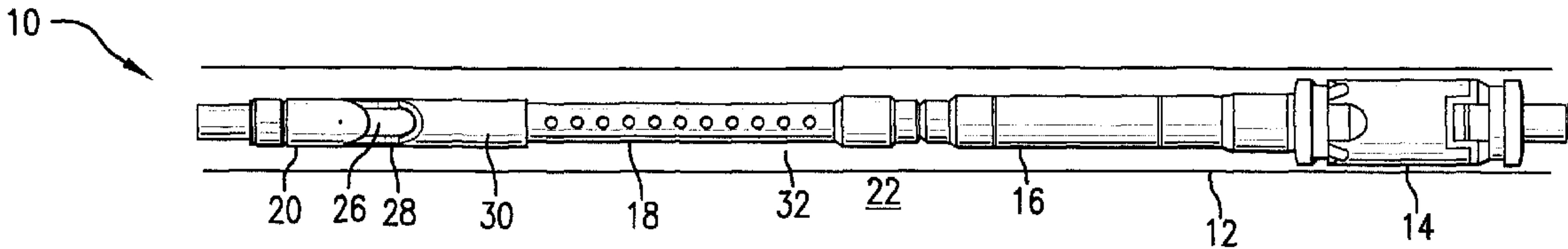




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(54) Titre : OUTIL DE POSE DE BOUCHON EN FOND DE PUITS
(54) Title: DOWNHOLE PLUG DROP TOOL



(57) Abrégé/Abstract:
A bottom hole assembly comprises an isolation tool; a setting tool operatively arranged for setting the isolation tool in a downhole structure, the setting tool initially connected to the isolation tool and disconnectable therefrom after setting; and a plug drop tool coupled with the setting tool, the plug drop tool configured to drop a plug, the plug operatively arranged to travel downhole and engage the isolation tool after disconnection from the setting tool for enabling isolation by the isolation tool.

ABSTRACT

A bottom hole assembly comprises an isolation tool; a setting tool operatively arranged for setting the isolation tool in a downhole structure, the setting tool initially connected to the isolation tool and disconnectable therefrom after setting; and a plug drop tool coupled with the setting tool, the plug drop tool configured to drop a plug, the plug operatively arranged to travel downhole and engage the isolation tool after disconnection from the setting tool for enabling isolation by the isolation tool.

DOWNHOLE PLUG DROP TOOL

FIELD

[0001] The subject application relates generally to downhole drilling and in particular,
5 to a downhole plug drop tool.

BACKGROUND

[0002] So called "plug and perf" operations are well known in the downhole drilling and completions industry, particularly with respect to unconventional resource plays
10 (unconventional gas, shale gas, tight gas and oil, coal bed methane, etc.). In a plug and perf operation, a bottom hole assembly is run, e.g., on wireline, into a borehole that is typically cased and cemented and could include both horizontal and vertical sections. The bottom hole assembly includes an isolation tool, a setting tool, and one or more perforation guns. The setting tool is actuated for packing off a production zone with the isolation tool. The one or
15 more perforation guns are then positioned in the borehole and triggered by a signal sent down the wireline. Typically, ball type plugs are used for the isolation tools, e.g., as they provide fluid communication with lower zones, which enables sufficient fluid flow for redeploying the perforation guns in the event that they do not fire properly. After perforation, the bottom hole assembly (sans isolation tool) is pulled out and a ball or other plug member dropped from
20 surface for engaging a seat of the isolation tool for impeding fluid flow therethrough. While the process works adequately, it requires a significant amount of time and fluid to pump a ball downhole. Bridge plugs are occasionally used instead of ball type frac plugs, but these bridge plugs do not enable the aforementioned redeployment of failed perforation guns. Accordingly, alternatives for reducing the time and resources required in plug and play operations while
25 maintaining the benefits of ball type frac plugs are well received by the industry.

SUMMARY

[0003] A bottom hole assembly comprises an isolation tool, a setting tool operatively arranged for setting the isolation tool in a downhole structure, the setting tool initially
30 connected to the isolation tool and disconnectable therefrom after setting, and a plug drop tool coupled with the setting tool, the plug drop tool configured to drop a plug, the plug operatively arranged to travel downhole and engage the isolation tool after disconnection from the setting tool for enabling isolation by the isolation tool.

[0004] A method of performing a downhole operation comprises running a bottom hole assembly into a downhole structure, the bottom hole assembly including a setting tool, an isolation tool, and a plug drop tool, setting the isolation tool in the downhole structure with the setting tool, disconnecting the setting tool from the isolation tool, deploying a plug from the plug drop tool, and engaging the plug with the isolation tool for enabling isolation by the isolation tool.

[0004a] A bottom hole assembly comprises: an isolation tool; a setting tool operatively arranged for setting the isolation tool in a downhole structure, the setting tool initially connected to the isolation tool and disconnectable therefrom after setting; and a plug drop tool coupled with the setting tool, the plug drop tool configured to drop a plug into an annulus about the plug drop tool, the plug operatively arranged to travel downhole and engage the isolation tool after disconnection from the setting tool for enabling isolation by the isolation tool.

[0004b] A method of performing a downhole operation comprises: running a bottom hole assembly into a downhole structure, the bottom hole assembly including a setting tool, an isolation tool, and a plug drop tool; setting the isolation tool in the downhole structure with the setting tool; disconnecting the setting tool from the isolation tool; deploying a plug from the plug drop tool into an annulus about the plug drop tool; and engaging the plug with the isolation tool for enabling isolation by the isolation tool.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The following descriptions should not be considered limiting in any way. With reference to the accompanying drawings, like elements are numbered alike:

[0006] Figure 1 schematically illustrates a downhole assembly;

5 [0007] Figure 2 is a cross-sectional view of a plug drop tool of the assembly of Figure 1 in a closed configuration;

[0008] Figure 3 is a side view of the plug drop tool of Figure 2;

[0009] Figure 4 is schematically illustrates the downhole assembly of Figure 1 in an actuated configuration;

10 [0010] Figure 5 is a cross-sectional view of the plug drop tool in communication with an annulus; and

[0011] Figure 6 is a side view of the plug drop tool of Figure 5.

DETAILED DESCRIPTION

15 [0012] A detailed description of one or more embodiments of the disclosed apparatus and method are presented herein by way of exemplification and not limitation with reference to the Figures.

[0013] Referring now to Figure 1 an embodiment of the current invention is illustrated, namely an assembly 10 run into a downhole structure 12. The downhole structure, 20 could be, e.g., a borehole that is lined, cased, cemented, etc. The assembly 10 is, e.g., run downhole by use of a wireline system. In the illustrated embodiment the assembly 10 includes an isolation tool 14, a setting tool 16, a perforation gun 18, and a plug drop tool 20.

[0014] For example, in one embodiment, the assembly 10 is, e.g., a bottom hole assembly for a “plug and perf” operation. In this embodiment, the assembly 10 is positioned 25 downhole and the isolation tool 14 is set in the structure 12 by the setting tool 16 for packing off a production zone 22. The isolation tool 14 and the setting tool 16 could be any suitable tools known in the art. For example, the isolation tool 14 could be retrievable, drillable, etc.,

and formed from composites, metals, polymers, etc. In one embodiment the setting tool 16 is an E-4 setting tool commercially available from Baker Hughes, Inc.. The setting tool 16 is then uncoupled from the isolation tool 14 and the perforation gun 18 positioned within the structure 12 for perforating the zone 22, as generally illustrated in Figure 4. Multiple
 5 perforation guns could be included in the assembly 10 for forming multiple perforated sections in each production zone.

[0015] After perforation, the uncoupled tools of the assembly 10 are removed (the isolation tool 14 remaining downhole) and a plug 24, corresponding to a complementarily formed seat in the isolation tool 14, is dropped downhole for isolating opposite sides of the
 10 plug tool 14, e.g., thereby enabling a pressure up event to fracture the production zone 22 through the perforations formed by the gun(s) 18. The plug 24 could be a ball or take any other suitable form or shape receivable by the isolation tool 14. The isolation tool 14 could include any suitable seat, such as the one taught in United States Patent No. 7,600,572 to Slup et al.

15 [0016] Advantageously, the assembly 10 includes the plug drop tool 20 so that the plug 24 can be dropped before or while the assembly 10 is pulled out so that the plug 24 only has to drop a small number of feet as opposed to plugs in conventional systems that must drop hundreds or thousands of feet from surface. In accordance with the above, the plug drop tool 20 is initially in the condition of Figures 2 and 3 during run-in and perforation and
 20 transitions to the condition of Figures 5 and 6 for deployment of the plug 24 after perforation.

[0017] In the initial configuration of the tool 20 as illustrated in Figures 2 and 3, a valve member 26 is disposed with a window 28 formed in a body 30 of the plug drop tool 20. The window 28 is in communication with an annulus 32 formed between the assembly 10 and the structure 12, but, as shown in Figure 2, blocked from communication with a chamber
 25 34 formed in the body 30. Blockage of the window 28 accordingly blocks communication between the chamber 34 and the annulus 32. By blocking communication between the chamber 34 and the annulus 32, the plug 24 disposed within the chamber 34 can be run-in and moved with the tool 20. A cap 36 is included with the tool 20 for preventing the plug 24 from exiting the chamber 34 during run-in and positioning of the perforation guns 18. The
 30 cap 36 and valve member 26 may both be formed as sleeves or rods having passages therethrough for enabling the flow of fluid through the tool 20.

[0018] The cap 36 is secured to the valve member 26 via at least one strut 38 for enabling forces exerted on the cap 36 to be transferred to the valve member 26. For example the tool 20 could include a lead screw, spring or other resilient element, magnetic or

hydraulically actuated components, etc., or any other device, mechanism, or system arranged for actuating the valve member 26. This actuation system could be triggered, e.g., by a signal sent via the wireline on which the assembly 10 is run. At least one release member 40, e.g., a set screw, can be included for preventing premature actuation of the valve member 26, e.g.,
 5 until a predetermined threshold force is applied to the cap 36.

[0019] It is to be further appreciated that in addition or alternatively to axial movement, the member 26 could be actuated differently, e.g., rotational movement could align the struts 38 with the windows 28 for selectively enabling and disabling communication between the chamber 34 and the annulus 32. In another embodiment, the windows 28 are
 10 opened by forming the valve member 26 from a material that is dissolvable, degradable, consumable, corrodible, disintegrable, or otherwise removable in response to a downhole fluid, e.g., acid, brine, etc. Regardless of the mechanism used, actuation (movement, disintegration, etc.) of the valve member 26 will open the window 28, thereby enabling communication between the chamber 34 and the annulus 32.

[0020] When the chamber 34 is in communication with the annulus 32 the plug 24 is able to exit the chamber 34 by passing through the window 28 into the annulus 32. The plug 24 is operatively sized with respect to the annulus 32, i.e., having a dimension smaller than that of a radial clearance through the annulus 32. The radial clearance is generally defined by the radially largest portion of the tools past which the plug 24 must travel in order to engage
 20 with the isolation tool 14 (e.g., the drop tool 20, perforation guns 18, setting tool 16, etc.). By being so sized, the plug 24 is able to pass by the drop tool 20, the perforating gun 18 and setting tool 16 of the assembly 10 in order to engage in a corresponding seat of the isolation tool 14 and cause isolation as noted above.

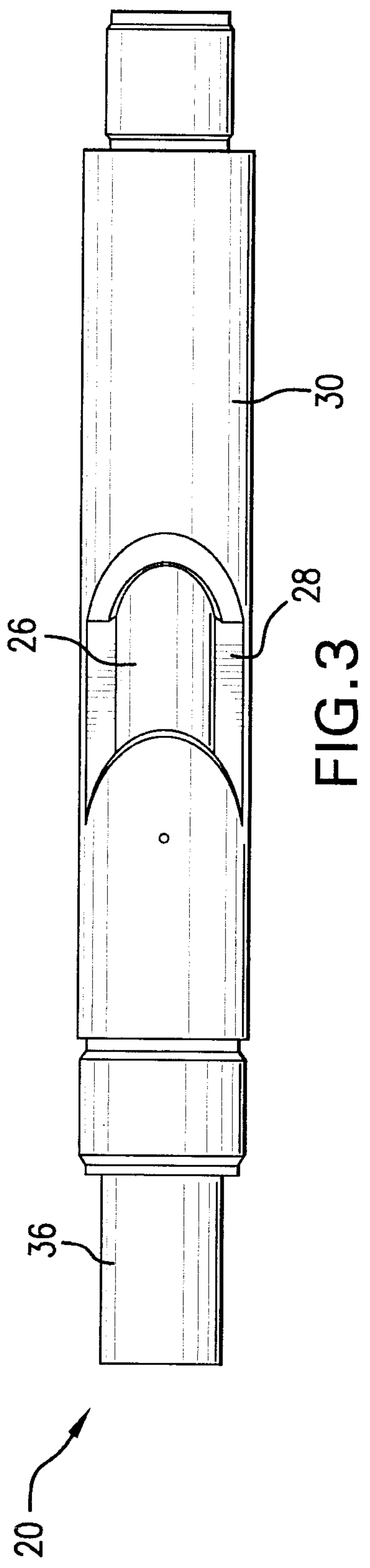
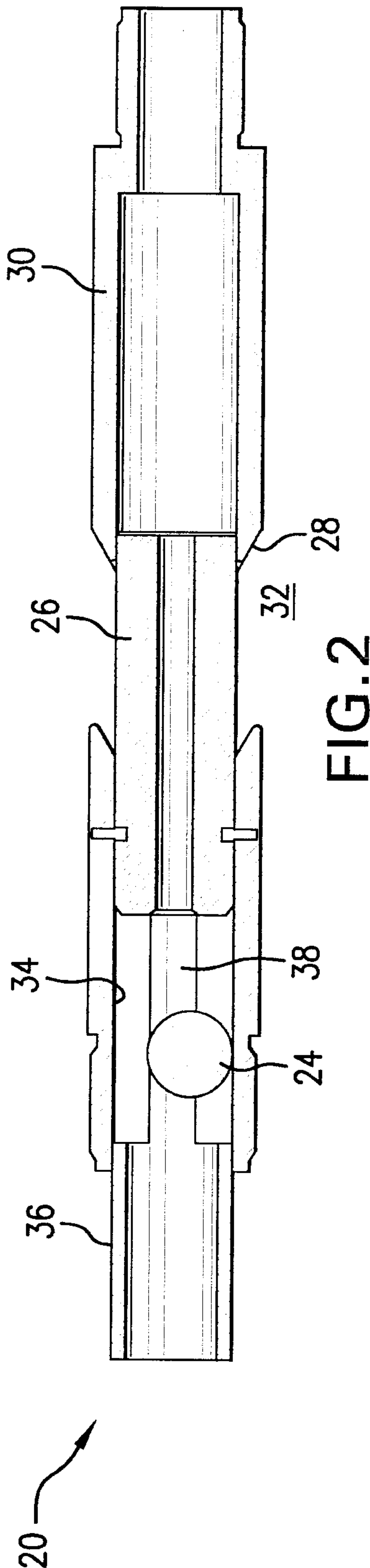
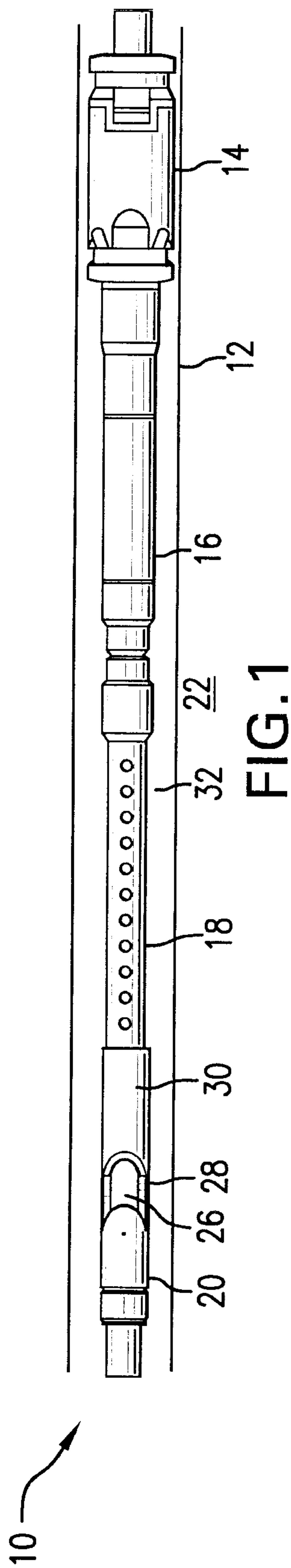
[0021] While the invention has been described with reference to an exemplary
 25 embodiment or embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to
 30 the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the claims. Also, in the drawings and the description, there have been disclosed exemplary embodiments of the invention and, although specific terms may have been employed, they are unless otherwise stated used in a generic and descriptive sense only and not for purposes

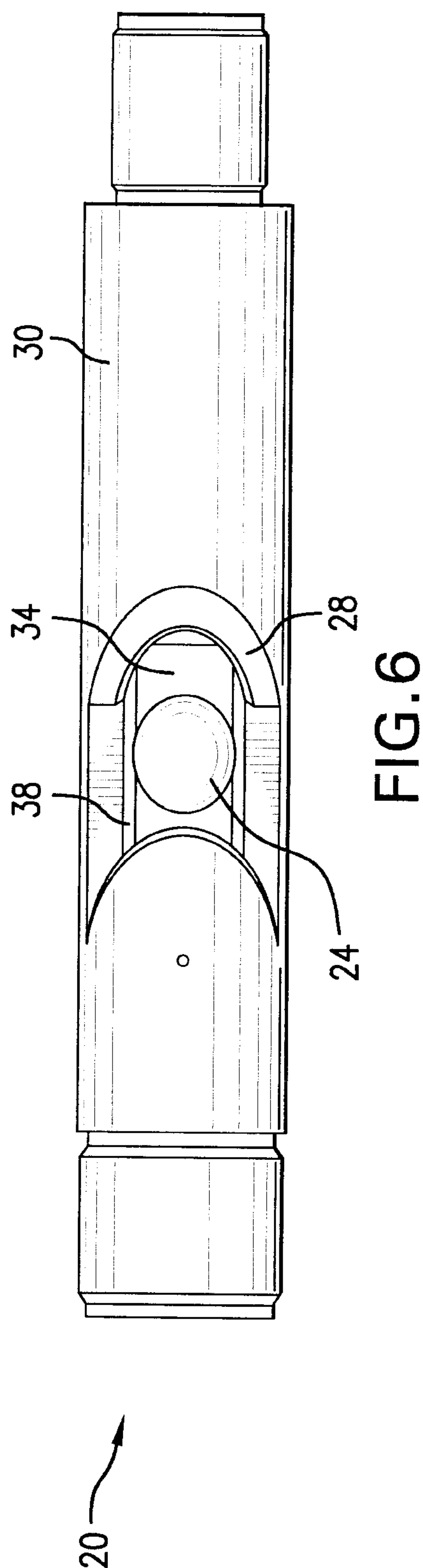
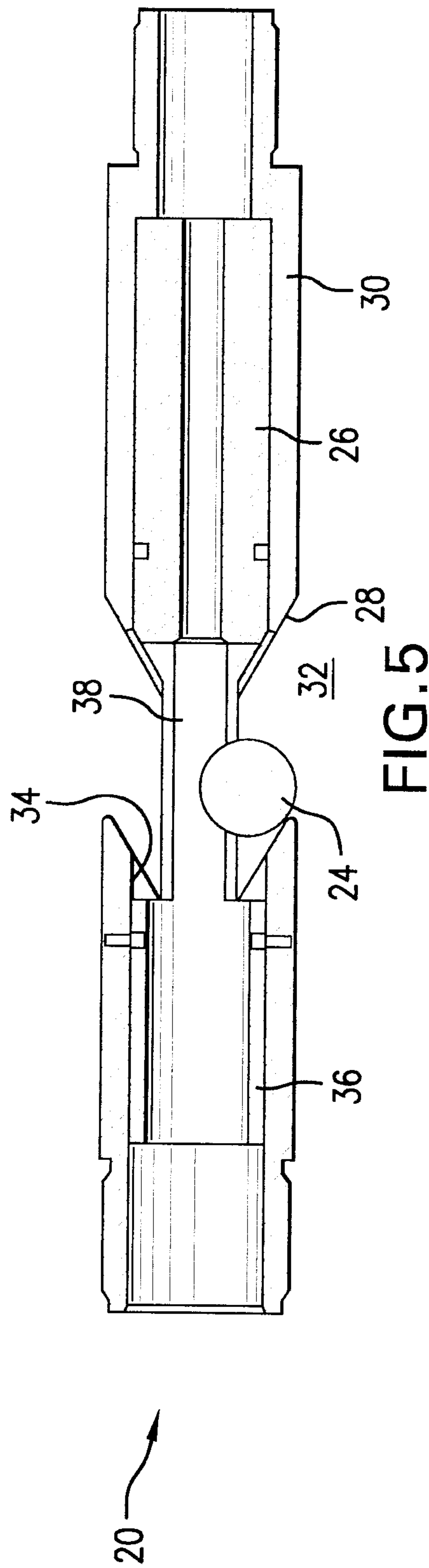
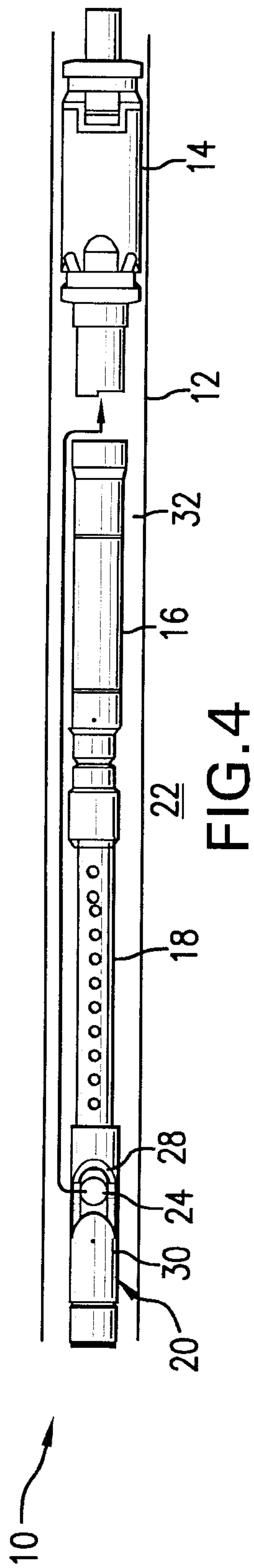
of limitation, the scope of the invention therefore not being so limited. Moreover, the use of the terms first, second, etc. do not denote any order or importance, but rather the terms first, second, etc. are used to distinguish one element from another. Furthermore, the use of the terms a, an, etc. do not denote a limitation of quantity, but rather denote the presence of at
5 least one of the referenced item.

What is claimed is:

1. A bottom hole assembly comprising:
an isolation tool;
a setting tool operatively arranged for setting the isolation tool in a downhole structure, the setting tool initially connected to the isolation tool and disconnectable therefrom after setting; and
a plug drop tool coupled with the setting tool, the plug drop tool configured to drop a plug into an annulus about the plug drop tool, the plug operatively arranged to travel downhole and engage the isolation tool after disconnection from the setting tool for enabling isolation by the isolation tool.
2. The assembly of claim 1, further including at least one perforation gun coupled with the setting tool and the plug drop tool.
3. The assembly of claim 1 or 2, wherein the annulus is formed between the bottom hole assembly and the downhole structure.
4. The assembly of claim 3, wherein the plug is engagable with the isolation tool after disconnection of the isolation tool and the setting tool.
5. A method of performing a downhole operation, the method comprising:
running a bottom hole assembly into a downhole structure, the bottom hole assembly including a setting tool, an isolation tool, and a plug drop tool;
setting the isolation tool in the downhole structure with the setting tool;
disconnecting the setting tool from the isolation tool;
deploying a plug from the plug drop tool into an annulus about the plug drop tool; and
engaging the plug with the isolation tool for enabling isolation by the isolation tool.
6. The method of claim 5, wherein deploying the plug drop tool includes opening at least one window in a body of the plug drop tool.
7. The method of claim 5, wherein deploying the plug drop tool includes actuating at least one member disposed with a body of the plug drop tool.

8. The method of any one of claims 5 to 7, wherein the annulus is formed between the bottom hole assembly and the downhole structure.





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