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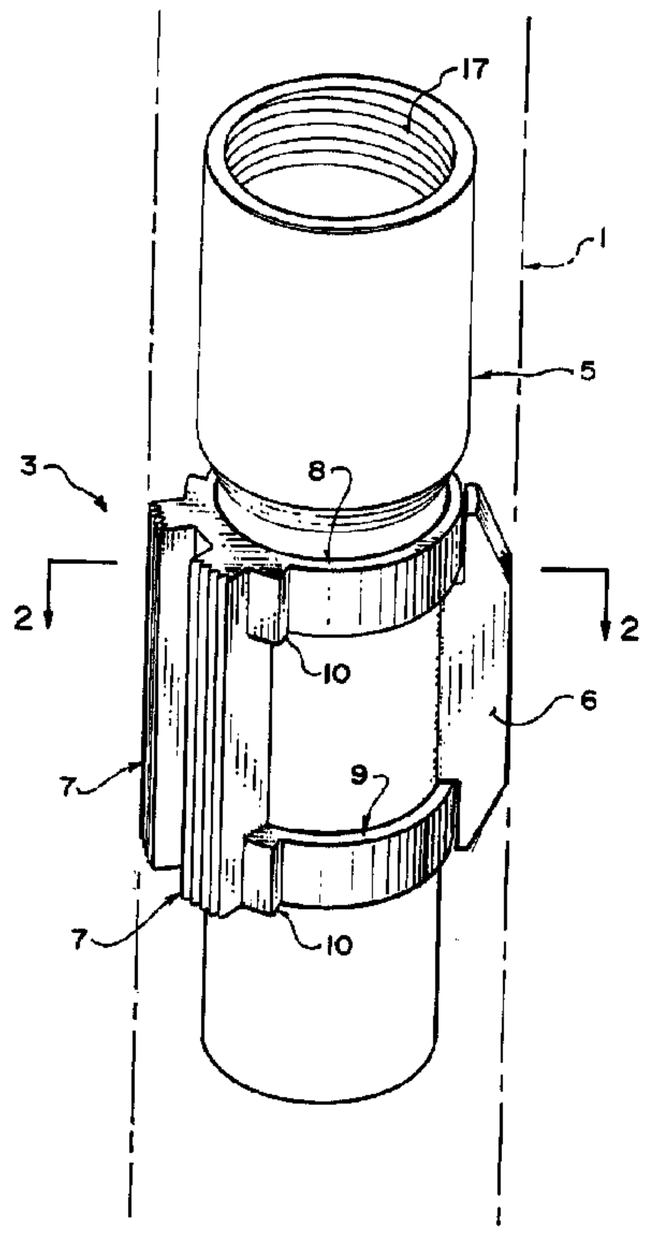

(57) Abrégé/Abstract:
An anti-rotation device prevents righthand rotation of a tubing string within a stationary well casing. The device includes a tubular housing connected inline with the tubing string. A fixed jaw configured for gripping the well casing projects outwardly from the housing. A pair of collars free to rotate about the housing support two floating jaws, which are also configured for gripping the well casing. The floating jaws rotate about the housing between a free position in which the floating jaws are positioned adjacent the fixed jaw and the overall diameter of the device is less than the diameter of the well casing and an engaged position with the floating jaws and the fixed jaws situated on opposing sides of the housing and the overall diameter of the device is greater than the diameter of the well casing.

ABSTRACT

An anti-rotation device prevents righthand rotation of a tubing string within a stationary well casing. The device includes a tubular housing connected inline with the tubing string. A fixed jaw configured for gripping the well casing projects outwardly from the housing. A pair of collars free to rotate about the housing support two floating jaws, which are also configured for gripping the well casing. The floating jaws rotate about the housing between a free position in which the floating jaws are positioned adjacent the fixed jaw and the overall diameter of the device is less than the diameter of the well casing and an engaged position with the floating jaws and the fixed jaws situated on opposing sides of the housing and the overall diameter of the device is greater than the diameter of the well casing.

ANTI-ROTATION TOOL

FIELD OF THE INVENTION

This invention relates to anti-rotation tools, and more particularly to devices for anchoring a tubing string to a surrounding well casing.

BACKGROUND OF THE INVENTION

Oil is commonly collected from below surface reservoirs using a tubing string. Typically the tubing string is constructed in threaded sections and includes an inline pump. The pump considered is a screw-type pump including a rotary drive, a stator and a screw type rotor rotatable therein. The pumps are commonly of right-hand rotation and under certain conditions can transmit large forces to the tubing string. This tends to rotate the tubing string and release the threaded sections which is undesirable.

This problem has been addressed by J. L. Weber in Canadian Patent No. 1,274,470, which discloses a "No-Turn™ Tool" for preventing such rotation of a tubing string. The device comprises an outer tubular housing which rotates about an inner mandrel. The housing holds four retractable slips which are extended for anchoring the device to the stationary well casing. Right-hand rotation of the inner mandrel relative to the housing engages cams which extend the slips into the well casing. Rotation in the opposite direction disengages the cams and the slips are pushed away from the well casing by springs. The device is relatively complex, using both springs and cams, resulting in significant manufacturing costs.

Also addressing the problem of rotation of a tubing string, US Patent No. 5,275,239 by M. Obrejanu discloses a device for anchoring a tubing string within

a stationary well casing against right-hand rotation. The device has four anchoring mechanisms spaced circumferentially about a main housing. Each anchoring mechanism includes a recess and an anchoring member free-floating within the recess. A spring urges the anchoring member outward to engage the well casing. Right-hand rotation of the device will rotate the anchoring members into a locking position. The device is also complex, requiring a spring for each anchoring member. The anchoring members are free-floating and can jam, making the device less reliable.

SUMMARY OF THE INVENTION

According to one aspect of the present invention there is provided an anti-rotation device to prevent right-hand rotation for a tubing string within a stationary well casing, the device comprising:

a tubular housing for connection to the tubing string;

a fixed jaw mounted on the tubular housing in fixed relation to the tubular housing for rotation with the tubular housing for engaging the well casing;

two floating jaws for engaging the well casing; and

floating jaw mounts mounting the two floating jaws on the tubular housing for free rotation about the housing relative to the fixed jaw for varying an overall diameter of the device as the floating jaws are displaced relative to the fixed jaw.

The present device is a simple, robust device with only one moving part improving upon the reliability of the previous art for anchoring a tubing string.

It is preferred that the floating jaw mounts comprise two collars which

rotate freely about the tubular housing mounting the floating jaws for rotation relative to the housing.

The two collars may comprise a first collar rotating above the fixed jaw and a second collar rotating below the fixed jaw for mounting the two floating jaws on the tubular housing.

The first and second jaws may include stops which engage the fixed jaw to inhibit full rotation of the floating jaws.

It is also preferred that the fixed jaw and the two floating jaws project outwardly from the tubular housing and that the outer edges of the fixed jaw and the two floating jaws are configured for gripping the well casing.

According to a second aspect of the present invention there is provided an anti-rotation device to prevent right-hand rotation for a tubing string within a stationary well casing having a prescribed diameter, the anti-rotation device being arranged for connection to the tubing string, the device comprising:

a tubular housing for connection to the tubing string;

a fixed jaw projecting outwardly from the tubular housing in fixed relation to the tubular housing for rotation with the tubular housing and configured for gripping the well casing;

two floating jaws projecting outwardly from the housing and configured for gripping the well casing; and

mounting means for mounting the two floating jaws for free rotation about the tubular housing relative to the fixed jaw between a free position in which the floating jaws are positioned adjacent the fixed jaw and the overall diameter of the

device is less than the diameter of the well casing and an engaged position in which the floating jaws and the fixed jaw are situated on opposing sides of the housing and the overall diameter of the device is substantially equal to the diameter of the well casing.

According to a third aspect of the present invention there is provided an anti-rotation device to prevent right-hand rotation for a tubing string within a stationary well casing, comprising:

a tubular housing for connection to the tubing string;

a fixed jaw projecting outwardly from the tubular housing and configured for gripping the well casing;

two floating jaws projecting outwardly from the housing and configured for gripping the well casing; and

mounting means for mounting the two floating jaws for free rotation about the tubular housing in the form of two collars, a first collar rotating above the fixed jaw and a second collar rotating below the fixed jaw;

the collars including stops which inhibit full rotation of the floating jaws about the tubular housing in relation to the fixed jaw.

According to a further aspect of the present invention there is provided an anchoring device for anchoring a tubing string within a stationary well casing, the device comprising:

a tubular housing for connection to the tubing string;

a fixed jaw mounted on the tubular housing in fixed relation to the tubular housing for rotation with the tubular housing for engaging the well casing;

two floating jaws for engaging the well casing; and

floating jaw mounts mounting the two floating jaws on the tubular housing for free rotation about the housing relative to the fixed jaw for varying an overall diameter of the device as the floating jaws are displaced relative to the fixed jaw.

The floating jaw mounts may comprise two collars which rotate freely about the tubular housing mounting the floating jaws for rotation relative to the housing.

The two collars preferably comprise a first collar rotating above the fixed jaw and a second collar rotating below the fixed jaw for mounting the two floating jaws on the tubular housing.

The first and second jaws may include stops which engage the fixed jaw to inhibit full rotation of the floating jaws.

The fixed jaw and the two floating jaws preferably project outwardly from the tubular housing.

Outer edges of the fixed jaw and the two floating jaws are preferably configured for gripping the well casing.

BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate an embodiment of the invention,

Figure 1 is an isometric view of the device of the present invention engaged within a well casing;

Figure 2 is a cross sectional view taken along the line 2-2 of Figure 1, showing the functional components of the device of the present invention in a

position where it is free to rotate within a well casing;

Figure 3 is a cross sectional view taken along the same line as Figure 2, showing the functional components of the device of the present invention in a locked position where it is not free to rotate within a well casing; and

Figure 4 is a diagrammatic cross section in a vertical plane of an anchoring device located within a well casing.

DETAILED DESCRIPTION

Reference will now be made to Figure 4 which shows the device 3 as it will be used for a production tubing string 12 with an inline progressive cavity pump 16. The pump 16 considered is a screw-type pump including a stator 13 and a screw-type rotor 14 therein. The device 3 is connected to the tubing string 12 by a threaded end 17 of device 3. If the righthand rotation of rotor 14 within the pump 16, transmits sufficient torque to the stator 13, the stator 13 begins to rotate. This rotation is transmitted to the device 3 and the device 3 will engage the well casing 1 as the following will describe.

Reference will now be made to Figure 1, which shows an isometric view of the device of the present invention 3 engaged in the well casing 1. The device 3 is in the form of a tubular housing 5. A fixed jaw 6 projects outwardly from the housing 5 and is configured for gripping the well casing 1. Also, two floating jaws 7 project outwardly from the housing 5 and are configured for gripping the well casing 1. The two floating jaws 7 are mounted on a first collar 8 and a second collar 9 which rotate about the tubular housing 5. The first collar 8 rotates about the housing 5 above the fixed jaw 6, while the second collar 9 rotates about the housing

5 below the fixed jaw 6. The first collar 8 and second collar 9 include stops 10 which engage the fixed jaw 6. The stops 10 inhibit the full rotation of the collars 8 and 9 about the housing 5 and prevent the floating jaws 7 from contacting the fixed jaw 6.

Reference will now be made to Figure 2 which shows a cross section of device 3 where the floating jaws 7 and the fixed jaw 6 are situated on the same side of the housing 5 such that the overall diameter of the device 3 is less that the diameter of the well casing 1. If the housing 5 is rotated to the left, as viewed from above, the fixed jaw 6 will rotate with the housing 5 and contact the stops 10 situated on the collars 8,9. The device 3 is free to further rotate as the fixed jaw 6 engages the stops 10 on the collars 8,9 and rotates the floating jaws 7 with the housing 5. If the housing 5 is rotated to the right, as viewed from above, the floating jaws 7 will engage the well casing 1 and the fixed jaw 6 will rotate away from the floating jaws 7. Further right-hand rotation is prevented when the device reaches the position of Figure 3 and the jaws 6,7 engage the well casing 1.

Reference will now be made to Figure 3 which shows a cross-section of device 3 where the floating jaws 7 and the fixed jaw 6 are situated on opposite sides of the housing 5 such that the overall diameter of the device 3 is greater that the diameter of the well casing 1. If the device 3 is rotated to the right, as viewed from above, the fixed jaw 6 and floating jaws 7 will engage further into the well casing 1 and prevent further rotation. If the device 3 is rotated to the left, as viewed from above, the induced rotation of the housing 5 will disengage the fixed jaw 6 from the well casing 1 and the housing 5 will continue to rotate freely until the fixed jaw 6 contacts the stops 10 of the collars 8 and 9, at which point the device 3 reaches the

position as described of Figure 2.

While one embodiment of the present invention has been described in the foregoing, it is to be understood that other embodiments are possible within the scope of the invention. The invention is to be considered limited solely by the scope of the appended claims.

CLAIMS:

1. An anti-rotation device to prevent righthand rotation for a tubing string within a stationary well casing, the device comprising:

a tubular housing for connection to the tubing string;

a fixed jaw mounted on the tubular housing in fixed relation to the tubular housing for rotation with the tubular housing for engaging the well casing;

two floating jaws for engaging the well casing; and

floating jaw mounts mounting the two floating jaws on the tubular housing for free rotation about the housing relative to the fixed jaw for varying an overall diameter of the device as the floating jaws are displaced relative to the fixed jaw.

2. The device according to Claim 1 wherein the floating jaw mounts comprise two collars which rotate freely about the tubular housing mounting the floating jaws for rotation relative to the housing.

3. The device according to Claim 2 wherein the two collars comprise a first collar rotating above the fixed jaw and a second collar rotating below the fixed jaw for mounting the two floating jaws on the tubular housing.

4. The device according to Claim 3 wherein the first and second jaws include stops which engage the fixed jaw to inhibit full rotation of the floating jaws.

5. The device according to any one of Claims 1 through 4 wherein the fixed jaw and the two floating jaws project outwardly from the tubular housing.

6. The device according to any one of Claims 1 through 5 wherein

outer edges of the fixed jaw and the two floating jaws are configured for gripping the well casing.

7. An anti-rotation device to prevent righthand rotation for a tubing string within a stationary well casing having a prescribed diameter, the anti-rotation device being arranged for connection to the tubing string, the device comprising:

a tubular housing for connection to the tubing string;

a fixed jaw projecting outwardly from the tubular housing in fixed relation to the tubular housing for rotation with the tubular housing and configured for gripping the well casing;

two floating jaws projecting outwardly from the housing and configured for gripping the well casing; and

mounting means for mounting the two floating jaws for free rotation about the tubular housing relative to the fixed jaw between a free position in which the floating jaws are positioned adjacent the fixed jaw and the overall diameter of the device is less than the diameter of the well casing and an engaged position in which the floating jaws and the fixed jaw are situated on opposing sides of the housing and the overall diameter of the device is substantially equal to the diameter of the well casing.

8. An anti-rotation device to prevent righthand rotation for a tubing string within a stationary well casing, comprising:

a tubular housing for connection to the tubing string;

a fixed jaw projecting outwardly from the tubular housing and configured for gripping the well casing;

two floating jaws projecting outwardly from the housing and configured for gripping the well casing; and

mounting means for mounting the two floating jaws for free rotation about the tubular housing in the form of two collars, a first collar rotating above the fixed jaw and a second collar rotating below the fixed jaw;

the collars including stops which inhibit full rotation of the floating jaws about the tubular housing in relation to the fixed jaw.

9. An anchoring device for anchoring a tubing string within a stationary well casing, the device comprising:

a tubular housing for connection to the tubing string;

a fixed jaw mounted on the tubular housing in fixed relation to the tubular housing for rotation with the tubular housing for engaging the well casing;

two floating jaws for engaging the well casing; and

floating jaw mounts mounting the two floating jaws on the tubular housing for free rotation about the housing relative to the fixed jaw for varying an overall diameter of the device as the floating jaws are displaced relative to the fixed jaw.

10. The device according to Claim 9 wherein the floating jaw mounts comprise two collars which rotate freely about the tubular housing mounting the floating jaws for rotation relative to the housing.

11. The device according to Claim 10 wherein the two collars comprise a first collar rotating above the fixed jaw and a second collar rotating below the fixed jaw for mounting the two floating jaws on the tubular housing.

12. The device according to Claim 11 wherein the first and second jaws include stops which engage the fixed jaw to inhibit full rotation of the floating jaws.

13. The device according to any one of Claims 9 through 12 wherein the fixed jaw and the two floating jaws project outwardly from the tubular housing.

14. The device according to any one of Claims 9 through 13 wherein outer edges of the fixed jaw and the two floating jaws are configured for gripping the well casing.

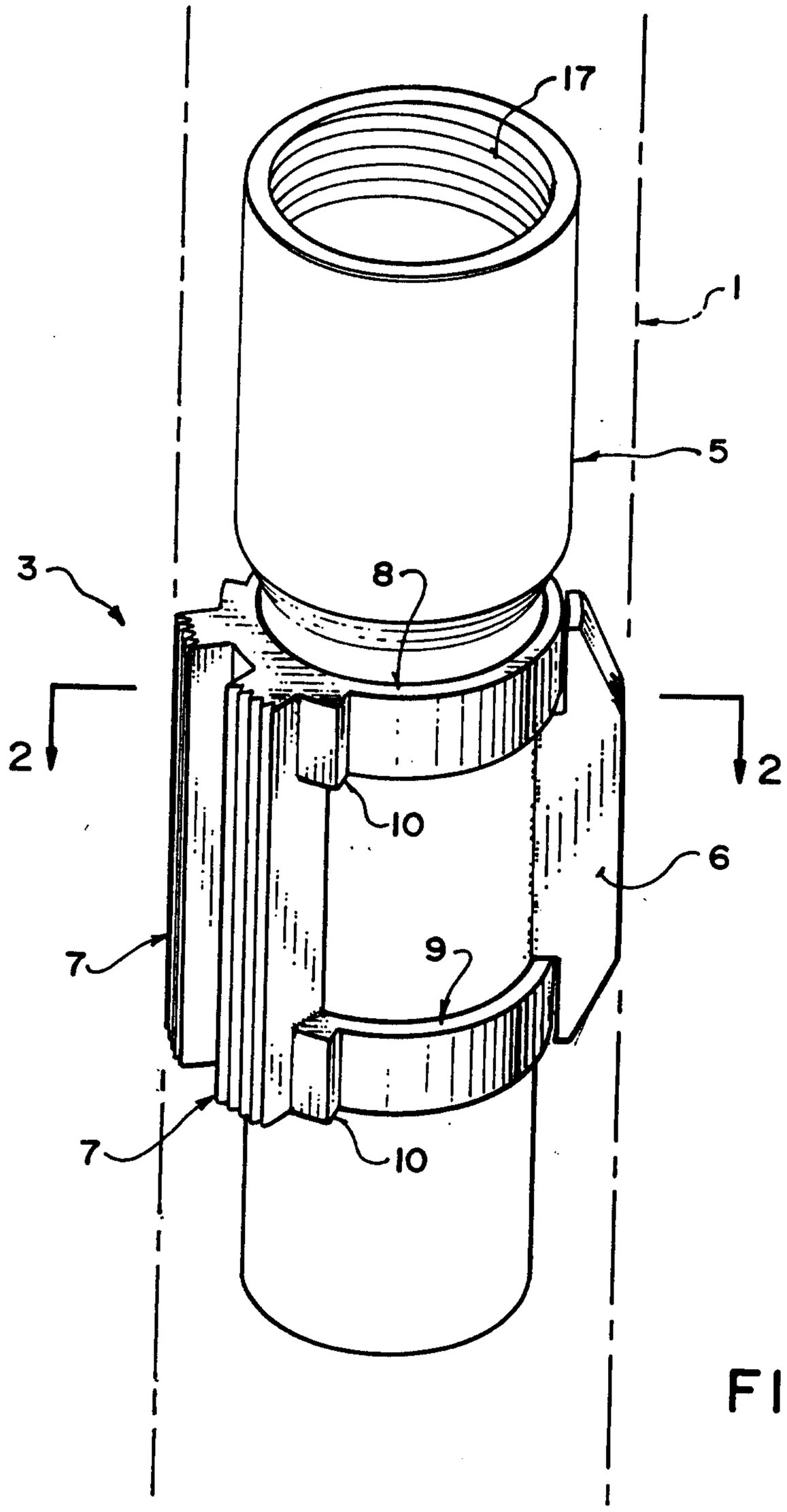

FIG. 1

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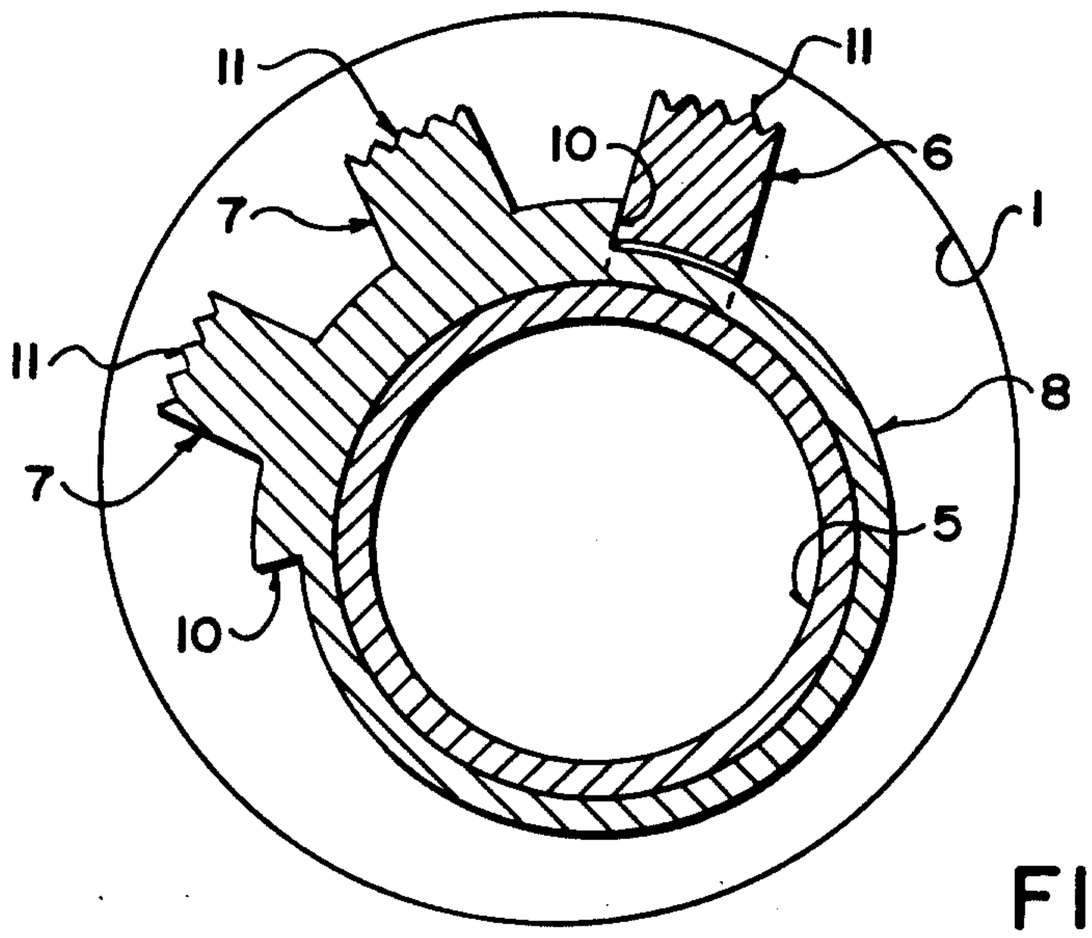

FIG. 2

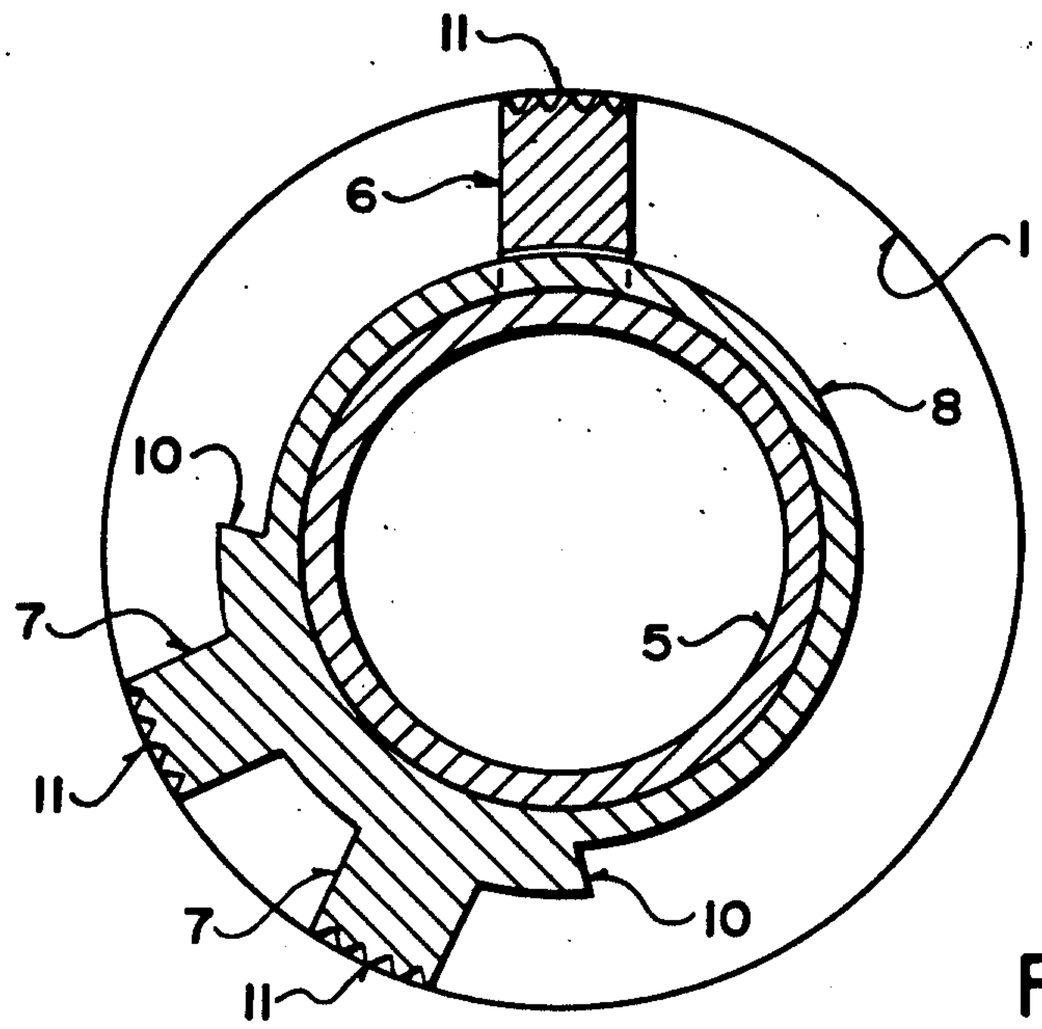

FIG. 3

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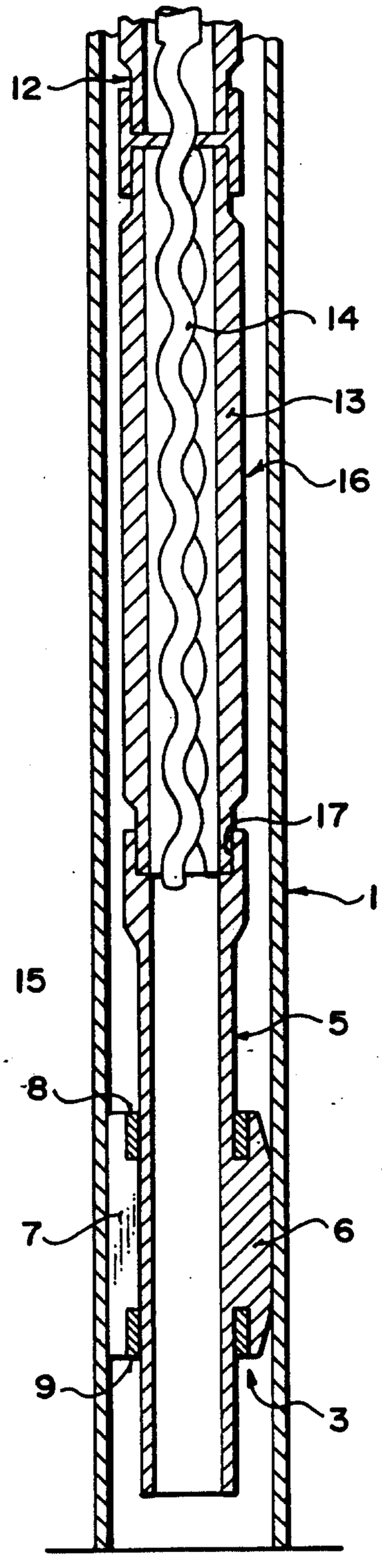

FIG. 4

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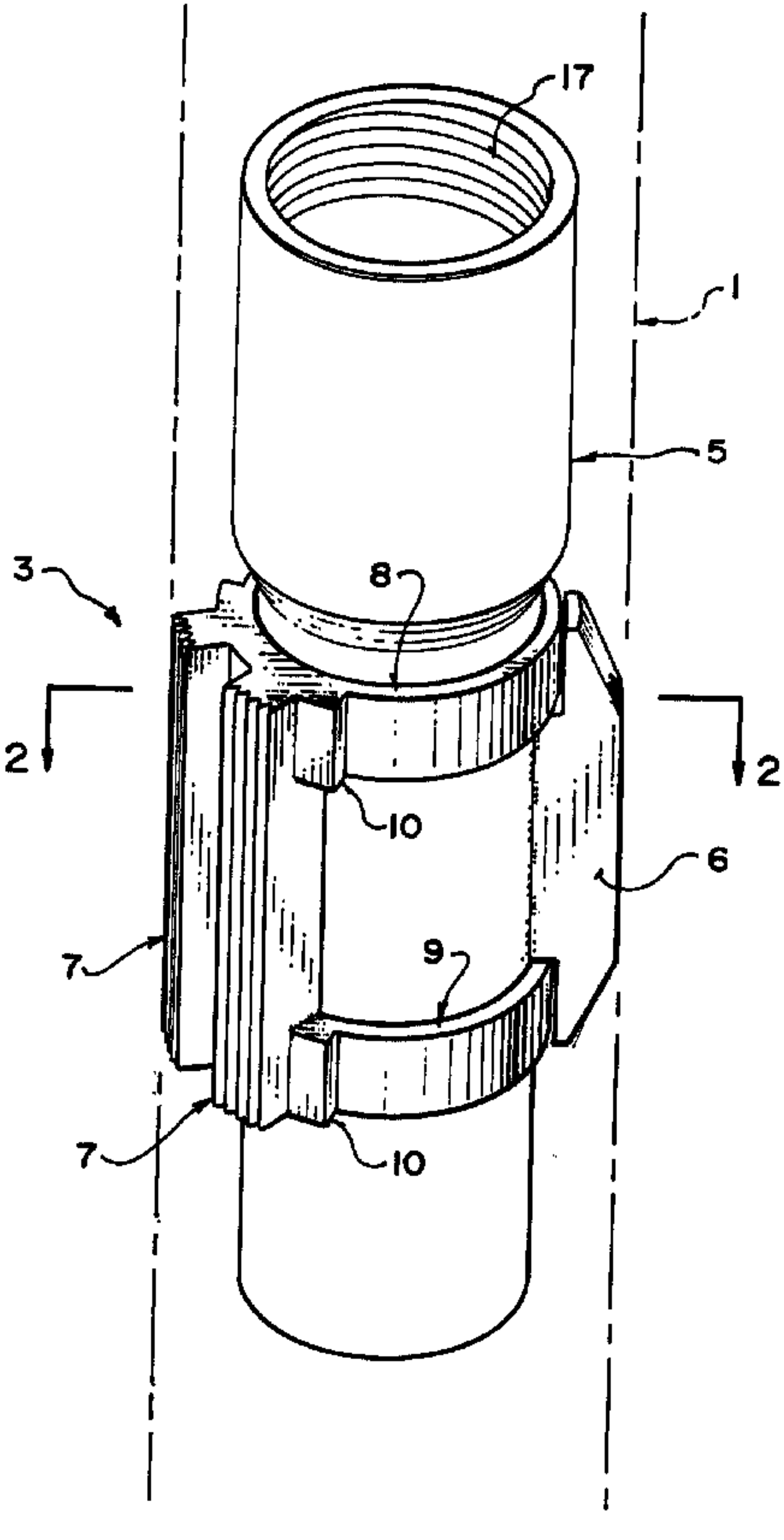
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