 is a section taken along the line 2–2 of FIG. 1;

FIG. 3 is a view taken along the line 3–3 of FIG. 1;

FIG. 4 is a view illustrating another catcher device embodying the present invention;

FIG. 5 is a section taken along the line 5–5 of FIG. 4;

FIG. 6 is a section taken along the line 6–6 of FIG. 4;

FIG. 7 is a sectional view illustrating still another modification of the catcher device embodying the present invention;

FIG. 8 is a section taken along the line 8–8 of FIG. 7; and

FIG. 9 is a section taken along the line 9–9 of FIG. 7.

Referring to the drawings, the reference numeral 10 generally designates a casing forming a hole for drilling oil wells and the like. The casing has disposed therein a string of pipe or tubing 12 connected by a threaded member 14 to a mandrel 16.

The upper portion of the mandrel 16 is provided with a cylindrical enlarged stop portion 18 having a plurality of vertical slots or passages 20 extending therethrough. The lower surface of the stop 18 is beveled as indicated at 22 and forms a sealing surface The lower end of the mandrel is provided with a locking nut 24 and bottom connection.

The lower portion of the mandrel 16 is provided with a plurality of circumferentially spaced J lugs thereon. A biasing spring 28 is mounted on the mandrel above the nut 24. The mandrel 16 is provided with a plurality of longitudinally extending slots 30 disposed above the J lugs 26.

Mounted on the mandrel 16 is a sealing member or chamber 32. The sealing member or chamber comprises a resilient hollow cup or skirt 34 formed of rubber or other suitable material and is reinforced with a plurality of steel straps 36 having inwardly bent portions 38 adjacent their lower ends and terminating in a bottom leg 40, extending below the rubber skirt. The upper ends of the straps 36 terminate in a reinforcing steel band 42. The band 42 forms a central opening in the sealing member and three circumferentially spaced steel guide members 44 extend inwardly of the band 42.

Referring to FIG. 1, the guide members 44 are normally disposed below the lugs 26 in a vertical position, but out of alignment therewith so that the sealing chamber may be actuated when necessary.

When the apparatus is ready for use, the sealing chamber or member 32 is put into J or locked position by forcing the top of the sealing member 32 below the J lugs 26, and turning to the right. The apparatus is now ready to lower into the casing 10 and in this position, the fluid passage area is locked in an open position. When the apparatus is lowered to the desired depth, the apparatus is turned to the left by rotating the tubing or pipe to the left at least three complete revolutions. This action releases the sealing member 32 from the J lugs 26 or the locked position.

If the tubing or the pipe should now break or part, the sealing chamber or member 32 will slide up the mandrel 16 from the position shown in section in FIG. 1 to the dotted line position shown therein.

Thus, the passage of fluid from below the sealing member 32, as indicated by the arrows in FIG. 1, will be prevented since the sealing member 32 will be disposed in a sealing relationship with the undersurface 22 of the stop 18. A fluid-type seal will also be formed at this time between the wall of the casing 10 and the skirt or sides of the sealing member 32 by the fluid pressure in and below the sealing member.

At this time, it will be noted that the sealing chamber is positioned above the flow slots 30 in the mandrel 16 and that it further closes off the passages 20 in the stop 18.

This movement of the sealing chamber is automatic and the movement of the sealing chamber will stop or slow the descent of the pipe or tubing, if the part or pipe break occurs in the string of pipe 12, so that no damage will result.

In order to retrieve the apparatus from the hole, no conditioning is necessary as the fluid passage automatically opens when the apparatus is lifted by the top connection 14 upwardly. The mandrel 16 merely lifts up through the sealing chamber central chamber and allows the fluid passage between the mandrel and the sealing chamber to again open so that the fluid will pass therethrough, as indicated by the arrows in FIG. 1.

Referring to the embodiment of the invention illustrated in FIGS. 4 to 6, the resilient sealing member or chamber 32 is substantially the same as that described in connection with the embodiment illustrated in FIGS. 1 to 3, except that the band 42 is provided with aligned openings 46 therein, and a horizontal pin or rod 48 extending therethrough and through two aligned openings in the corresponding resilient portion of the sealing member, as best seen in FIG. 5.

The hollow end of the mandrel 16 between the stop 18 and the locking nut 24 on the end thereof is provided with elongated vertically extending slots, which have a J-shaped configuration formed by an L-shape indicated at 52 at the bottom end thereof and which thereafter turns upwardly in a vertical direction as indicated at 54, as best seen in FIG. 5, to form the overall J-shaped slot. The mandrel is provided with two J slots on opposite sides of the mandrel which are identical to each other. The sealing member 32 is maintained centrally on the mandrel 16 by two apertured curved spacer members 56 disposed on opposite sides of the pin 48, as best seen in FIGS. 5 and 6.

The sealing chamber 32 can slide up and down the mandrel 16, guided by the pin 48 when the pins are disposed in the slots 50, as best seen in FIG. 4. At this time, the sealing chamber is in a position to move up to a sealing position should the mandrel 16 be lowered so that the upper surface of the sealing chamber 32 moves upwardly until it seats against the lower sealing surface 22 of the stop 18.

When the sealing chamber 32 is in the J position, apparatus can be lowered to any desired setting. The J position is when the pin or bar 48 has been moved downwardly and passed through the L-shaped slot 52 and then positioned within the vertical J slot 54, as shown in FIG. 5. This is accomplished by first taking the pin 48 and moving it to where it is positioned in the lower end of the slot 52, after which the mandrel is turned to the right at least one quarter turn so that it is then in the J slot 54. When the sealing chamber is in this J position, the apparatus can be lowered to any desired setting.

When it is desired to get the sealing chamber 32 out of the J position, in which it is disposed in the slot 54, you simply pull up on the mandrel and turn the mandrel at least one quarter turn to the left and lower it slightly so that the pin or bar 48 is then positioned in the elongated slot 50 and the sealing chamber 32 is able to move upward to a sealing position if the mandrel is lowered further. When the sealing chamber reaches the sealing surface 22 the fluid and gas seal is immediately effected.

Thus this embodiment of the invention provides a large fluid and gas passage in the device because of the large area between the mandrel 16 and the sealing chamber and because of the large openings of the slot 50 which run the entire length of the mandrel.

The nut 24 will hold the sealing chamber on the mandrel in the event the sealing chamber guide pin 48 should break or otherwise be removed from the sealing chamber. The threaded member 58 is a means for connecting a bottom connector to the apparatus.

Referring to the embodiment of the invention shown in FIGS. 7 to 9, this is substantially the same as that described in connection with the embodiment illustrated in FIGS. 1 to 6, except that the mandrel 16 is provided with a J slot configuration comprising a vertical elongated slot 60 at the lower end and a horizontal or L slot 62 at the upper end and a vertical slot 64 extending upwardly and above the horizontal or L slot 62, as best seen in FIG. 7. The mandrel is provided with two of these J slot configurations disposed on opposite sides of the mandrel. The pin or bar 48 and the shims or spaces 56 are connected to the sealing member 32 in the same manner as that described in connection with the embodiment of the invention illustrated in FIG. 4.

The band 42 has extending downwardly therefrom a plurality of slip members or straps with teeth or ridges 68 on the lower end thereof adapted to wedge against the cased hole.

The lower end of the mandrel is provided with a reduced section 70 on which is disposed a tapered cone 72 which is held thereon by a nut 74 disposed above a bottom connection 58.

In operation, in the embodiment of the invention described in FIGS. 7 to 9, after the mandrel 16 has been attached to the tubing or pipe 12, the sealing chamber 32 is set in the J position by sliding the sealing chamber pin 48 up the slot 60 to the horizontal or L slot 62, at which time the sealing chamber 32 is held out of a sealing position. At this time, the straps 66 are also held out of an anchor position when the pin is in the slot 62 or when in the J position because the straps are carried up and away from the tapered cone 72. Thus, the apparatus at this position is kept from not only sealing but also kept from anchoring and in this position can be raised or lowered to the desired position in the cased hole.

When the apparatus is at the desired depth and is ready to be set to full tension on the pipe and act as an anchor, the pipe or tubing 12 is rotated at least a quarter turn to the left and lowered at the same time. This will put the sealing chamber pin 48 into the elongated vertical slot 60 which will allow the sealing chamber 32 to move upwardly in the slot 60 or downwardly therein. This will allow the friction bars or springs or straps 36 to tend to hold the sealing chamber 32 so that the sealing chamber pin 48 can be put in the horizontal slot 62 by rotating the pipe or tubing clockwise or counterclockwise, depending on the desired position. However, to act as an anchor, the pipe or tubing 12 is turned counterclockwise at least one quarter turn and lowered so that the sealing chamber pin 48 is now at the top of the slot 60 and by pulling up on the pipe or the tubing, the cone 72 is pulled up and under the teeth straps 68 attached to the sealing chamber 32. The pipe or tubing thus causes the teeth of the straps 68 to wedge between the cone 72 and the side of the cased hole and a positive anchor is caused maintaining the apparatus at this setting. The desired tension or pull is maintained on the pipe or tubing 12 by the amount of pull upward. If the pipe or tubing should now part or become disconnected, the mandrel 16 would travel downwardly through the sealing chamber 32, and the sealing chamber 32 would remain fairly stationary as the sealing chamber pin 48 would allow downward travel until sealing chamber pin 48 arrived at the at the top of slot 60. When the sealing pin 48 reached the top of the slot 60 a fluid- and gastight seal would be made between the under surface of stop 18 and the top of the sealing chamber 32. Cone 72 would also now be below the teeth straps 68 and would allow them to be out of contact with the cased area and thereby they would not have a wedging or anchoring effect, and the apparatus would now be acting as a catcher having a fluid- and gastight seal.

To recover the apparatus, connection would have to be made onto the pipe or tubing 12 connected to the apparatus and then turning to the right or clockwise and pulling upwardly. By this action, the sealing pin 48 is put in the horizontal slots 62 and when in this position the sealing chamber 32 cannot make a seal nor can the straps 68 wedge so that the apparatus can now be raised or lowered.

Thus, the present invention provides a safety device or a catcher device that is provided with a resilient cup or hollow sealing chamber which is disposed on a mandrel so that it will slide upwardly and seal against a stop member and against the interior surface of the hole in which it is disposed should the string of pipe or other apparatus to which it is connected be disconnected.

From the foregoing description, it will be apparent that various changes may be made in the form, location and relative arrangement of several parts without departing from the essential characteristics of the invention, and it is to be understood that this invention is not to be limited except by the scope of the appended claims:

We claim:

1. In combination, a mandrel with a cylindrical stop thereon and a flange member spaced therebelow and a sealing chamber slidably mounted on said mandrel between said stop and flange member, said chamber being a hollow resilient cup with a resilient depending skirt and having a central opening therein, said central opening being of substantially larger diameter than the outer diameter of said mandrel to provide a flow passage therearound and there being a plurality of circumferentially spaced guide members extending inwardly from said central opening, said combination including spaced J lugs circumferentially spaced on the outer surface of said mandrel between said stop and flange member, said lugs being so sized and spaced as to pass through said central opening between said guide members.

2. The combination of claim 1 wherein the lower end of said mandrel is hollow and has slots in its periphery in communication with said hollow portion.

3. The combination of claim 2 wherein said stop is provided with a plurality of passages extending therethrough and said sealing cup has a resilient horizontal portion adapted to seat over said passages.

4. The combination of claim 3 wherein said resilient cup and skirt is provided with a plurality of steel reinforcing straps and a steel band forming said central opening.

5. In combination, a mandrel with a cylindrical stop thereon and a flange member spaced therebelow and a sealing chamber slidably mounted on said mandrel between said stop and flange member, said chamber being a hollow resilient cup with a resilient depending skirt and having a central opening therein, said central opening being of substantially larger diameter than the outer diameter of said mandrel to provide for a flow passage therearound; slot means in said mandrel and slidable pin means extending through said slot means; said sealing chamber being secured to and movable with said pin means; said stop having a plurality of passages extending therethrough and said cup having a resilient portion adapted to seat over said passages.

6. The combination of claim 5 wherein said slot means comprises a substantially J shape with the upper end of the J slot disposed adjacent said stop to permit sealing off of said passages when said pin means moves to said upper end.

7. The combination of claim 5 wherein said J slot has a horizontal slot disposed therein to prevent sealing off said passages when said pin means is disposed therein.

8. The combination of claim 7 wherein said J slot is in an inverted position.

9. The combination of claim 8 wherein said mandrel has a cone on the end thereof, and said sealing chamber has a plurality of downwardly extending resilient straps with teeth thereon adapted to wedge against a casing hole in which the sealing chamber is disposed.

10. The combination of claim 9 wherein said straps extend below said sealing cup and said cone is disposed on said mandrel to prevent a wedging action against a casing hole until said pin means is disposed in an elongated vertical slot of said J slot.

11. The combination of claim 10 wherein said straps depend from a circular band formed around said central passage.

12. The combination of claim 7 wherein said J slot is in an upright position.

13. The combination of claim 12 wherein said J slot is provided with a short vertical slot disposed in said mandrel at a position to prevent sealing off of said passages when said pin means is disposed therein.