

[54] **DRILL STRING RETRIEVAL DEVICE**

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294/86.14, 86.15, 86.24, 86.26, 86.34,
86.33; 24/115 R, 115 A; 166/98, 99, 101,
120, 212

[56] **References Cited**

UNITED STATES PATENTS

1,521,789	1/1925	Oswald	294/86.26
2,268,598	1/1942	Kellems.....	294/86 CG
3,697,114	10/1972	Chatard et al.....	294/86.26

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[57] **ABSTRACT**

Device, and method for utilizing same, for withdrawing from a borehole a section of drill string said device comprising a hollow rod with a capping member mounted on the lower end thereof adapted to fit into the upper end of the drill string to be removed and a cylindrical mesh fixed to the rod surrounding the cap and of sufficient diameter to slide over the drill string to be removed and woven so that an increase in the diameter of the upper section of the mesh results in a substantial decrease in the diameter of the lower section resulting in gripping action on the drill string. Expansion of the upper section is caused by mud flow through the rod and through ports in the capping member outwardly through the upper section of the cylindrical mesh.

9 Claims, 2 Drawing Figures

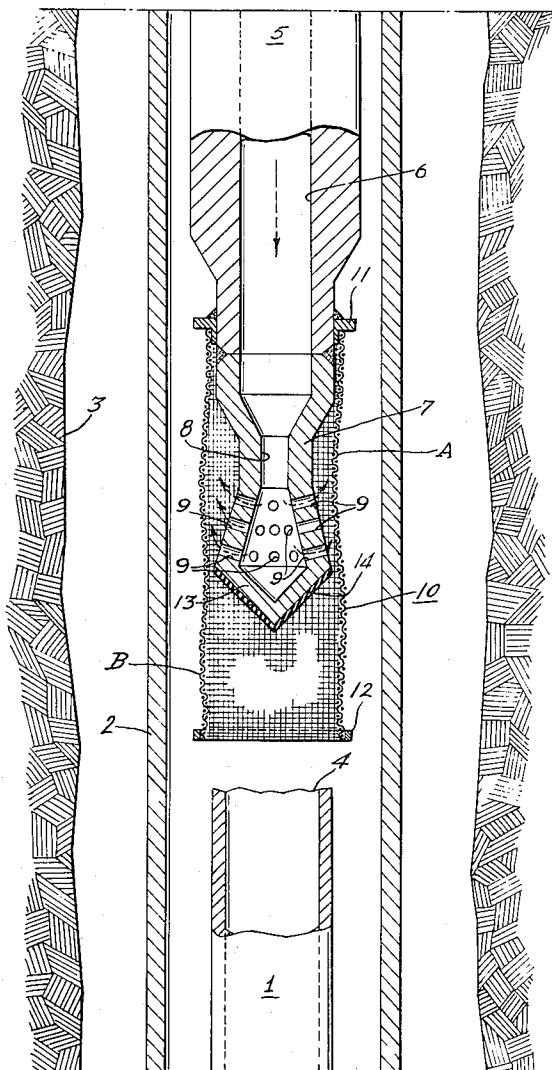


FIG. 1.

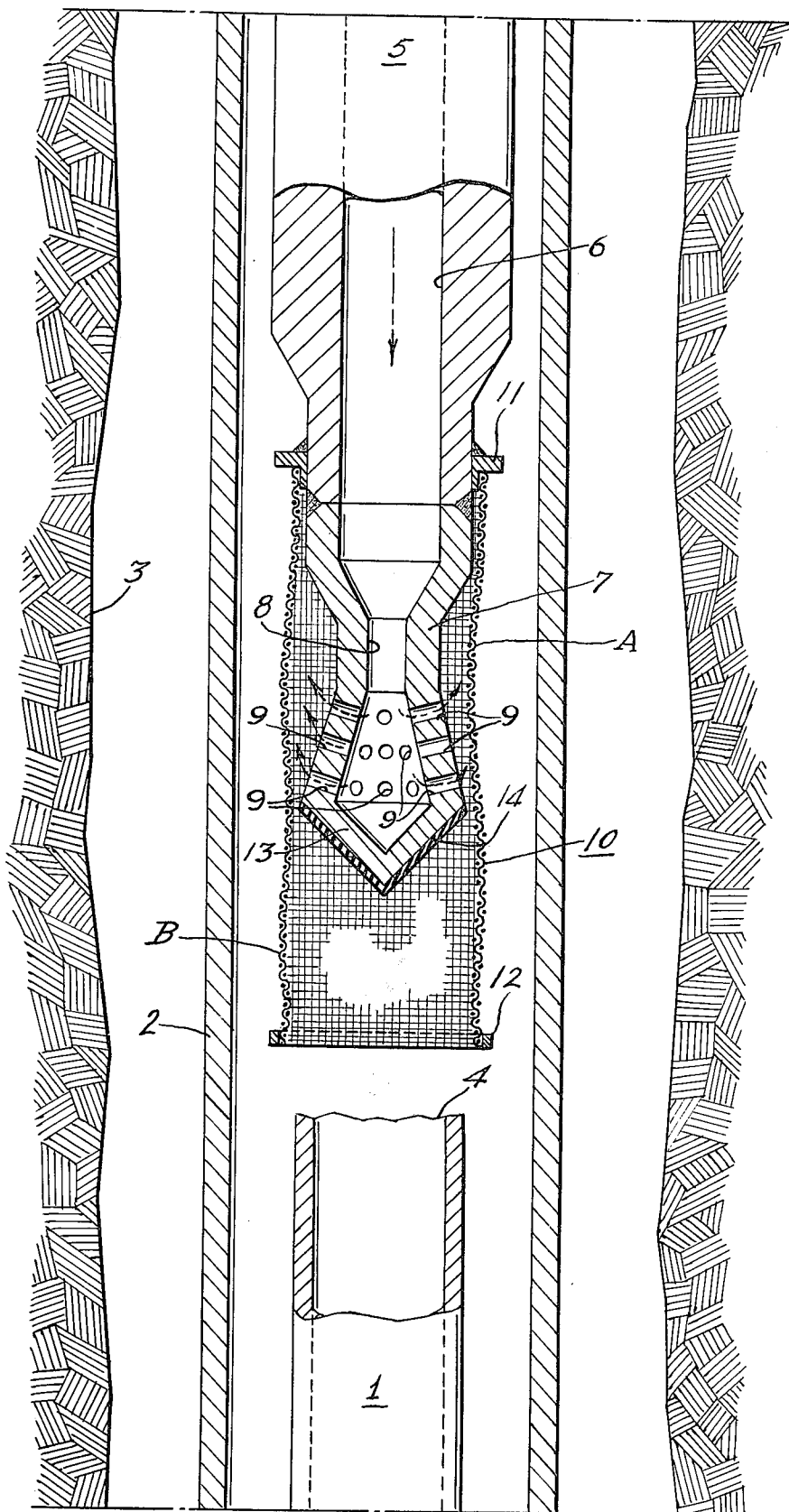
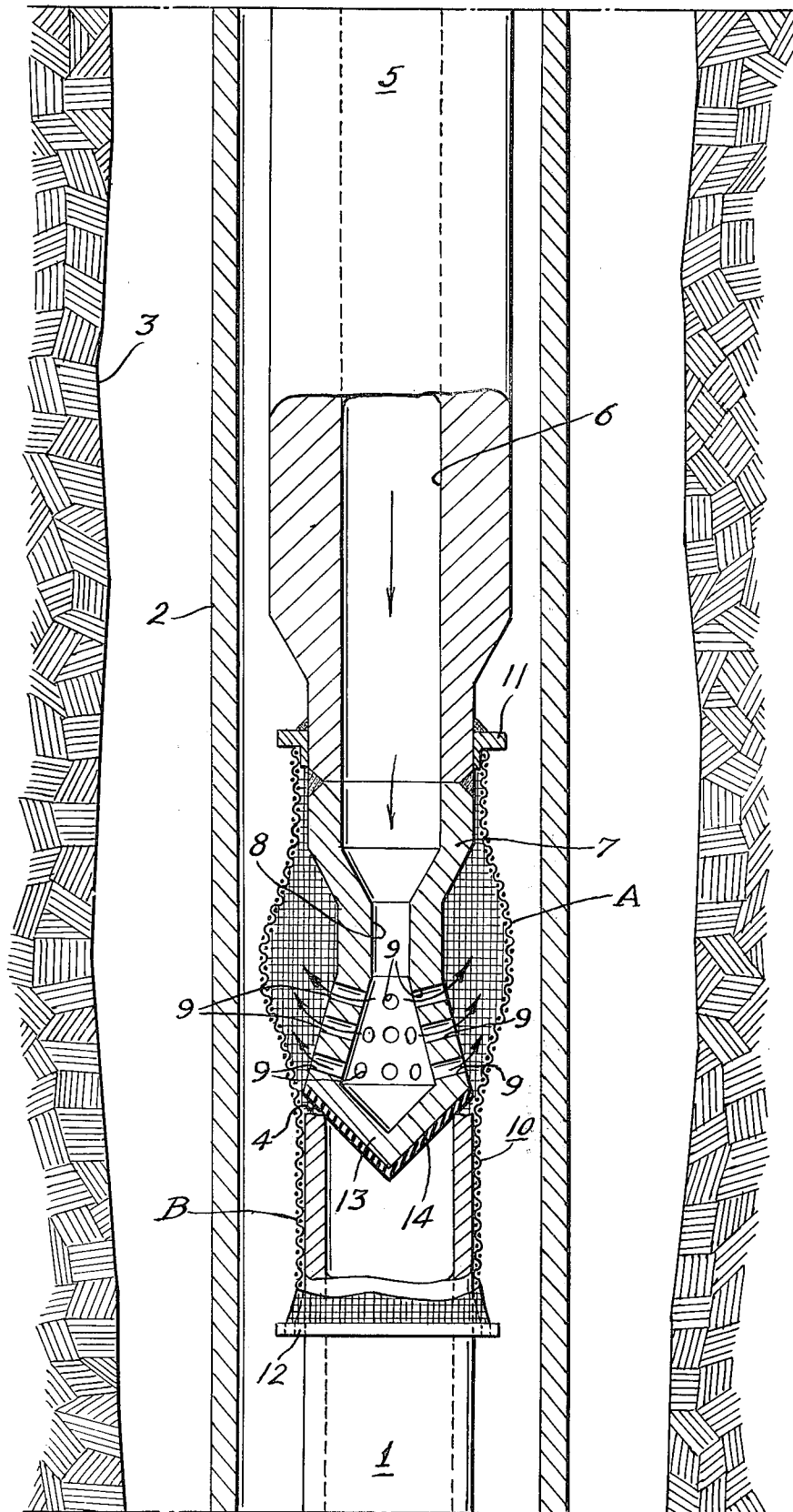


FIG. 2.



DRILL STRING RETRIEVAL DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to retrieval of a cylindrical member from a location with limited access. More particularly, it relates to a device and method of utilizing the device whereby a second of drill string lodged in a borehole due to breakage or other causes can be removed so that drilling can be continued.

2. Description of the Prior Art

During drilling operations it may happen that a breakage of the drill string occurs. A lower portion of the drill string at the end of which is secured the drilling tool is thus lost in the well and it is practically impossible to restart the drilling operation as long as this lower portion of the drill string has not been removed.

It is thus necessary to conduct fishing operations for recovering the lower portion of the drill string. These operations are often difficult to carry out and are more expensive as they also immobilize the drilling installation for a long time.

The fishing devices used up to now are very complex and require cutting off sections on the portion of drill string to be recovered. This results in a further increase of the operation time and of its cost.

It is therefore an object of this invention to provide a simple device avoiding the above-mentioned disadvantages and which is efficient and easy to use.

U.S. Pat. No. 3,697,114 issued to Chatard et al, Oct. 10, 1972, discloses a system simpler than the fishing procedure mentioned above and comprising a rod with a sock-like member mounted on the lower end and means for axially elongating the sock-like member so as to decrease its diameter and grip the drill string. Yet to conduct an elongation operation in the Chatard system, requires a system of pistons and moving parts all subject to jamming and malfunction, as are all moving parts, especially in a borehole environment.

SUMMARY OF THE INVENTION

A device and method for retrieving a drill string section from a borehole are now put forth which utilize a wire mesh to grip the drill string without the axial motion of the mesh thereby eliminating an expensive and perhaps malfunction-prone aspect of the prior art and greatly simplifying the operation when compared to prior fishing operations.

The device for withdrawal of an elongated member or of a section of drill string from a borehole comprises

- a. a cylindrical member, having an internal fluid passageway, one end of which is introduced into the borehole,
- b. a capping member, fixedly attached to the end of the cylindrical member introduced into the borehole, having an upper section and a lower section, said upper section further comprising a series of ports through which the fluid passageway of the cylindrical member is in fluid communication with the borehole outside of the cylindrical member and said lower section of a configuration adapted to fit the internal diameter of the drill string, preferably a tapered configuration,
- c. a sheath of flexible material attached to the lower section of the capping member so as to form a seal between the lower section of the capping member and the drill string internal wall,

d. a cylindrical mesh of metal wires, cables or strands of a diameter, essentially greater than that of the elongated member or drill string, attached at one end to the cylindrical member and extending vertically to enclose the capping member and an upper portion of the drill string to be removed, said mesh woven so that a radial expansion in one section results in a radial constriction in another section,

e. means for lowering the device into the borehole so that the capping member seals the internal passageway of the drill string,

f. means for pumping drilling mud or the like through the cylindrical member and outwardly through the ports in the upper section of the capping member thereby radially expanding the mesh in that section resulting in radial constriction in the section surrounding the drill string to be removed resulting in gripping of the drill string and

g. means for withdrawing the device and thereby withdrawing the drill string now attached thereto.

In procedure, the device is lowered until the seal is formed and the mesh is surrounding the drill string, at which time, mud flow is started thereby causing the gripping action previously described and allowing the drill string to be raised and removed.

A more complete understanding of the invention can be had upon review of the description of the drawings and the preferred embodiment which follows.

DESCRIPTION OF THE DRAWING AND THE PREFERRED EMBODIMENT

FIG. 1 is a cross-section of the device in a non-gripping position.

FIG. 2 shows the device operatively disposed.

As can be seen in FIG. 1, a drill string section 1 has sheared or become otherwise lodged in the wellpipe or borehole 2 which has been placed in the borehole 3.

The upper edge of the drill string is probably uneven as shown at location 4. The invention device is lowered into the wellpipe and comprises a cylindrical member 5 running to the surface and having a fluid passageway 6 within it. Mounted on the lower end of member 5 is capping member 7 which is in fluid communication with 5 via passageways 8 and 6 and in fluid communication with the wellpipe via ports 9. Arrows show the intended mud flow.

Also attached to member 5 is the mesh 10 which is fixed to member 5 at collar 11. This cylindrical mesh extends downwardly surrounding the entire capping member at location A and extending essentially beyond it at location B. The mesh also has a collar 12 at its lower end to maintain the integrity of its cylindrical shape. The lower face 13 of capping member 7 is preferably tapered so as to fit into drill string 1 and form a seal. A sheath of flexible material such as rubber or soft plastic 14 can be fitted on this face so as to improve the seal.

As seen in FIG. 2, the device is lowered into the wellpipe until capping member 7 fits into drill string 1 and forms a seal with it via face 13 and sheath 14. At the same time mesh 10 slides over the drill string at location B. At this time mud flow as shown by the arrows is commenced. The mud flows via passageways 6 and 8 and ports 9 whereby it expands the mesh radially at location A thereby constricting it radially at location B so as to grip drill string 1. Once gripped, the entire

string can be removed by withdrawing the device with the drill string so attached.

The wires or cables of the mesh are of sufficient hardness to withstand the weight of the drill string and must be of sufficient length, in excess of about 5 yards for the total friction force to compensate for the total weight to be removed from the well.

The invention claimed is:

1. A device for withdrawing an elongated member from a well comprising

- a. a cylindrical member, having an internal passageway, the lower end of said member being introduced into the well,
- b. a capping member, fixedly mounted to the lower end of said cylindrical member, having an upper section and a lower section adapted to fit into the elongated member forming a seal therewith,
- c. a series of ports in the upper section of said capping member through which the fluid passageway of said cylindrical member is in internal communication with the well outside of said capping member,
- d. a cylindrical mesh of metal wires, cables or strands, of a diameter essentially greater than that of the elongated member, attached at one end to the cylindrical member and extending vertically downward to surround the capping member and an upper portion of the elongated member, said mesh woven so that a radial expansion in one section results in radial constriction in another section,
- e. means for lowering the device into the borehole so that said capping member meets and forms a seal with the elongated member,
- f. means for pumping drilling mud or the like through the cylindrical member and outwardly through said ports thereby radially expanding the cylindrical mesh in one section, resulting in radial constriction in the section surrounding the elongated member to be removed resulting in gripping of said elongated member and
- g. means for withdrawing the device and thereby withdrawing the elongated member attached thereto.

2. The device of claim 1 wherein the elongated mem-

ber is a drill string.

3. The device of claim 1 wherein the lower end of the cylindrical mesh further comprises a rigid cylindrical collar of essentially equal diameter to the cylindrical mesh.

4. The device of claim 3 wherein the lower section of said capping member is of tapered configuration.

5. The device of claim 4 wherein the lower section is faced with flexible material to enhance the seal such as rubber or soft plastic.

6. The device of claim 5 wherein the elongated member is a drill string.

7. The device of claim 6 wherein the cylindrical mesh is at least about 5 yards in length.

8. A method for withdrawing a section of drill string from a well comprising

- a. lowering into the well a cylindrical member having an internal passageway,
- b. capping the upper end of the drill string with the lower end of said member which is tapered to form a seal between it and the drill string walls,
- c. enclosing the drill string with a cylindrical mesh of metal wires, cables or strands of a diameter essentially greater than that of the drill string, said mesh fixed at its upper end to the cylindrical member and extending downwardly to its lower end wherein a cylindrical collar, which slides over the drill string, is attached,
- d. pumping drilling mud downwardly through said internal passageway and outwardly through ports positioned above said tapered lower end whereby the mesh is extended outwardly in the section surrounding the cylindrical member and thereby causing a constriction in the section surrounding the drill string,
- e. gripping the drill string with the mesh by the constriction and
- f. removing the drill string by raising of the cylindrical member to which it is attached.

9. The method of claim 8 wherein the tapered end of the cylindrical member is faced with a pliable material to enhance the seal, said material being rubber or plastic.

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