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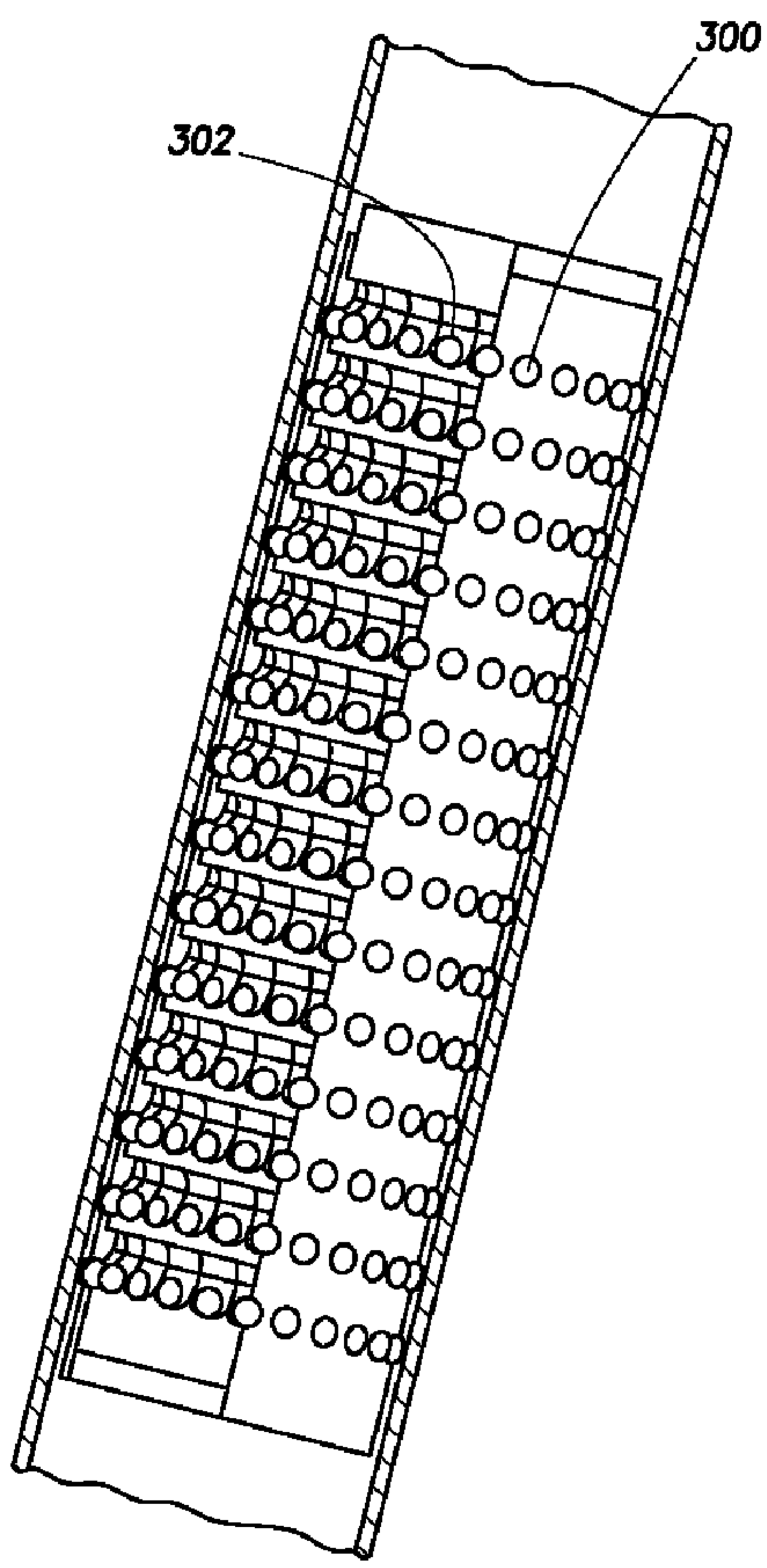

(57) Abrégé/Abstract:
An apparatus (108) is disclosed for handling a tubular segment (102), coupling the tubular segment (102) with a tubular string (104), and handling the tubular string (104) in a well bore (106). The apparatus has a tubular engagement assembly (108), which

(57) **Abrégé(suite)/Abstract(continued)**:
connects to a drive shaft of a top drive (112). The tubular engagement assembly (108)has a self-engaging ball (300) and taper (302) assembly that releasably engages the tubular segment (102). When the tubular engagement assembly (108) connects to the drive shaft and the ball (300) and taper (302) assembly engages the tubular segment (102), any rotation in the drive shaft results in rotation of the tubular segment(102). This rotation allows the tubular segment (102) to engage the tubular string (104).

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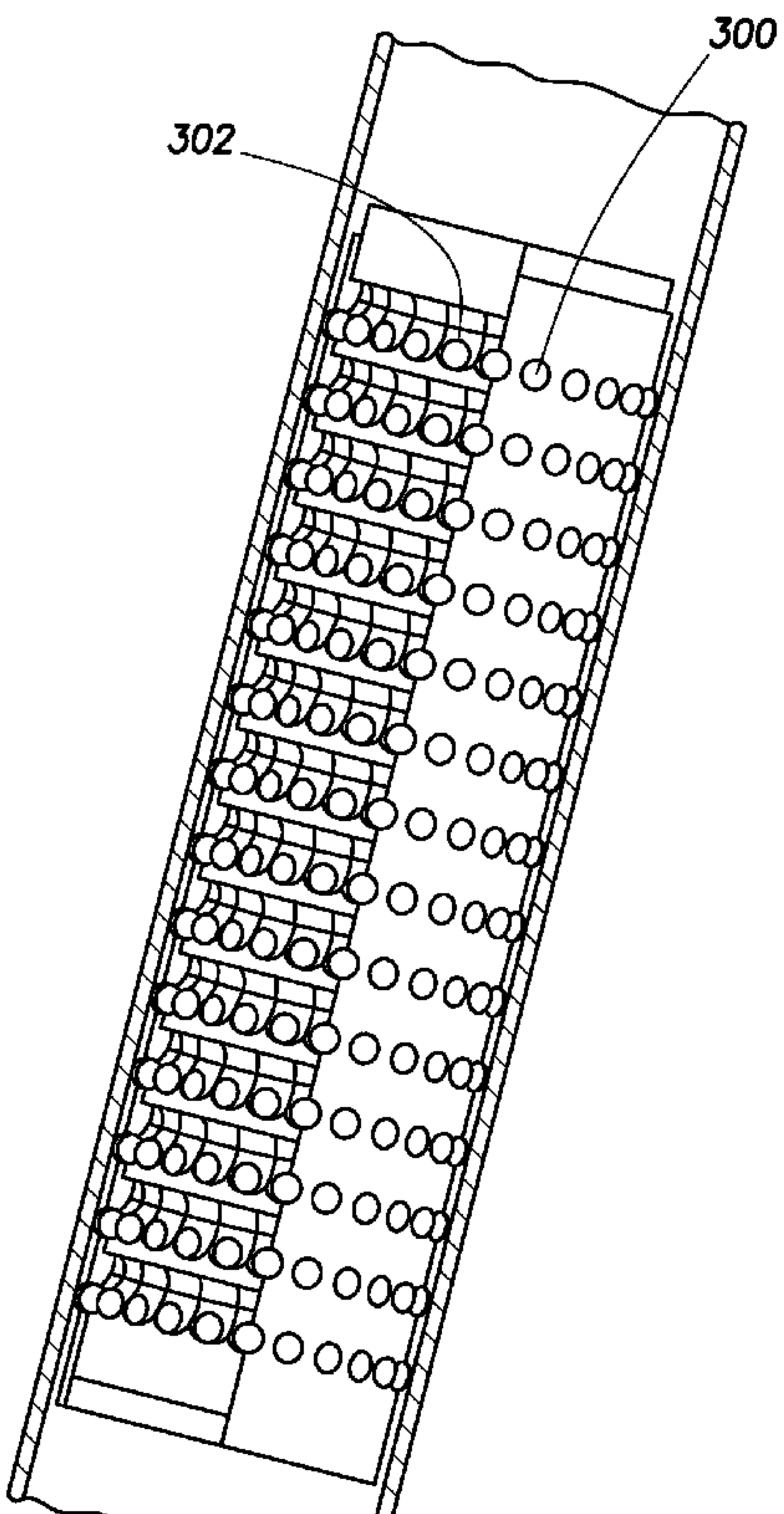

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TUBULAR RUNNING TOOL

BACKGROUND

[0002] The present invention relates to well drilling operations and, more particularly, to an apparatus for assisting in the assembly, disassembly and handling of tubular strings, such as casing strings, drill strings, and the like.

[0003] The drilling of subterranean wells involves assembling tubular strings, such as casing strings and drill strings, each of which comprises a plurality of elongated, heavy tubular segments extending downwardly from a drilling rig into a well bore. The tubular string consists of a number of tubular segments, which threadedly engage one another.

[0004] Conventionally, workers use a labor-intensive method to couple tubular segments to form a tubular string. This method involves the use of workers, typically a "stabber" and a tong operator. The stabber manually aligns the lower end of a tubular segment with the upper end of the existing tubular string, and the tong operator engages the tongs to rotate the segment, threadedly connecting it to the tubular string. While such a method is effective, it is dangerous (especially since both the "stabber" and the "tong operator" typically work on elevated platforms), cumbersome, and inefficient. Additionally, the tongs require multiple workers for proper engagement of the tubular segment and to couple the tubular segment to the tubular string. Thus, such a method is labor-intensive and therefore costly. Furthermore, using tongs can require the use of scaffolding or other like structures, which endangers workers.

[0005] Others have proposed a running tool, utilizing a conventional top drive assembly for assembling tubular strings. The running tool includes a manipulator, which engages a tubular segment and raises the tubular segment up into a power assist elevator, which relies on applied energy to hold the tubular segment. The elevator couples to the top drive, which rotates the elevator. Thus, the tubular segment contacts a tubular string and the top drive rotates the tubular segment and threadedly engages it with the tubular string.

[0006] While such a tool provides benefits over the more conventional systems used to assemble tubular strings, such a tool suffers from shortcomings. One such shortcoming is that the tubular segment might be scarred by the elevator dies. Another shortcoming is that a conventional manipulator arm cannot remove single joint tubulars and lay them down on the pipe deck without worker involvement.

[0007] Accordingly, it will be apparent to those skilled in the art that there continues to be a need for an apparatus that efficiently couples a tubular segment with a tubular string and handles the tubular string within the well bore utilizing an existing top drive. The present invention addresses these needs and others.

SUMMARY

[0008] The present invention provides an apparatus that moves a tubular segment from or to the v-door, couples the tubular segment with a tubular string, and handles the tubular string in a well bore.

[0009] An example of an apparatus of the present invention includes a tubular engagement assembly that connects to a drive shaft of a top drive. The tubular engagement assembly has a self-engaging ball and taper assembly that engages the tubular segment. The tubular engagement assembly connects to the drive shaft, such that rotation of the drive shaft causes rotation of the tubular segment as well. The apparatus may also have a single joint handling mechanism. This mechanism may have a remote controlled elevator hoist mechanism with elevator links and a manipulator arm to guide the tubular segment from the tubular delivery system to well center or from well center to the tubular delivery system.

[0010] An example of a method of the present invention includes providing the tubular segment, providing the top drive, providing the tubular engagement assembly, connecting the tubular engagement assembly to the drive shaft, picking up a tubular segment, connecting the tubular engagement assembly to the tubular segment using the ball and taper assembly, centralizing the tubular segment over the wellbore using a manipulator arm, lowering the top drive to bring the tubular segment into contact with the tubular string, and rotating the drive shaft so that the tubular segment engages the tubular string.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Fig. 1 is a side view showing one embodiment of a running tool in accordance the present invention.

[0012] Fig. 2A is a partial side view of one embodiment of an external tubular engagement assembly in accordance with the present invention.

[0013] Fig. 2B is a partial side view of one embodiment of an internal tubular engagement assembly in accordance with the present invention.

[0014] Fig. 3 is a cutaway side view of one embodiment of a ball and taper assembly in accordance with the present invention.

[0015] Fig. 4A is a cross sectional side view the ball and taper assembly of Fig. 3, wherein a ball is in a constricted section of a taper.

[0016] Fig. 4B is another cross sectional side view the ball and taper assembly of Fig. 3, wherein a ball is in a widened section of a taper.

[0017] Fig. 4C is a cross sectional top view of the ball and taper assembly of Fig. 3.

[0018] Fig. 5 is a cut-away view of the compensator assembly.

DETAILED DESCRIPTION

[0019] Referring to Fig. 1, shown therein is a running tool **100** for handling a tubular segment **102**, coupling the tubular segment **102** with a tubular string **104**, and handling the tubular string **104** in a well bore **106**. The running tool **100** has a tubular engagement assembly **108**, which connects to a drive shaft **110** of a top drive **112**. The tubular engagement assembly **108** has a ball and taper assembly **114**, sized to releasably engage the tubular segment **102**. The ball and taper assembly **114** engages the tubular segment **102**, such that rotation of the drive shaft **110** results in a corresponding controlled rotation of the tubular segment **102**.

[0020] The tubular running tool **100** may also include a block **116** connectable to the top drive **112**. The block **116** is capable of engaging a plurality of cables **118**, which connect to a rig drawworks or tubular string hoisting mechanism **121**. The rig drawworks or tubular string hoisting mechanism **121** allows selective raising and lowering of the top drive **112** relative to a rig floor **134**.

[0021] The tubular segment **102** is lifted from a tubular delivery system **122** via the block **116** connected to the top drive **112**, using one or more elevator links **124** and an elevator hoist mechanism **126**. The elevator hoist mechanism **126** may be equipped with two hinged side doors that open and close when handling the tubular segment **102**. The side doors will have a safe lock mechanism to secure the tubular segment **102** in the elevator hoist mechanism **126**. Alternatively, a standard elevator hoisting mechanism may be used. The elevator links **124** and the elevator hoist mechanism **126** hoist the tubular segment **102** until the tubular is vertical, aligning with the well bore and running tool **100**. The manipulator arm **140** assists with the alignment of the tubular segment **102** at its lower end. The elevator hoist mechanism **126** may operate hydraulically or pneumatically. The elevator links **124** have at least one hydraulic cylinder **141** to control the angle of the elevator links **124**.

[0022] The top drive **112**, with the corresponding tubular engagement assembly **108** and the tubular segment **102** still connected to the elevator hoist mechanism **126**, descends until the threads at the bottom of the tubular segment **102** align with threads at the top of the tubular string **104**, which is present in the well bore **106**. Since the top drive **112** is very heavy, it may have a compensator **128** to ensure that only the weight of the tubular segment **102** and the drive shaft **110** rests on the threads. This prevents cross threading or shearing of the threads. Alternatively, if the top drive **112** does not have the capability to properly compensate, an external compensator **129**, working in a similar fashion as described above, can be added to the bottom of the top drive **112**. The compensator **128** or **129** may include an indicator **500** (shown in Fig. 5) to show the position of the external compensator **129** or compensator **128**. A stationary or rotating slip or spider **130** supports the tubular string **104** in the well bore **106** when the top drive **112** is not connected to the tubular string **104**. The slip or spider **130** may engage the tubular string **104** using a ball and taper assembly much like the ball and taper assembly **114** of the tubular engagement assembly **108**. Once the tubular segment **102** is supported by the tubular string **104**, the top drive **112** continues to be lowered, until the tubular engagement assembly **108** engages the tubular segment **102**. In order to facilitate this engagement, the running tool **100** may include a stabbing guide **200** (shown in Figs. 2A and 2B). The stabbing guide **200** centralizes the tubular segment **102** about the tubular engagement assembly **108**. While the stabbing guide **200** may be in any location, it is desirably on the bottom of the tubular engagement assembly **108**.

[0023] Once the threads at the top of the tubular string **104** align with the threads at the bottom of the tubular segment **102**, and the tubular engagement assembly **108** is fully inserted, the downward motion of the top drive **112** ceases, the tubular engagement assembly **108** engages and the top drive **112** is operated such that the drive shaft **110** turns. The turning of the drive shaft **110** results in controlled rotation of the tubular engagement assembly **108**, and thus the tubular segment **102**. During this time, the slip or spider **130** prevents the tubular string **104** from rotating. As the drive shaft **110** turns, the tubular segment **102** connects to and becomes part of the tubular string **104**. Resultantly, the top drive **112** can support the suspended load of the entire tubular string **104**, and the slip or spider **130** can be disengaged. At this point, the top drive **112** can operate to lift, rotate, lower, or perform any other operations typical with the tubular string **104**. If the tubular string **104** is incomplete, the block **116** may lower the top drive **112**, thus lowering the tubular string **104** into the well bore **106**. This lowering may provide clearance for adding an additional tubular segment **102** to the tubular string **104**. Before an additional tubular segment **102** is added, the slip or spider **130** re-engages the tubular string **104** to provide support. The top drive **112** is then detached from the tubular string **104**, so that it is free to attach to the next tubular segment **102**. The slip or spider **130** holds the tubular string **104** in place until the addition of the next tubular segment **102**. After the tubular segment **102** becomes part of the tubular string **104**, the top drive **112** may again support the tubular string **104**, and the slip or spider **130** can again be released. The process repeats until the tubular string **104** reaches the desired length. A load plate **136** allows the tubular string **104** to be pushed into the well bore **106**. If the weight of the top drive **112** is not sufficient to push the tubular string **104** into the well bore, a wireline winch pull down mechanism **138** or hydraulic cylinder assembly **144** maybe attached to the top drive **112** to impart additional downward force to the tubular string **104** via top drive **112** and load plate **136**.

[0024] The tubular engagement assembly **108** desirably includes a seal assembly **206** to enable pressure and fluid flow between the drive shaft **110** and the tubular string **104**. This allows for a sealed central fluid flow path from the top drive **112** to the tubular string **104** in the well bore **106**, without the need to remove the tubular engagement assembly **108**. The resulting flow may be pressurized or non-pressurized, depending on conditions at the site. Providing fill-up capability in the tubular string **104** allows functions such as adding fluid to the annulus of the tubular string **104** while running the tubular string **104** into the well bore **106** or cementing to take place through the tubular string **104**, once the tubular string **104**, has been run into the well bore **106**. This may occur by placing a cementing head **132** above the tubular engagement assembly **108**. Placing the cementing head **132** in this location prior to running the tubular string **104** into the well bore **106** also prevents some difficulties occurring when the tubular string **104** ends above the rig floor **134**. Additionally, this placement allows for vertical movement, rotation or torquing of the tubular string **104** in the well bore **106** while completing a cementing operation. While the advantages of placing the cementing head **132** above the tubular engagement assembly **108** are apparent, the cementing head **132** may still rest below the tubular engagement assembly **108**.

[0025] The ball and taper assembly **114** may be any shape. However, the ball and taper assembly **114** is desirably cylindrical with a centerline aligning generally with a centerline of the tubular segment **102**. The ball and taper assembly **114** may engage the tubular segment **102** at either an outer surface **202** (shown in Fig. 2A) or an inner surface **204** (shown in Fig. 2B) of the tubular segment **102**, depending on the diameter of the tubular segment **102**. In order to accommodate different diameters, the ball and taper assembly **114** is desirably interchangeable with other ball and taper assemblies, depending on specific operational requirements. Generally, smaller diameter tubular segments **102** will require engagement at the outer surface **202** and larger diameter tubular segments **102** will require engagement at the inner surface **204**. However, selection of the ball and taper assembly **114** may vary as site conditions dictate.

[0026] The ball and taper assembly **114** is self-engaging. That is, it has a self-energizing engagement. To engage the tubular segment **102**, the ball and taper assembly **114** uses friction. As shown in Fig. 3, a plurality of balls **300** are generally contained within a plurality of tapers **302**, which are disposed about the ball and taper assembly **114**. While some tapers may be oriented in a generally vertical alignment, others may be oriented in a generally horizontal or any other alignment. Referring now to Fig. 4, the tapers **302** have at least one widened section **400** and at least one constricted section **402**. The tapers **302** may be any shape, so long as they have the widened section **400** and the constricted section **402.** While the figures show spherical balls **300**, the balls **300** may also be elongated, resembling rollers, or the balls **300** may be any other suitable shape.

[0027] The balls **300**, due to gravity and the weight of the sleeve **412**, are typically in the constricted section **402**. When the ball and taper assembly **114** moves in a first direction **404** toward the tubular segment **102**, a wall **406** of the tubular segment **102** pushes the balls **300** toward the widened section **400** of the tapers **302** (causing the balls **300** to partially move in a first rotation **414**), allowing free passage of the tubular segment **102**, as shown in Fig. 4A. Depending on the diameter of the tubular segment **102**, the wall **406** may correspond to the inner surface **204** (shown in Fig. 2B), or to the outer surface **202** (shown in Fig. 2A). When the ball and taper assembly **114** moves in a second direction **408** (causing the balls **300** to move in a second rotation **416**) friction between the balls **300**, tapers **302** and the wall **406** will fully engage the ball and taper assembly **114** with the tubular segment **102**, as shown in Fig. 4A.

[0028] When the balls **300** are in the constricted section **402**, any additional force in the second direction **408** acting on the ball and taper assembly **114** translates into a compressive force at contact points **410**. However, the balls **300** may only impart small peen marks during engagement. This is very different from traditional slip dies, which scar the contact surface of the tubular segment **102**. The drawback of scarring is that it creates stress risers in the tubular segment **102** which may result in propagation of cracks.

[0029] The tapers **302** may have a shape that allows the balls **300** to move along more than one axis. Additionally, the tapers **302** have widened **400** and constricted **402** sections. Since there are pluralities of possible contact points **410** within any given taper **302**, the grip of the ball and taper assembly **114** may be effective in more than one direction. Depending on the shape of the tapers **302**, the ball and taper assembly **114** may provide support to a gravitational load, prevent relative rotation in clockwise or counterclockwise direction, or simultaneously support a load and resist relative rotation. Additionally, the ball and taper assembly **114**, may allow for some upward loads to be resisted by the running tool **100**. This may be accomplished through the use of a fail safe locking mechanism **142** and load plate **136**. This is particularly useful when pushing the tubular string **104** into the well bore **106**. For this, load plate **136** may allow downward force to transfer to the tubular string **104**. Additionally, wireline winch pull down mechanism **138** or hydraulic cylinder assembly **144** may be attached to the top drive **112**, in order to impart additional downward force on the running tool **100** and force the tubular string **104** into the well bore **106**.

[0030] The ball and taper assembly **114** may have both static and dynamic load bearing capability. This allows the ball and taper assembly **114** to carry the full weight of the tubular string **104** while rotating and lowering into or raising out of the well bore **106**. The ball and taper assembly **114** is capable of withstanding the torque involved in make up and break out, allowing the tubular segment **102** to be added to or removed from the tubular string **104** without the need for tongs. Additionally, the ball and taper assembly **114** may provide support and/or prevent movement in any number of other directions.

[0031] Simultaneously preventing movement in multiple directions can be done in at least two ways. Multiple single-direction balls and tapers may have different orientations. For example, one ball and taper may be situated vertically on the ball and taper assembly **114**, while another ball and taper may be situated horizontally on the ball and taper assembly **114**. This allows each ball and taper to resist movement in a single direction. Alternatively, a single ball and taper may be configured to prevent movement in multiple directions. As shown in Fig. 4C, the taper **302** can be shaped so as to have more than one constricted section **402**. The ball and taper assembly **114** shown in Fig. 4C may prevent movement in at least two directions. Combining the views of Figs. 4A, 4B, and 4C results in a multi-direction ball and taper, which can prevent movement in at least three directions (rotation to the right, rotation to the left, and pulling the ball and taper assembly **114** upward). The shape of the tapers **302** may be modified in any number of ways, depending on the expected directions of loads, the materials used, the radius of the balls **300**, the radius of the wall **406** to be gripped. For example, a pseudo-dome shape may be used for the taper **302**.

[0032] In order to release the engagement between the tubular segment **102** and the ball and taper assembly **114**, a sleeve **412** (shown in Figs. 4A and 4B) may be used. The sleeve **412** fits between the tubular segment **102** and the ball and taper assembly **114**, and extends due to gravity, allowing engagement between the tubular segment **102** and the ball and taper assembly **114**. When forcefully retracted, the sleeve **412** serves to disengage the ball and taper assembly **114** by preventing the ball and taper assembly **114** from engaging the tubular segment **102**. While engagement of the balls is a self-energizing process, the failsafe locking mechanism **142** with a powered unlock is desirable for disengagement. Therefore, disengagement may use hydraulics, pneumatics, or any other power source readily available at the site. In order to prevent premature disengagement, the ball and taper assembly **114** desirably has the failsafe locking mechanism **142** that keeps the sleeve **412** in an extended position until disengagement is desired.

[0033] Prior to disengagement, the ball and taper assembly **114** may move slightly in the first direction **404**, such that the compressive force at the contact points **410** diminishes. The sleeve **412** may then move more easily between the tubular segment **102** and the ball and taper assembly **114** in the second direction **408**, thereby blocking the ball and taper assembly **114** from gripping the tubular segment **102**. The ball and taper assembly **114** then moves in the second direction **408** away from tubular string **104**.

[0034] While the use of the running tool **100** for coupling has been discussed, it should be understood that one skilled in the art could similarly use the running tool **100** for uncoupling with minor changes. Additionally, while movement of the ball and taper assembly **114** relative to the tubular segment **102** is disclosed, the tubular segment **102** may move relative to the ball and taper assembly **114** with the same general result.

[0035] Therefore, the present invention is well adapted to attain the ends and advantages mentioned as well as those that are inherent therein. The particular embodiments disclosed above are illustrative only, as the present invention may be modified and practiced in different but equivalent manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. It is therefore evident that the particular illustrative embodiments disclosed above may be altered or modified and all such variations are considered within the scope and spirit of the present invention. Also, the terms in the claims have their plain, ordinary meaning unless otherwise explicitly and clearly defined by the patentee.

What is claimed is:

1. An apparatus for handling a tubular segment, coupling or uncoupling the tubular segment with a tubular string, and handling the tubular string in a well bore, comprising:

a tubular engagement assembly connectable to a drive shaft of a top drive, the tubular engagement assembly having a self-engaging ball and taper assembly sized to releasably engage the tubular segment;

wherein, when the tubular engagement assembly connects to the drive shaft and the ball and taper assembly engages the tubular segment, rotation of the drive shaft results in a corresponding rotation of the tubular segment, with minimal relative rotation between the tubular engagement assembly and the tubular segment;

wherein the tubular engagement assembly is capable of withstanding the torque involved in rotating the tubular string in the well bore and the torque required to make up or breakout a tubular segment; and wherein the ball and taper assembly has both static and dynamic load bearing capability configured to carry the full weight of the tubular string while simultaneously rotating and vertically moving the tubular string within the well bore.

2. The apparatus of claim 1 wherein the top drive has a compensator such that only the weight of the tubular segment and the drive shaft is on threads during coupling of the tubular segment with the tubular string.

3. The apparatus of claim 1, further comprising an external compensator assembly such that only the weight of the tubular segment and the drive shaft is on threads during coupling of the tubular segment with the tubular string.

4. The apparatus of claim 2 or 3, further comprising an indicator to show the position of the compensator assembly.

5. The apparatus of claim 1 wherein the tubular engagement assembly further comprises a stabbing guide to ensure that the tubular centralizes as the tubular engagement assembly engages it, or a seal to maintain pressure and fluid flow between the drive shaft and the tubular string, or both.

6. The apparatus of claim 1 wherein the ball and taper assembly is generally cylindrical.

7. The apparatus of claim 1 wherein the sizing of the ball and taper assembly permits it to engage an inner or outer surface of the tubular segment.

8. The apparatus of claim 1, wherein the ball and taper assembly has a failsafe locking mechanism capable of preventing premature disengagement, or a powered unlock for disengagement from the tubular segment, or both.

9. The apparatus of claim 1, wherein the ball and taper assembly is interchangeably replaceable with another ball and taper assembly sized to accommodate a different tubular diameter.

10. The apparatus of claim 1 wherein the tubular engagement assembly is capable of withstanding the compressive force involved in pushing the tubular string into the well bore, or the tensile force involved in supporting the tubular string in the well bore, or both.

11. The apparatus of claim 1 wherein a manipulator arm guides the tubular segment between a delivery system and the well bore.

12. The apparatus of claim 1 wherein an elevator hoist mechanism, a manipulator arm and elevator links hoist the tubular segment until it aligns over the well bore.

13. The apparatus of claim 1 wherein the tubular segment may be guided back to a delivery system upon removal from the tubular string.

14. The apparatus of claim 12, wherein the elevator hoist mechanism has two hinged doors that open and close with fail safe mechanism when handling the tubular segment.

15. An apparatus for handling a tubular segment, coupling or uncoupling the tubular segment with a tubular string, and handling the tubular string in a well bore, comprising:

a top drive having a drive shaft and a compensator, such that only the weight of the tubular segment and the drive shaft is on threads during coupling of the tubular segment with the tubular string;

a tubular engagement assembly connectable to the drive shaft of the top drive, the tubular engagement assembly having an interchangeable, cylindrical, self-engaging ball and taper assembly with a hydraulic or pneumatic systems controlled powered unlock, and a failsafe locking mechanism, the ball and taper assembly being sized to releasably engage a surface of the tubular segment and a seal to maintain pressure and fluid flow between the drive shaft and the tubular string; and

a stabbing guide to ensure that the tubular centralizes as the tubular engagement assembly engages it;

wherein, when the tubular engagement assembly connects to the drive shaft and the ball and taper assembly engages the tubular segment, rotation of the drive shaft results in a corresponding rotation of the tubular segment, with minimal relative rotation between the tubular engagement assembly and the tubular segment, and the tubular engagement assembly is capable of withstanding compressive force, tensile force, and torque involved in tubular string operations; and

wherein the ball and taper assembly has both static and dynamic load bearing capability configured to carry the full weight of the tubular string while simultaneously rotating and vertically moving the tubular string within the well bore.

16. A method for coupling a tubular segment with a tubular string, the method comprising the steps of:

providing the tubular segment;

providing a top drive having a drive shaft;

providing a tubular engagement assembly connectable to the drive shaft of the top drive, the tubular engagement assembly having a self-engaging ball and taper assembly sized to releasably engage the tubular segment;

connecting the tubular engagement assembly to the drive shaft;

connecting the tubular engagement assembly to the tubular segment using the ball and taper assembly;

centralizing the tubular segment over the well;

providing the tubular string;

lowering the top drive to bring the tubular segment into contact with the tubular string; and

rotating the drive shaft such that the tubular segment engages the tubular string;

wherein the tubular engagement assembly is capable of withstanding the torque involved in rotating the tubular string in the well bore and the torque required to make up or breakout a tubular segment; and

wherein the ball and taper assembly has both static and dynamic load bearing capability configured to carry the full weight of the tubular string while simultaneously rotating and vertically moving the tubular string within the well bore.

17. The method of claim 16, wherein the tubular engagement assembly also has a compensator to minimize the weight applied to the thread of the tubular segment and a manipulator assembly to guide the tubular to be aligned with the tubular string or to guide the tubular segment back to a delivery system for lay down purposes.

18. The method of claim 16, wherein the ball and taper assembly is able to engage an inner or outer surface of the tubular segment.

19. A method for uncoupling a tubular segment with a tubular string, the method comprising the steps of:

providing the tubular string, including the tubular segment;

providing a top drive having a drive shaft;

providing a tubular engagement assembly connectable to the drive shaft of the top drive, the tubular engagement assembly having a self-engaging ball and taper assembly sized to releasably engage the tubular segment;

connecting the tubular engagement assembly to the drive shaft;

lowering the top drive to bring tubular engagement assembly into contact with tubular segment of the tubular string;

connecting the tubular engagement assembly to the tubular segment using the ball and taper assembly; and

rotating the drive shaft such that the tubular segment disengages the tubular string;

wherein the tubular engagement assembly is capable of withstanding the torque involved in rotating the tubular string in the well bore and the torque required to make up or breakout a tubular segment; and

wherein the ball and taper assembly has both static and dynamic load bearing capability configured to carry the full weight of the tubular string while simultaneously rotating and vertically moving the tubular string within the well bore.

20. The method of claim 19, wherein the tubular engagement assembly also has a compensator to minimize the weight applied to the thread of the tubular segment and a manipulator assembly to guide the tubular to be aligned with the tubular string or to guide the tubular segment back to a delivery system for lay down purposes.

21. An apparatus for handling a tubular segment, comprising:

a tubular engagement assembly haying a self-engaging ball and taper assembly sized to releasably engage the tubular segment;

wherein the ball and taper assembly comprises a plurality of balls within a plurality of a single-direction tapers, wherein the plurality of single-direction tapers are oriented in at least two different directions;

wherein the tubular engagement assembly is capable of withstanding the torque involved in rotating a tubular string in a well bore and the torque required to makeup or breakout the tubular segment; and

wherein the ball and taper assembly has both static and dynamic load bearing capability configured to carry the full weight of the tubular sting while simultaneously rotating and vertically moving the tubular string within the well bore.

22. An apparatus for handling a tubular segment, comprising:

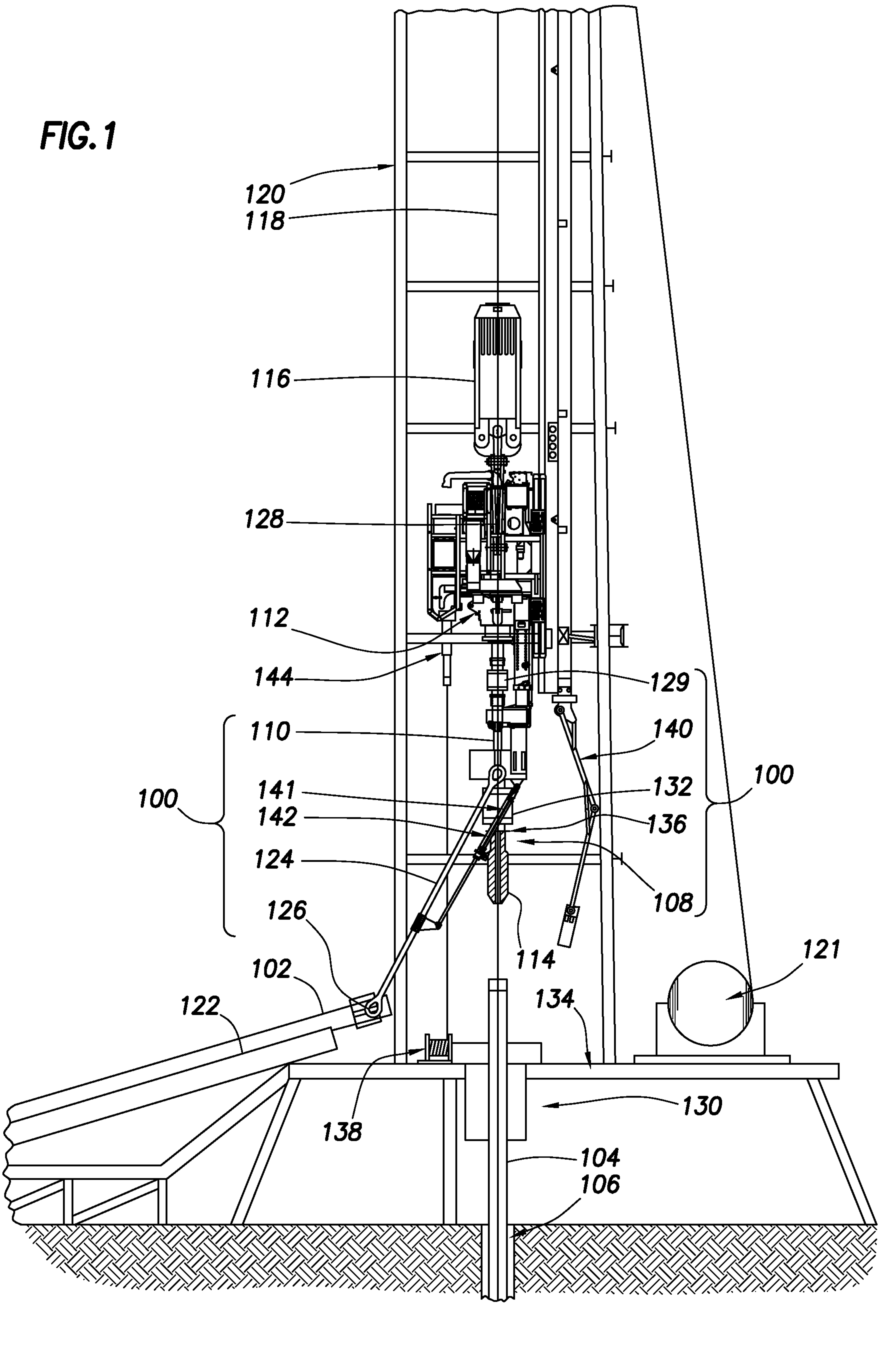
a tubular engagement assembly having a self-engaging ball and taper assembly sized to releasably engage the tubular segment;

wherein the ball and taper assembly comprises a plurality of balls within a plurality of a multi-direction tapers;

wherein the tubular engagement assembly is capable of withstanding the torque involved in rotating a tubular string in a well bore and the torque required to make up or breakout the tubular segment; and

wherein the ball and taper assembly has both static and dynamic load bearing capability configured to carry the full weight of the tubular string while simultaneously rotating and vertically moving the tubular string within the well bore.

FIG. 1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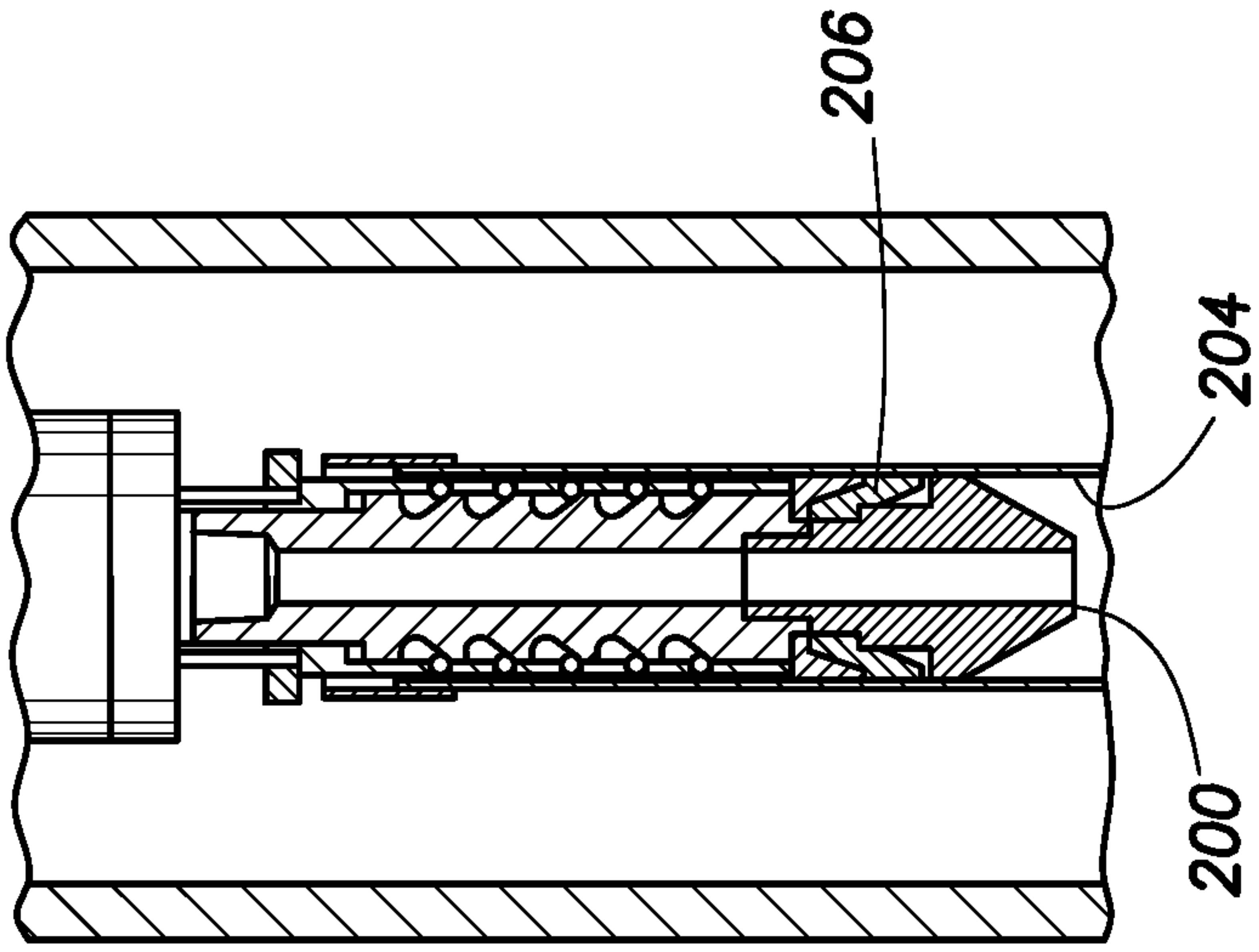

FIG.2B

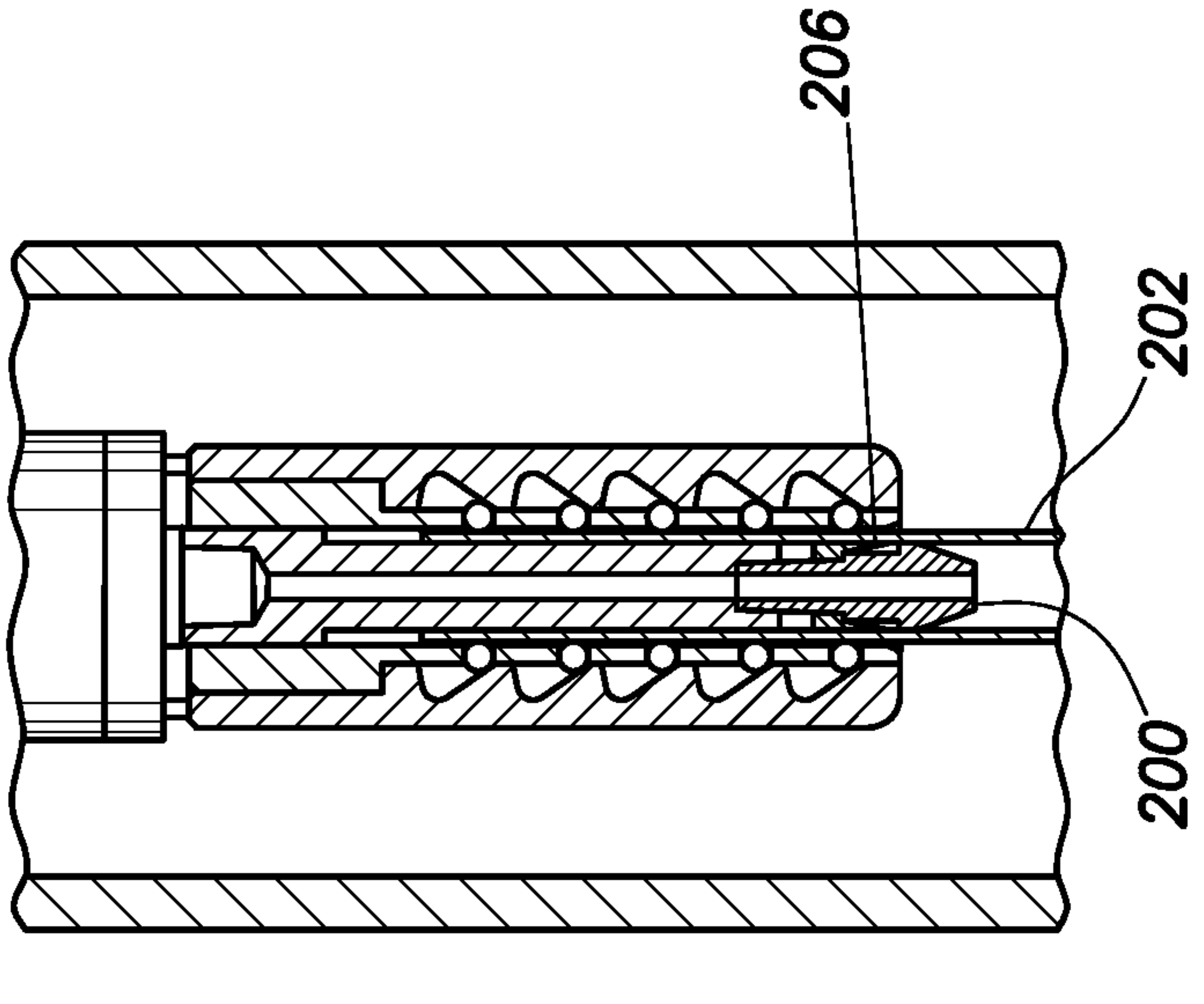

FIG.2A

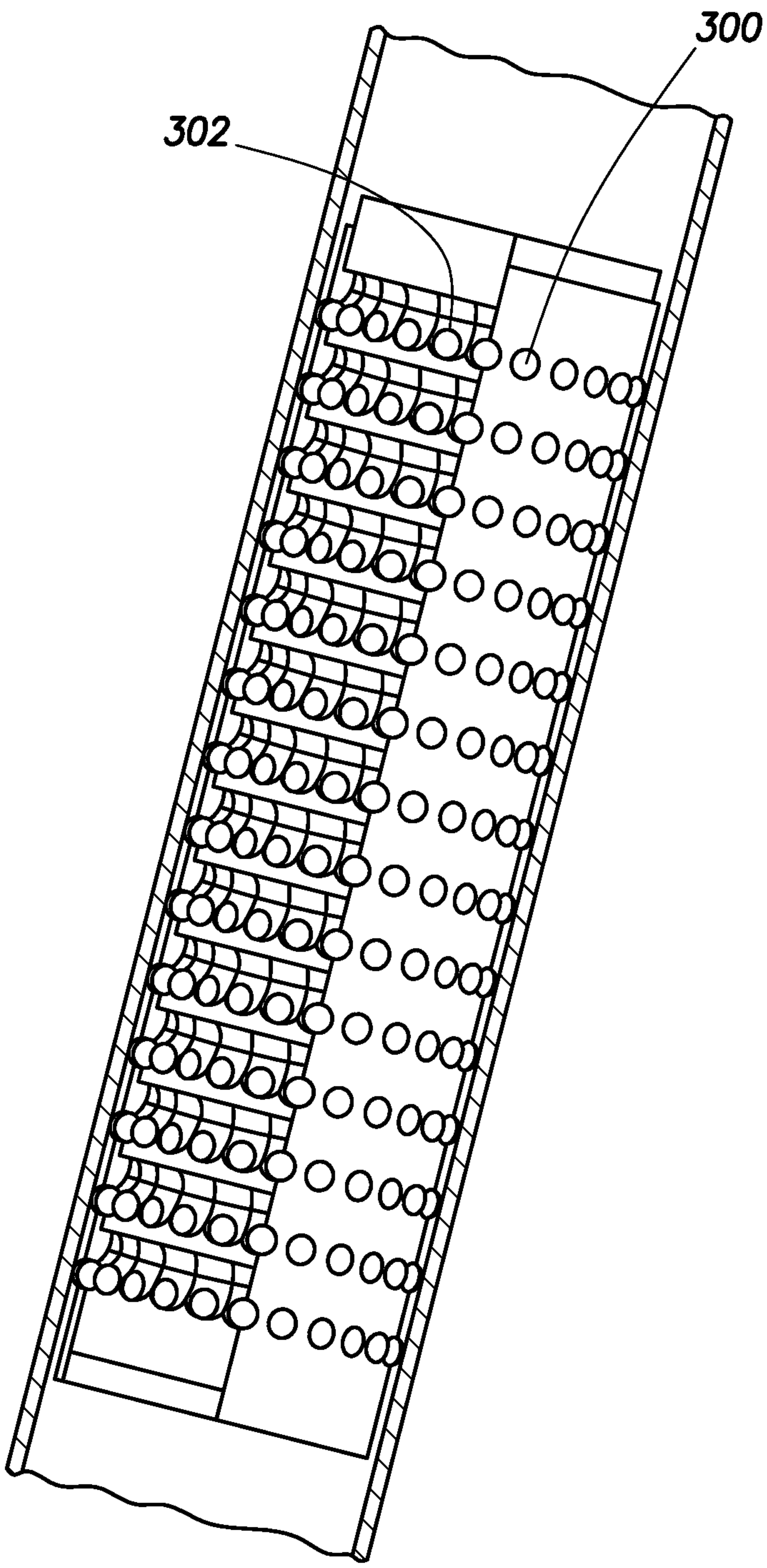

FIG.3

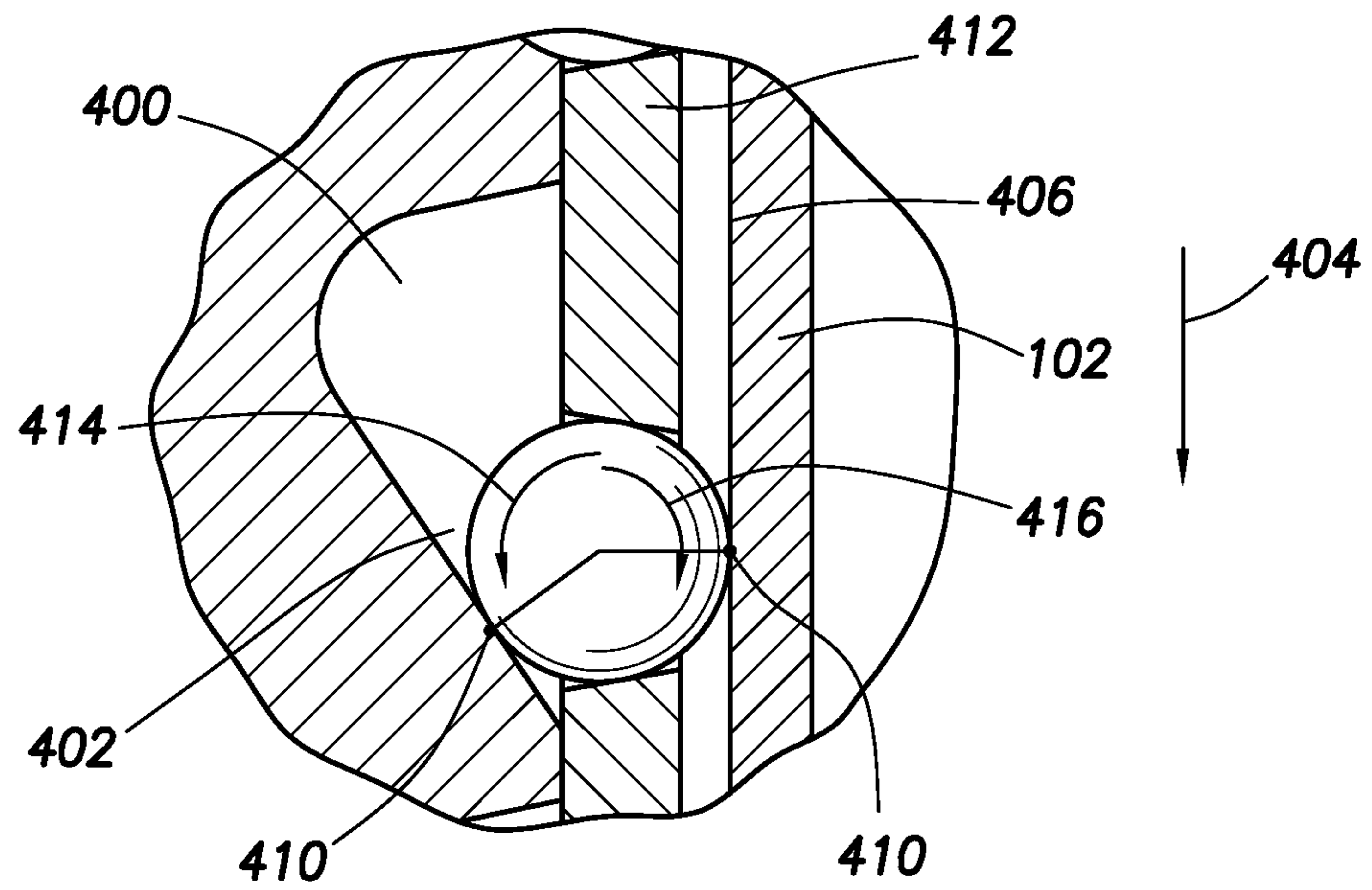
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FIG.4A

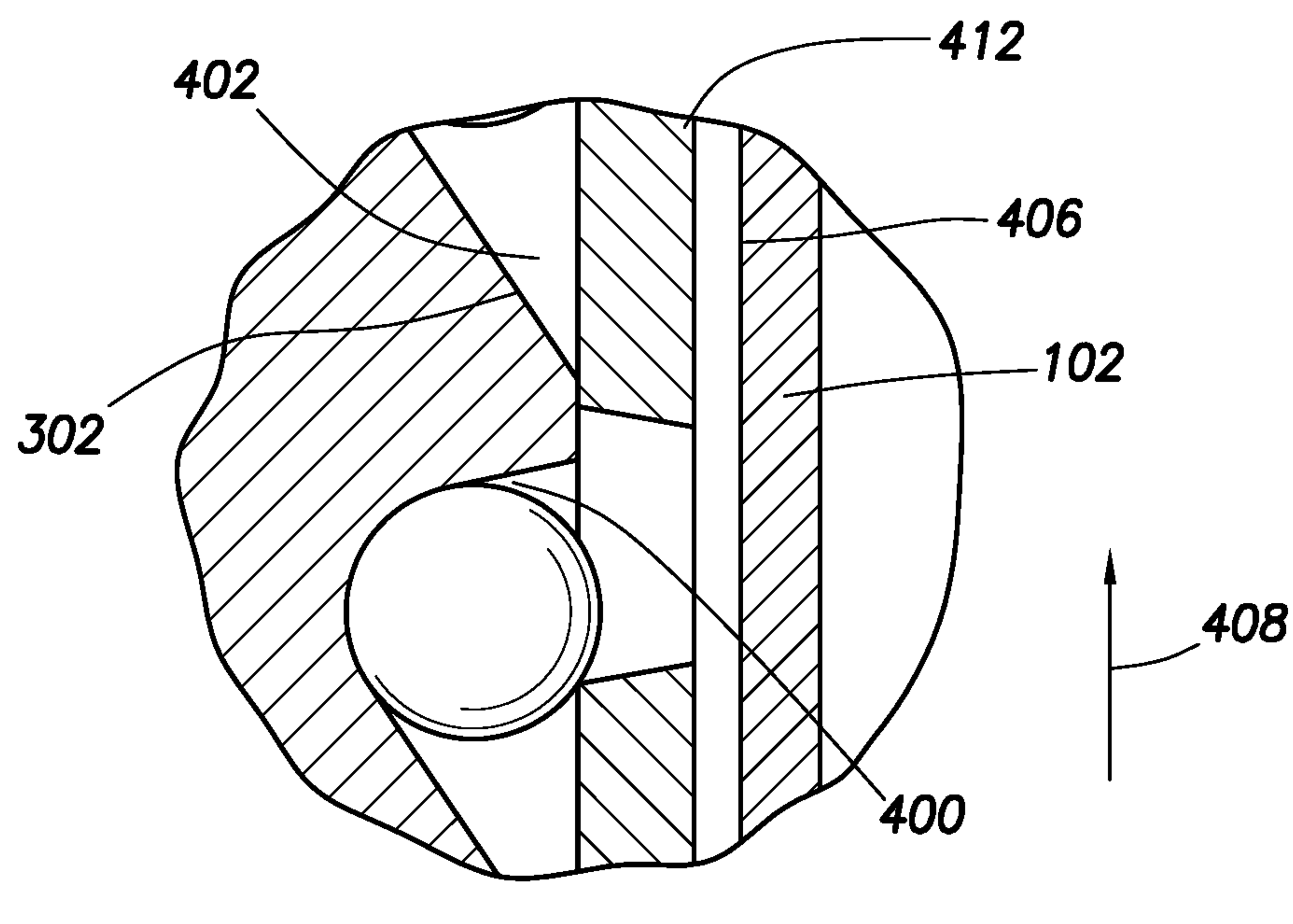
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FIG.4B

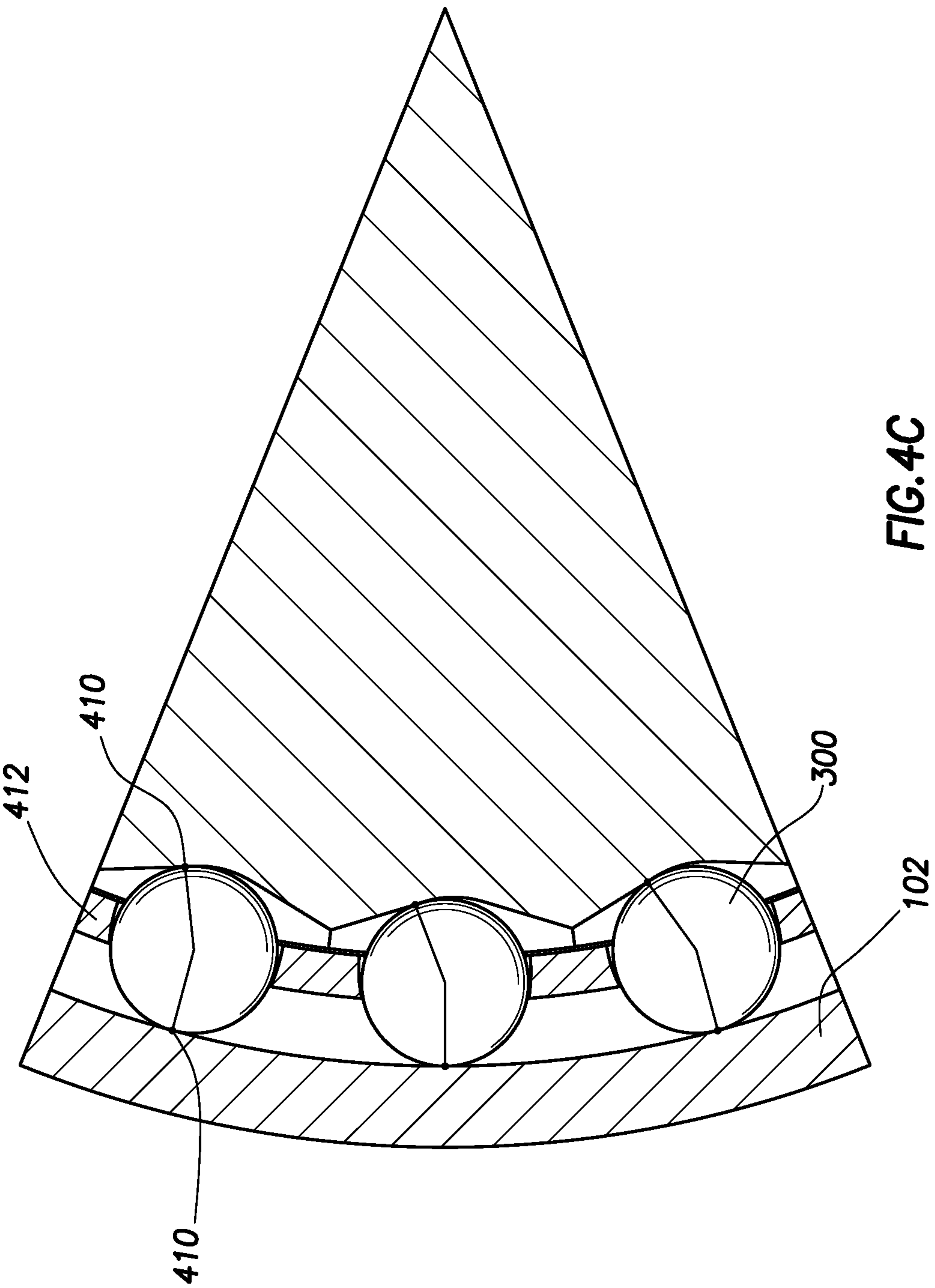


FIG.4C

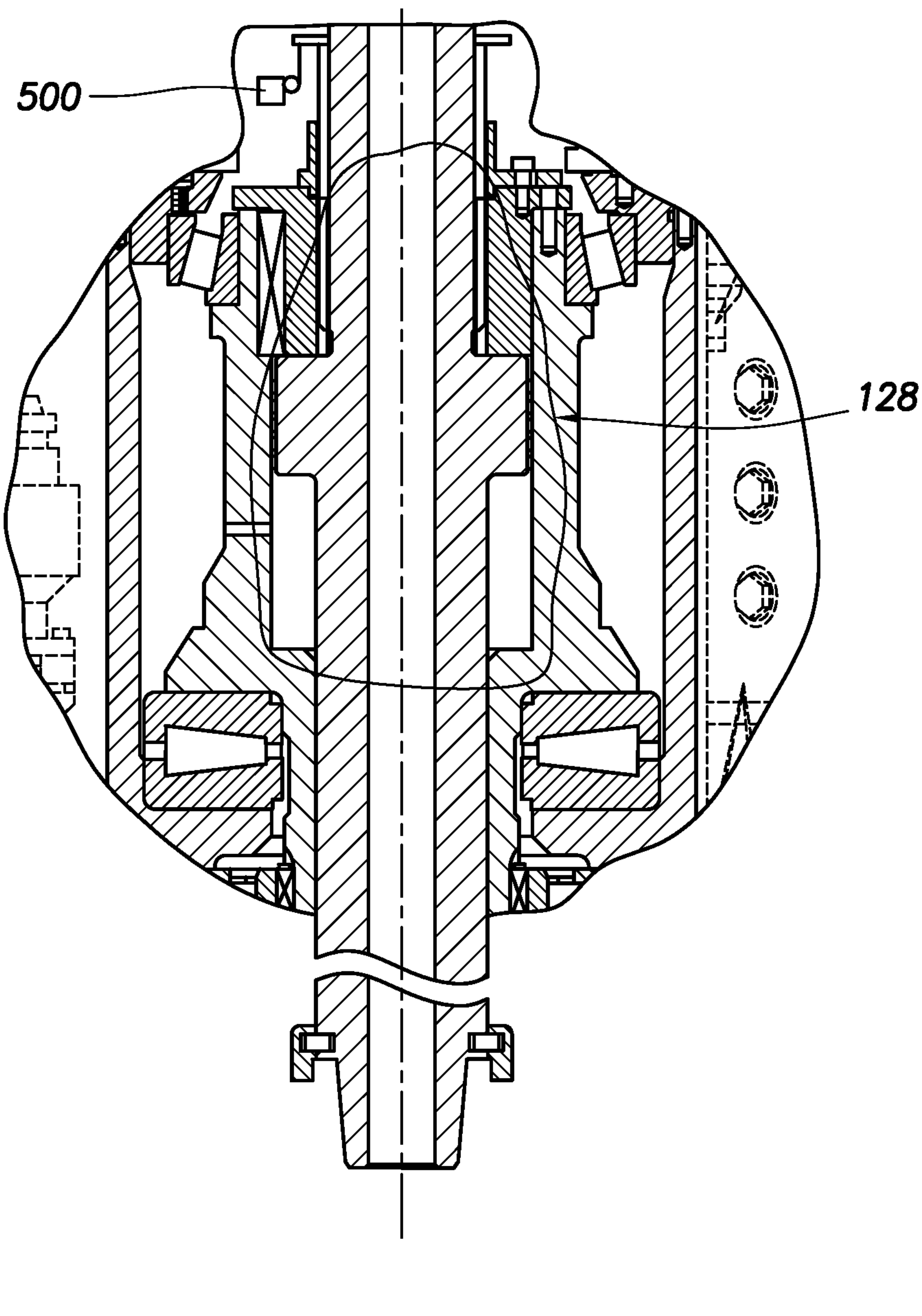
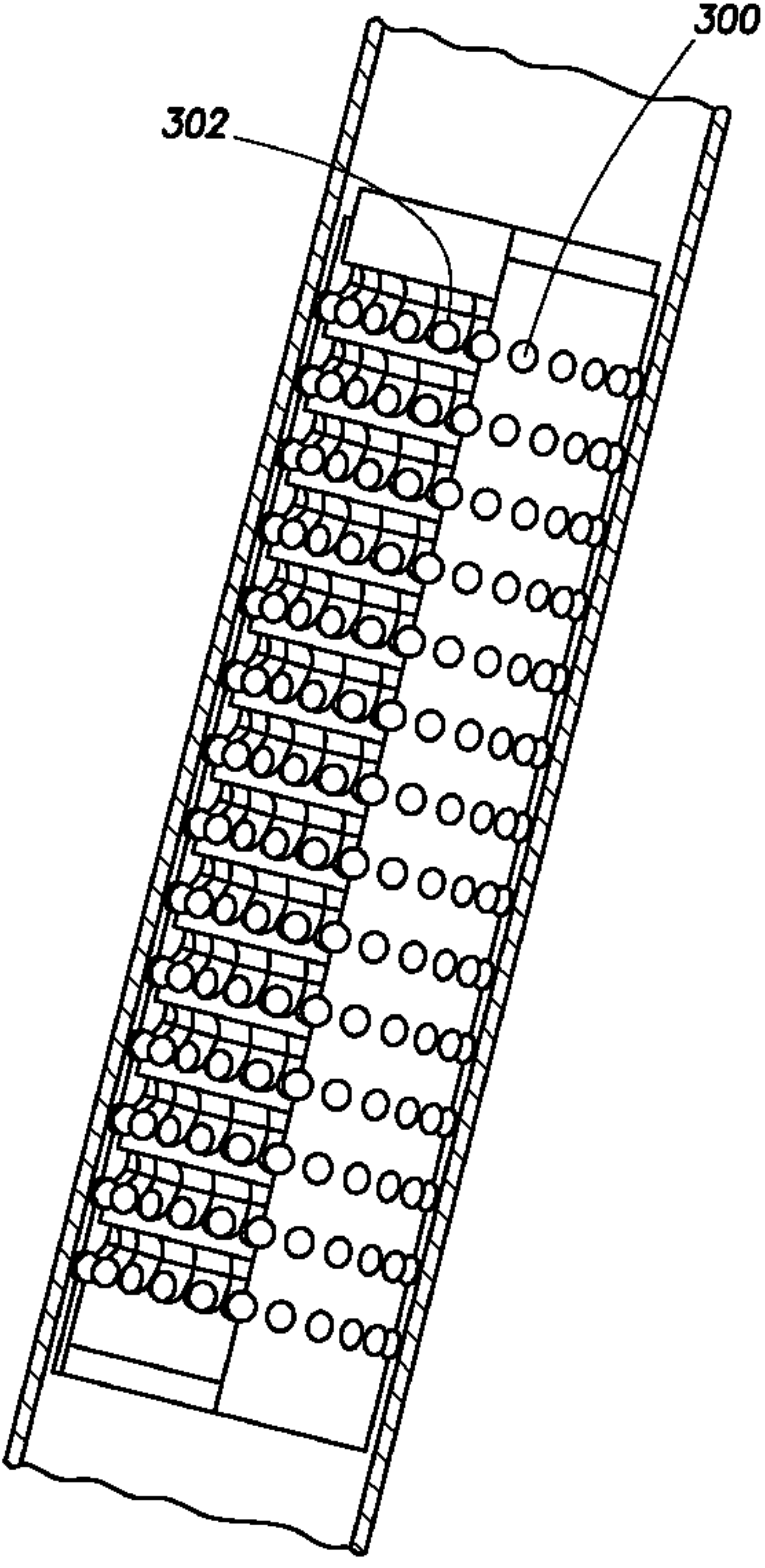


FIG.5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