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(54) **Titre : GARNITURE D'AMORCAGE DE LA FRACTURATION (TIS) SANS MANDRIN**
(54) **Title: MANDREL-LESS LAUNCH TOE INITIATION SLEEVE (TIS)**

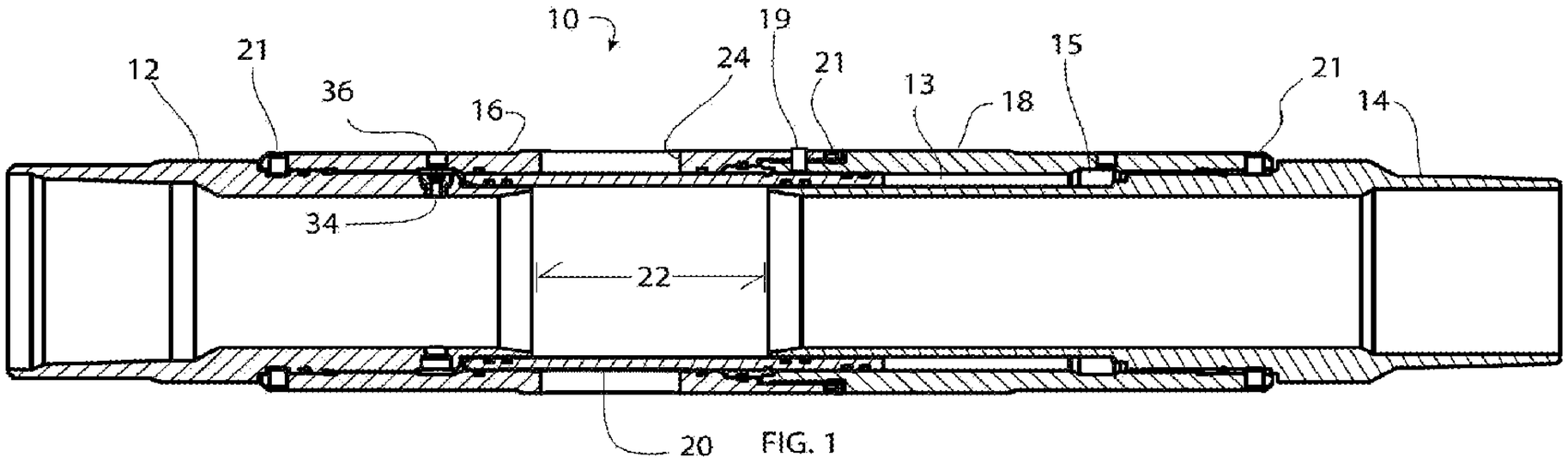

FIG. 1

(57) **Abrégé/Abstract:**
The present invention is a valve tool utilized for hydraulically fracturing multiple zones in an oil and gas well without perforating the cement casing. An oil/gas well completion method involves the use of a valve that is installed as part of the casing string of the well. A mandrel-less casing provides for cement flow within the casing when the valve element is in a closed position and allows for axial flow of fracturing fluid through the cement casing to fracture the formation near the valve when the sleeve is open. The invention disclosed herein is an improved valve used in this process.

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(54) **Title**: MANDREL-LESS LAUNCH TOE INITIATION SLEEVE (TIS)

FIG. 1

(57) **Abstract**: The present invention is a valve tool utilized for hydraulically fracturing multiple zones in an oil and gas well without perforating the cement casing. An oil/gas well completion method involves the use of a valve that is installed as part of the casing string of the well. A mandrel-less casing provides for cement flow within the casing when the valve element is in a closed position and allows for axial flow of fracturing fluid through the cement casing to fracture the formation near the valve when the sleeve is open. The invention disclosed herein is an improved valve used in this process.

Mandrel-less Launch Toe Initiation Sleeve (TIS)

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application claims the benefit of U.S. Provisional Application 61/878,115, filed Sept. 16, 2013, entitled Mandrel-less Launch Toe Initiation Sleeve (TIS), which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[002] The present invention is directed to a valve utilized for hydraulically fracturing multiple zones in an oil and gas well without perforating the cement casing. An oil/gas well completion method involves the use of a valve that is installed as part of the casing string of the well. A mandrel-less casing provides for cement flow within the casing when the valve element is in a closed position and allows for axial flow of fracturing fluid through the cement casing to fracture the formation near the valve when the sleeve is open. The invention disclosed herein is an improved valve used in this process.

BRIEF DESCRIPTION OF THE DRAWINGS

[003] Fig. 1 is a cross-sectional view of a valve tool according to at least one aspect of the current invention with the sleeve closed.

[004] Fig. 2 is a cross-sectional view of a valve tool according to at least one aspect of the current invention with the sleeve opened.

[005] Fig. 3 is an exploded, cross-sectional view of a valve tool according to at least one aspect of the current invention.

[006] Figs. 4-8 are cross-sectional views of the various parts of the tool.

[007] Figs. 9-11 are cross-sectional views of the top and bottom subs and the sleeve.

[008] Fig. 12 is a cross-sectional view of the valve tool according to at least one embodiment of the invention.

[009] Similar reference characters denote corresponding features consistently throughout the attached drawings.

SUMMARY OF THE INVENTION

[010] The present invention is directed to a valve utilized for hydraulically fracturing multiple zones in an oil and gas well without perforating the cement casing. A mandrel-less casing provides for cement flow within the casing when the valve element is in a closed position and allows for axial flow of fracturing fluid through the cement casing to fracture the formation near the valve when the sleeve is open. The invention disclosed herein is an improved valve used in this process.

[011] It is therefore an object of the invention to provide a mandrell-less casing for providing cement flow within the casing.

[012] It is an object of the invention to provide a casing having a sleeve within the casing that protects openings in the casing from being in communication with cement during the cementing in process.

[013] It is an object of the invention to provide the casing with a moveable sleeve that can be moved by pressure or other devices to expose the windows/opening in the casing to prepare for the fracking process.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(s)

[014] The present invention is to a mandrel-less valve tool 10 having an upper and lower sub 12, 14. Each sub preferably has an extended cylindrical portion which acts as a cement barrier in conjunction with sleeve 16 to present a smooth, nearly continuous wall from one end of the tool 10 to the other.

[015] An upper body 18 and lower body 20 are provided about the upper and lower subs. The upper and lower body thread together or may be pinned together by a pin or a screw 19 and then to the subs to locate the subs relative to each other by set screws 21 or the like. Alternatively, upper body 18 and lower body 20 could be formed as a single unit. A gap 22 between the subs of a predetermined size provides a window or opening that aligns with an opening 24 in the upper body so that fluid may selectively be passed between the interior of the tool 10 and the environment about the tool during fracking.

[016] An upper end 30 of sleeve 20 abuts a collar 32 (Fig 3) to form a sleeve chamber between the upper end 30, the collar 32 and upper body 16. An opening through the upper sub is selectively blocked by a burst disk 34. An optional access port 36 may be blocked by a pipe plug or the like for replacing or repairing the burst disk 34 or to allow equalization of the pressure within the sleeve chamber while the tool is being assembled. The sleeve chamber is originally at atmospheric pressure, i.e., is unpressurized. During operation, as will be discussed further hereunder, a high pressure within the upper sub will burst the burst disk 34 causing an increase in pressure on the upper end 30 of the sleeve biasing the sleeve to move downwardly. The sleeve is preferably prevented from

moving unintentionally by shear pins, a shear ring or the like, which may be provided between the lower body and the sleeve at 37 or at other locations (Figure 3). O-rings or other seals at the same locations 38,40,42 may also be provided to seal the sleeve chamber. Once the pressure in the sleeve chamber is sufficient to overcome the force of the shear pins, the sleeve will slide downwardly (into chamber 13) exposing window 24 to the interior of the valve tool 10. Movement of the sleeve will be stopped as the lower end 44 of the sleeve strikes the collar 46 of the lower sub 14. Ratchets, lock rings or other devices may be used to ensure that the sleeve cannot travel in the reverse direction and cannot close the opening once opened. The chamber 13 may be bounded at one end by piston 15 for known purposes.

[017] In operation, the valve tool is attached onto a casing string at the desired location. The string is then lowered into a well bore. When the string is set to a desired depth, cement is pumped through the casing and out into the well bore using appropriate tools or openings. A plug or other device is then lowered through the casing to wipe the casing to remove residual cement. Because the walls of the interior are smooth (i.e., do not include exposed windows or apertures in a mandrel, etc.), the plug can readily remove any cement. When the sleeve 20 is closed, the upper and lower subs present extended cylindrical walls to the plug, and the sleeve 20 provides a cylindrical cover bridging across the gap 22 between the upper and lower sub. This is in distinction to prior art devices, such as the mandrel openings 23 of U.S. Patent 8,267,178, issued Sep. 18, 2012 to Sommers et al., which is incorporated herein by reference. Since the openings are exposed to the interior of the tool when the cement is being pumped through the casing, it

is possible for cement to creep into the openings in the mandrel of the prior art device, and for a plug to be unable to remove the cement from these openings, reducing the effective area of the openings.

[018] When it is desired to open the window of the valve tool 10, the pressure is increased in the casing. The increased pressure causes burst disk 34 to breach allowing pressure into the sleeve chamber. The pressure in sleeve chamber acts downwardly on sleeve 20. The downward pressure at a desired force level shears shear pin or shear ring 37 allowing the sleeve to move out of alignment with gap 22. As the sleeve retreats, the gap 22 is exposed to window 24 of the upper body 16. With the openings aligned and the sleeve withdrawn, the interior of the valve tool 10 and the exterior foundation adjacent the valve tool are brought into fluid communication. Fracing fluid can then be applied from within to area outside the valve tool 10 to fracture the foundation adjacent the valve or to perform other such operations as necessary.

[019] While this invention has been described as having a preferred design, it is understood that it is capable of further modifications, uses and/or adaptations of the invention following in general the principle of the invention and including such departures from the present disclosure as come within the known or customary practice in the art to which the invention pertains and as maybe applied to the central features hereinbefore set forth, and fall within the scope of the invention and the limits of the appended claims.

It is therefore to be understood that the present invention is not limited to the sole embodiment described above, but encompasses any and all embodiments within the scope of the following claims.

CLAIMS

I claim:

1. A well valve tool for providing a window to the environment around the valve tool, the tool comprising:

a top sub and a bottom sub, wherein said top sub is not connected directly to said bottom sub;

an outer sleeve connected between said top sub and said bottom sub having at least one window;

an inner sleeve connected between said top sub and said bottom sub within said outer sleeve to define an inner passage way selectively preventing fluid communication between an area within said top sub, bottom sub and inner sleeve with said outer sleeve at least one window.

2. The well valve tool of claim 1, wherein said sleeve is selectively slidable along one of the group of said top sub and said bottom sub to selectively provide fluid communication between said inner passage way and said outer sleeve at least one window.

3. The well valve tool of claim 1, wherein said sleeve is connected to one of the group of said top sub and said bottom sub by at least one shear pin or a shear disc.

4. The well valve tool of claim 1, wherein said sleeve includes a pressure burst valve for pressurizing said sleeve to cause said sleeve to slide along one of the group of said top sub and said bottom sub to selectively provide fluid communication between said inner passage way and said outer sleeve at least one window.

5. A method of operating a well valve tool comprising:

providing a top sub and a bottom sub;

connecting an outer sleeve between said top sub and said bottom sub, wherein said outer sleeve includes at least one window;

connecting an inner sleeve between said top sub and said bottom sub and within said outer sleeve to selective seal said outer sleeve from an area defined within said top sub, said bottom sub and said inner sleeve.

6. The method of operating a well valve tool of claim 5, further comprising:

running said valve tool within a well;

pouring cement within said valve tool;

removing said cement from said valve tool by moving a plug through said valve tool.

7. The method of operating a well valve tool of claim 5, further comprising:

running said valve tool within a well;

pouring cement within said valve tool;

removing said cement from said valve tool by moving a plug through said valve tool;

pressurizing the inner passage of said valve tool;

said pressure operating to move the inner sleeve relative to said outer sleeve to allow fluid communication between the inner passage and said outer sleeve;

pumping fracking fluid through said at least one window of said outer sleeve.

8. The method of operating a well valve tool of claim 5, further comprising:

running said valve tool within a well;

pouring cement within said valve tool;

removing said cement from said valve tool by moving a plug through said valve tool;

providing a pressure burst valve between said inner passage and an inner sleeve actuation chamber;

pressurizing the inner passage of said valve tool;

raising said pressure until said pressure burst valve bursts allowing pressurization of said inner sleeve actuation chamber;

said pressure in said inner sleeve actuation chamber operating to move the inner sleeve relative to said outer sleeve to allow fluid communication between the inner passage and said outer sleeve.

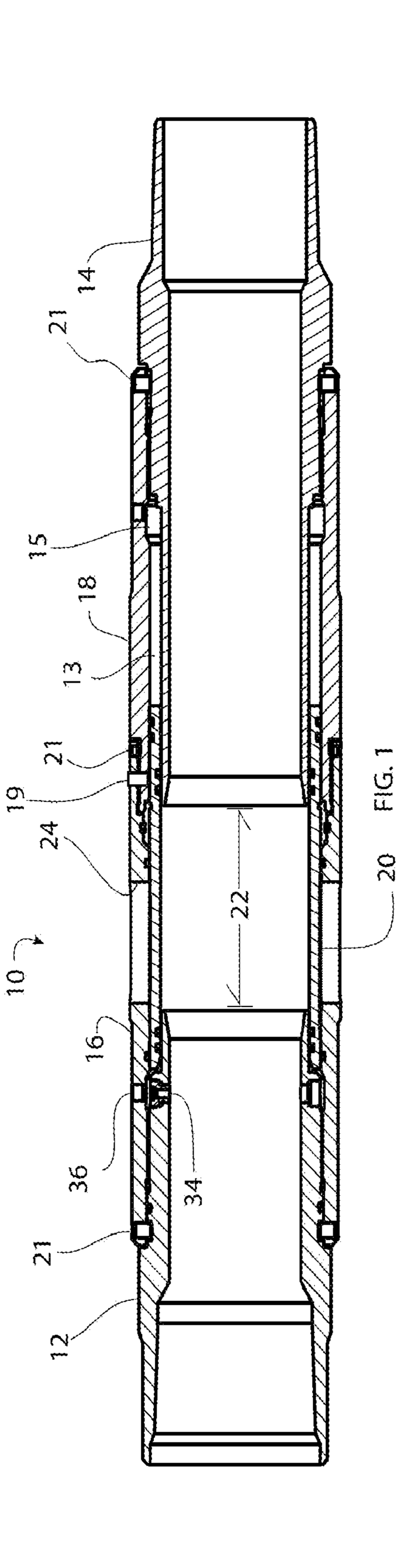

FIG. 1

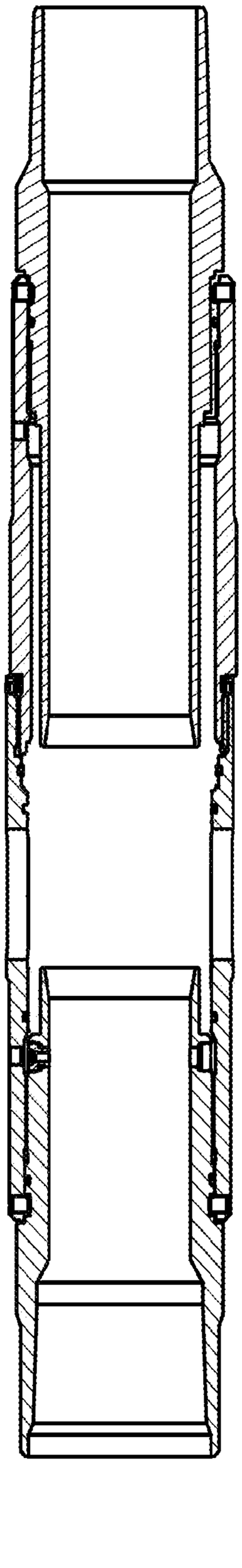

FIG. 2

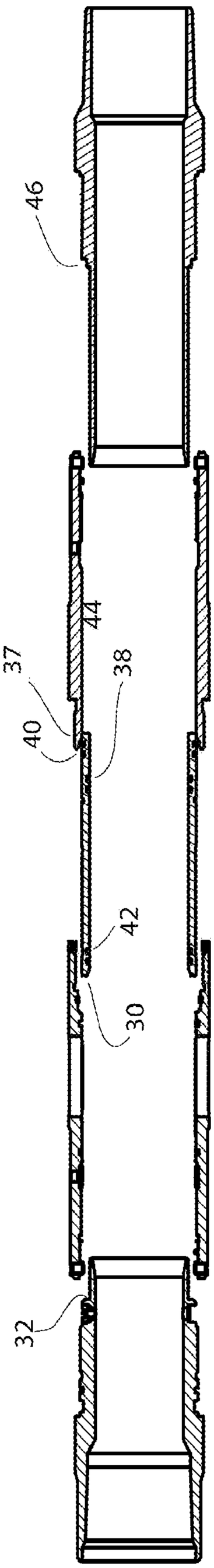

FIG. 3

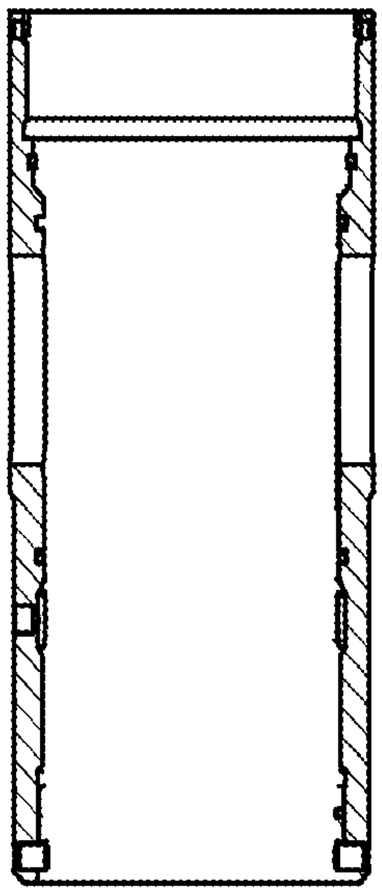

FIG. 7

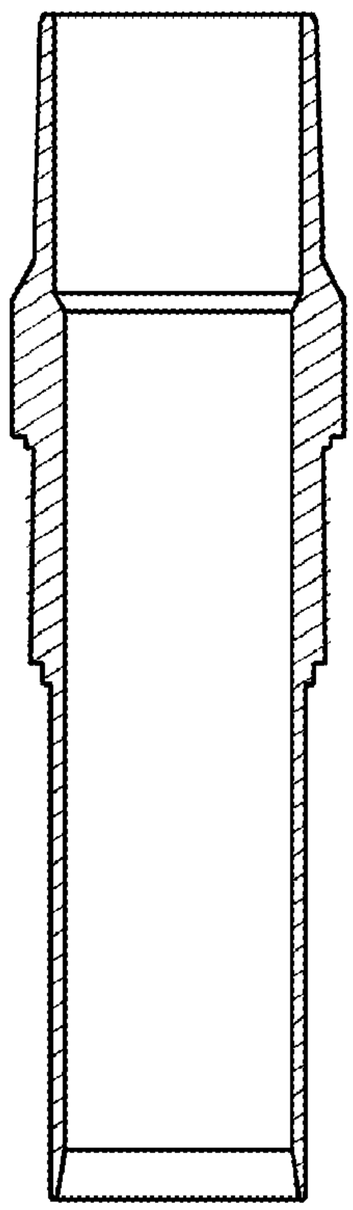

FIG. 8

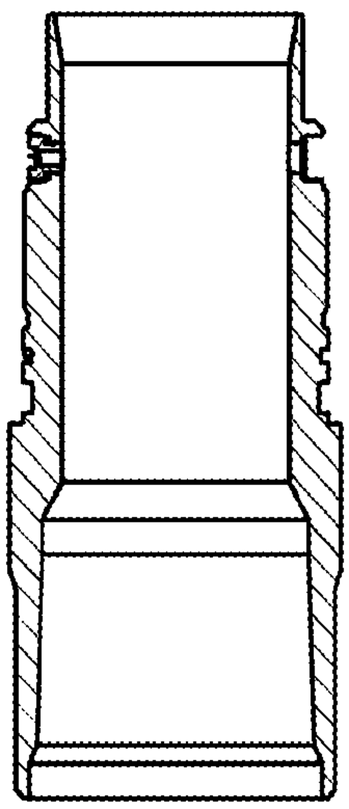

FIG. 4

FIG. 5

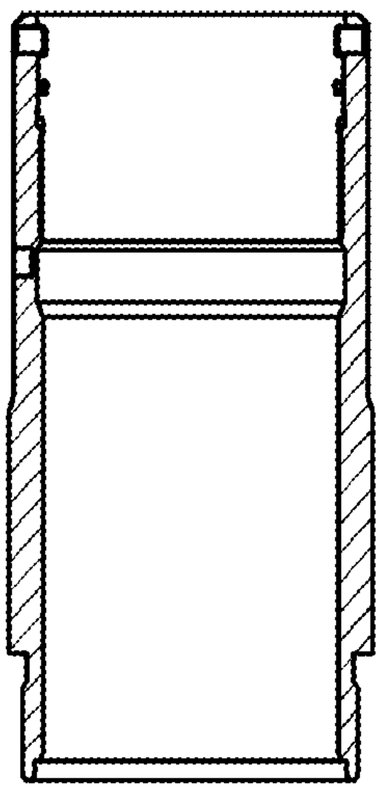

FIG. 6

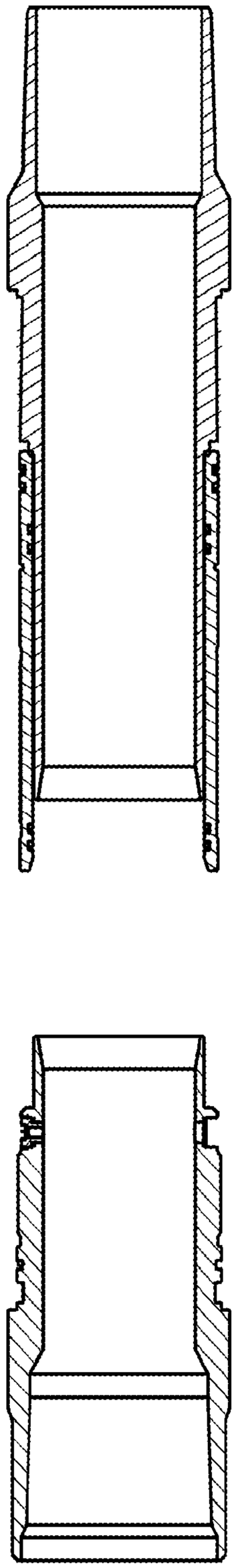

FIG. 10

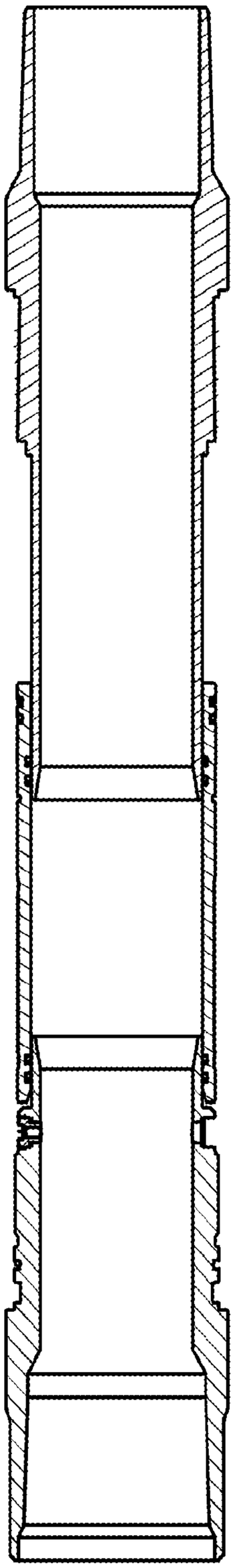

FIG. 11

FIG. 9

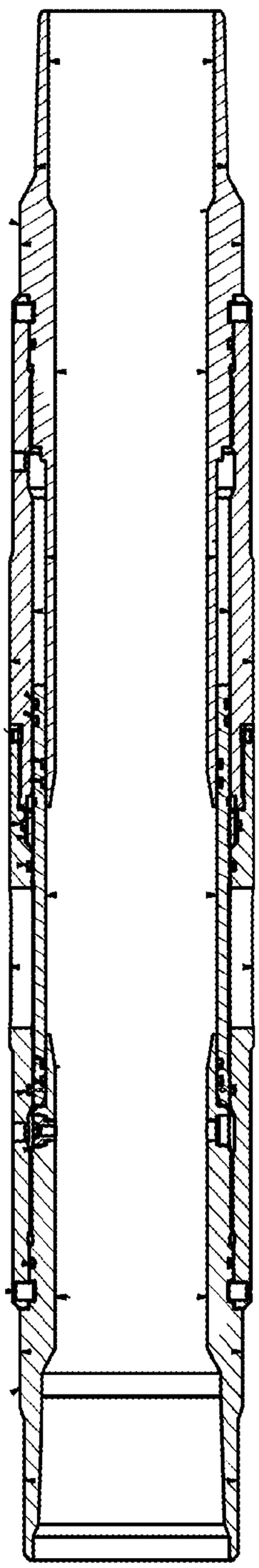

FIG. 12

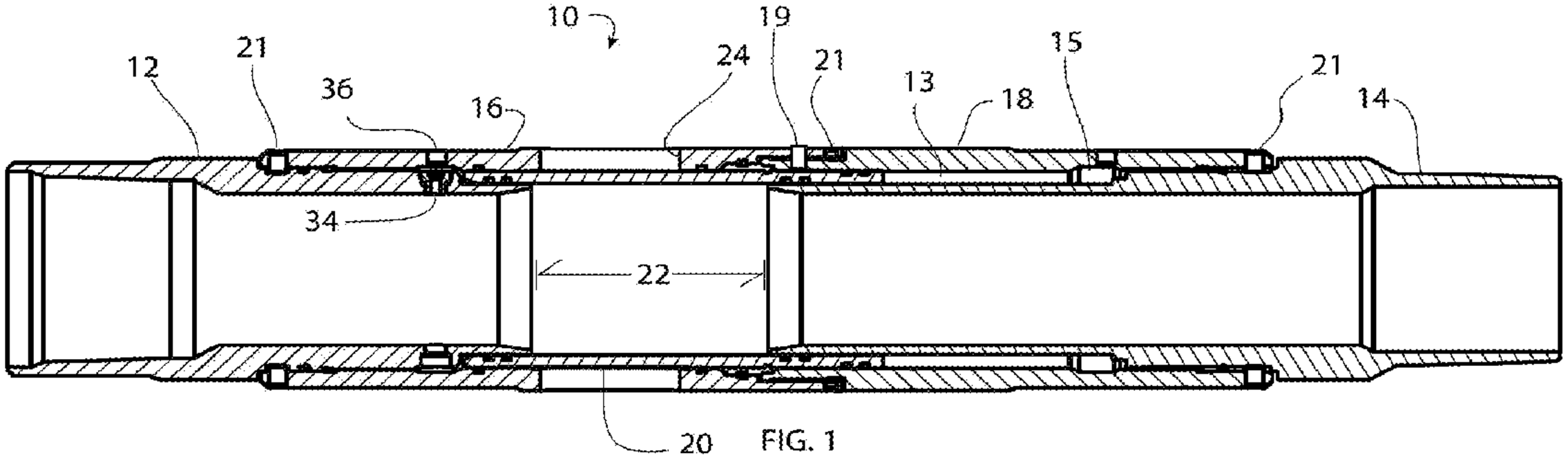

FIG. 1