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Guidry

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(54) **FRACTURING FLUID DISTRIBUTION SYSTEMS AND METHODS**

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(51) **Int. Cl.**

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E21B 33/068	(2006.01)
E21B 43/26	(2006.01)
G05D 7/06	(2006.01)

(52) **U.S. Cl.**

CPC ***E21B 33/068*** (2013.01); ***E21B 33/03*** (2013.01); ***E21B 43/26*** (2013.01); ***G05D 7/0664*** (2013.01)

(58) **Field of Classification Search**

CPC combination set(s) only.

See application file for complete search history.

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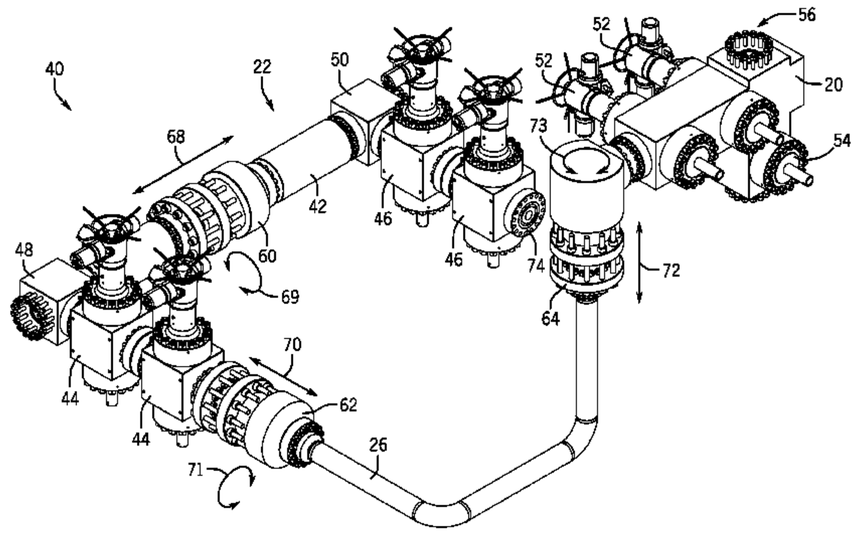
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(57) **ABSTRACT**

A fracturing system including a fracturing manifold. In one embodiment, the system includes a fracturing manifold coupled to a plurality of fracturing trees via a plurality of fluid conduits. Further, multiple fracturing trees of the plurality of fracturing trees can each be coupled to the fracturing manifold by only a single fluid conduit of the plurality of fluid conduits to allow each of the multiple fracturing trees to receive fracturing fluid from the fracturing manifold via its respective single fluid conduit. Additional systems, devices, and methods are also disclosed.

11 Claims, 11 Drawing Sheets



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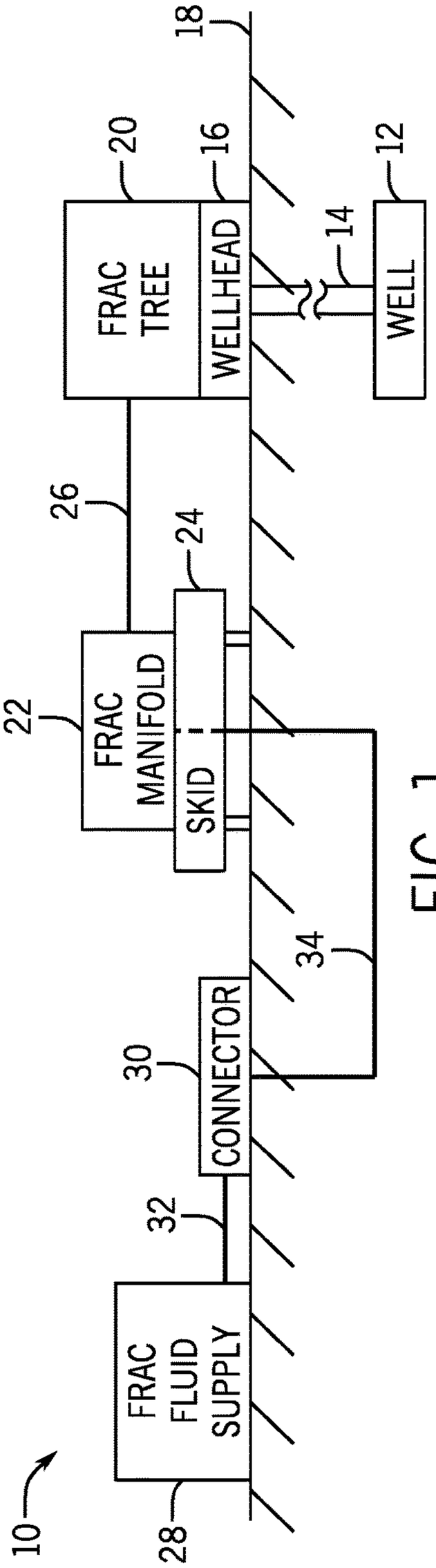

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FRAC TREE
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FRAC FLUID SUPPLY
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FIG. 1

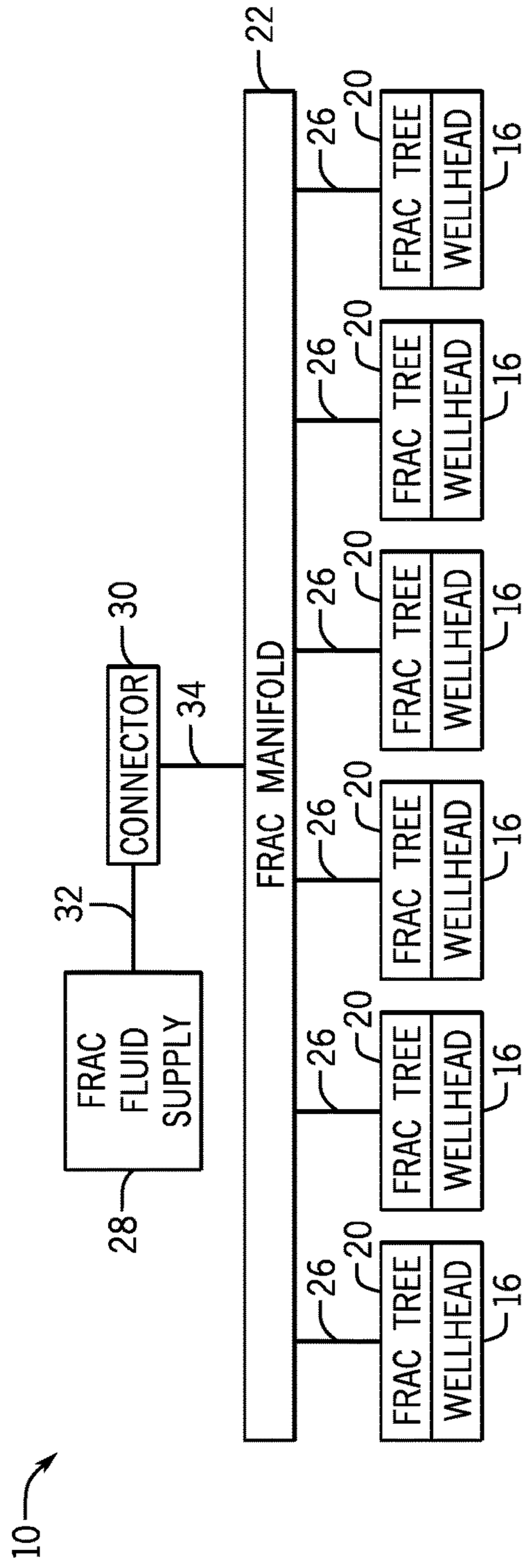

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FIG. 2

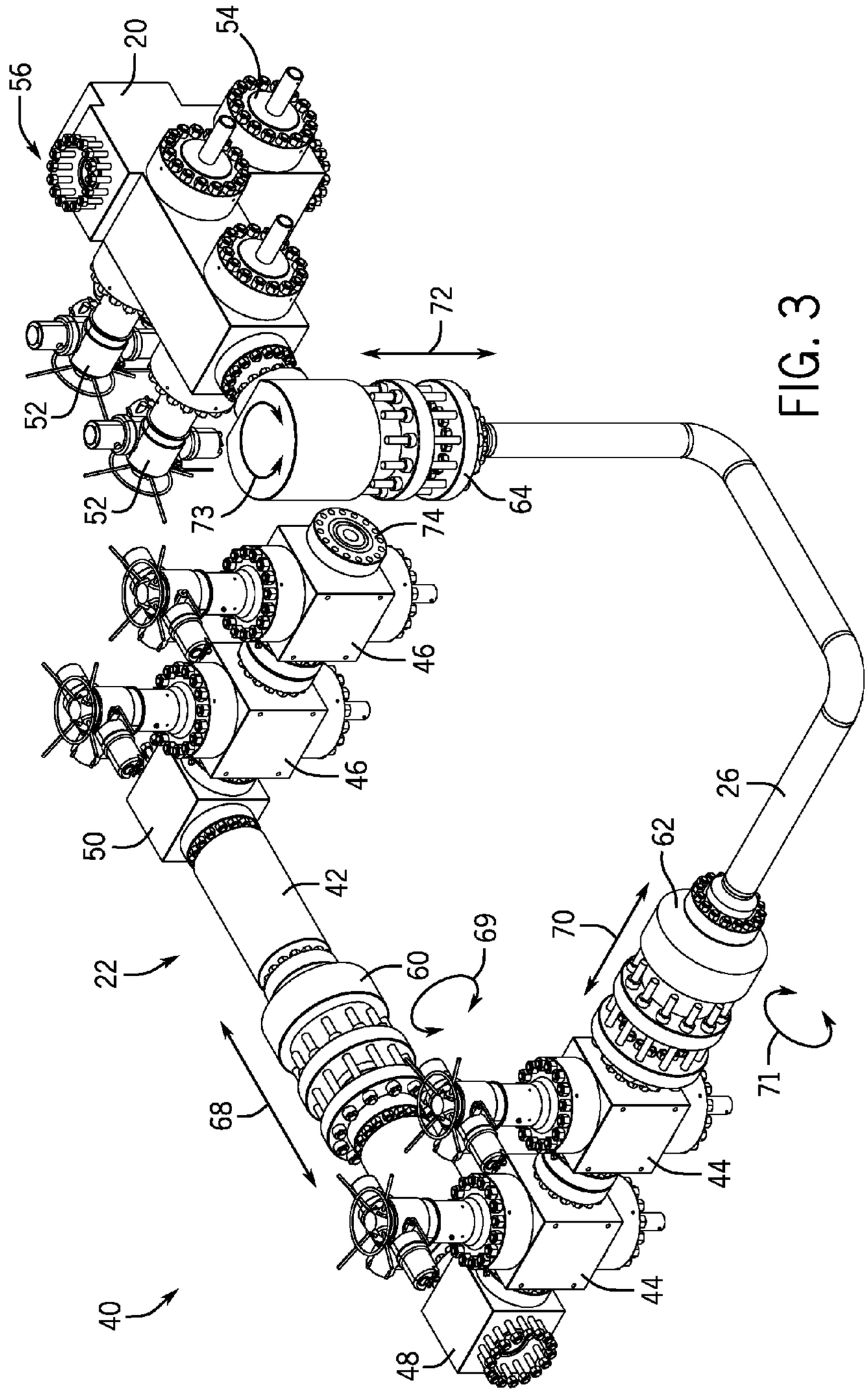
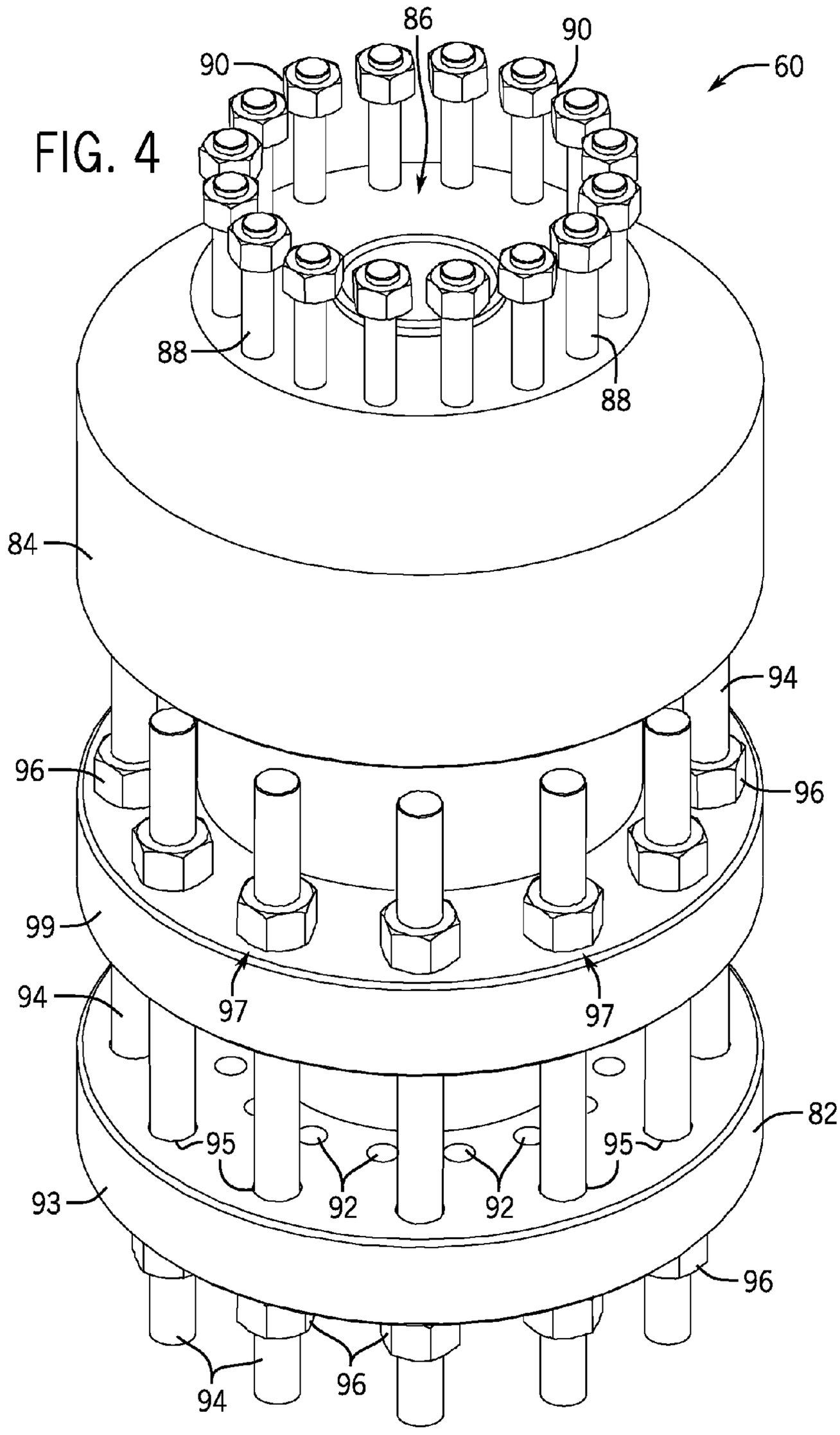

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FIG. 3

FIG. 4



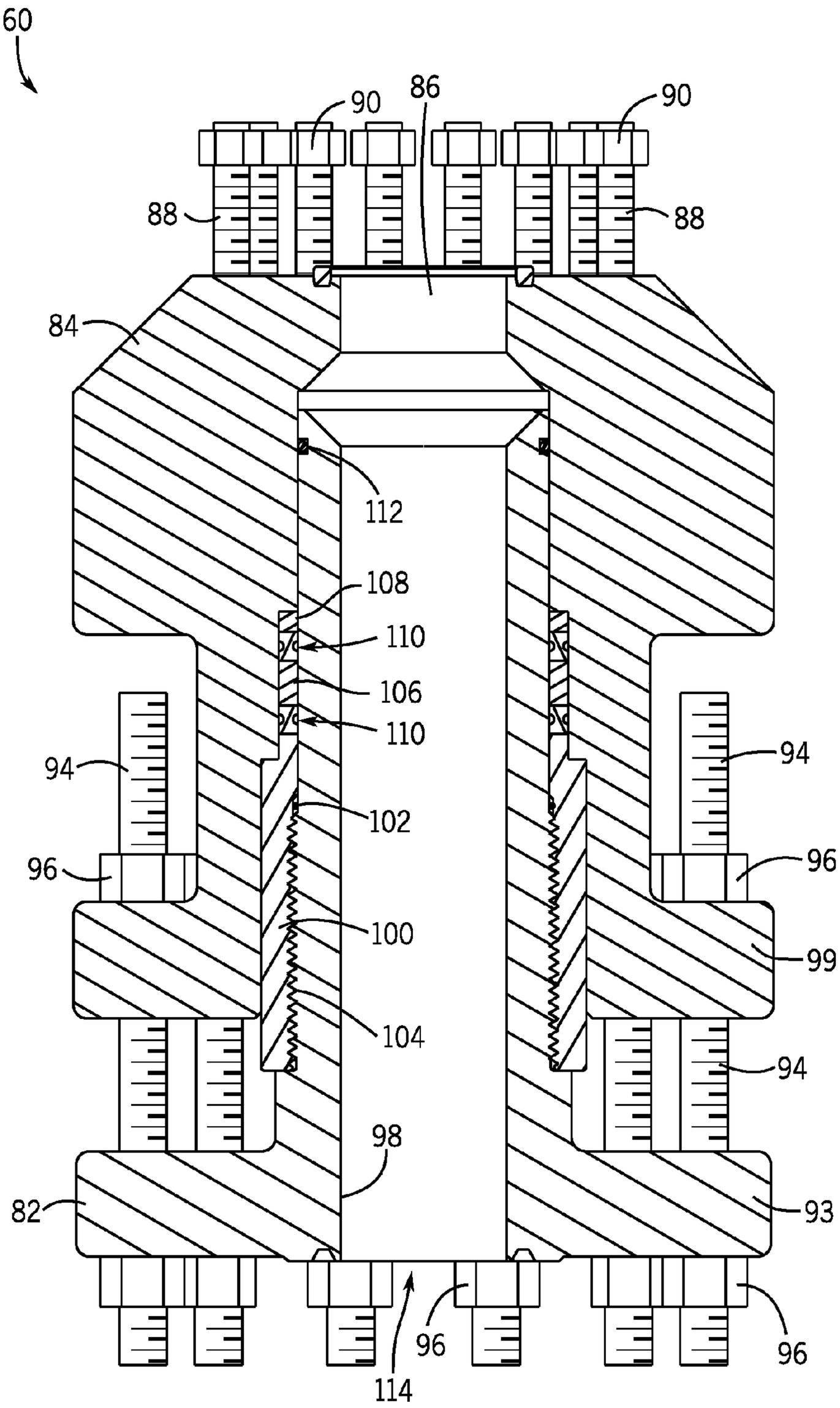

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FIG. 5

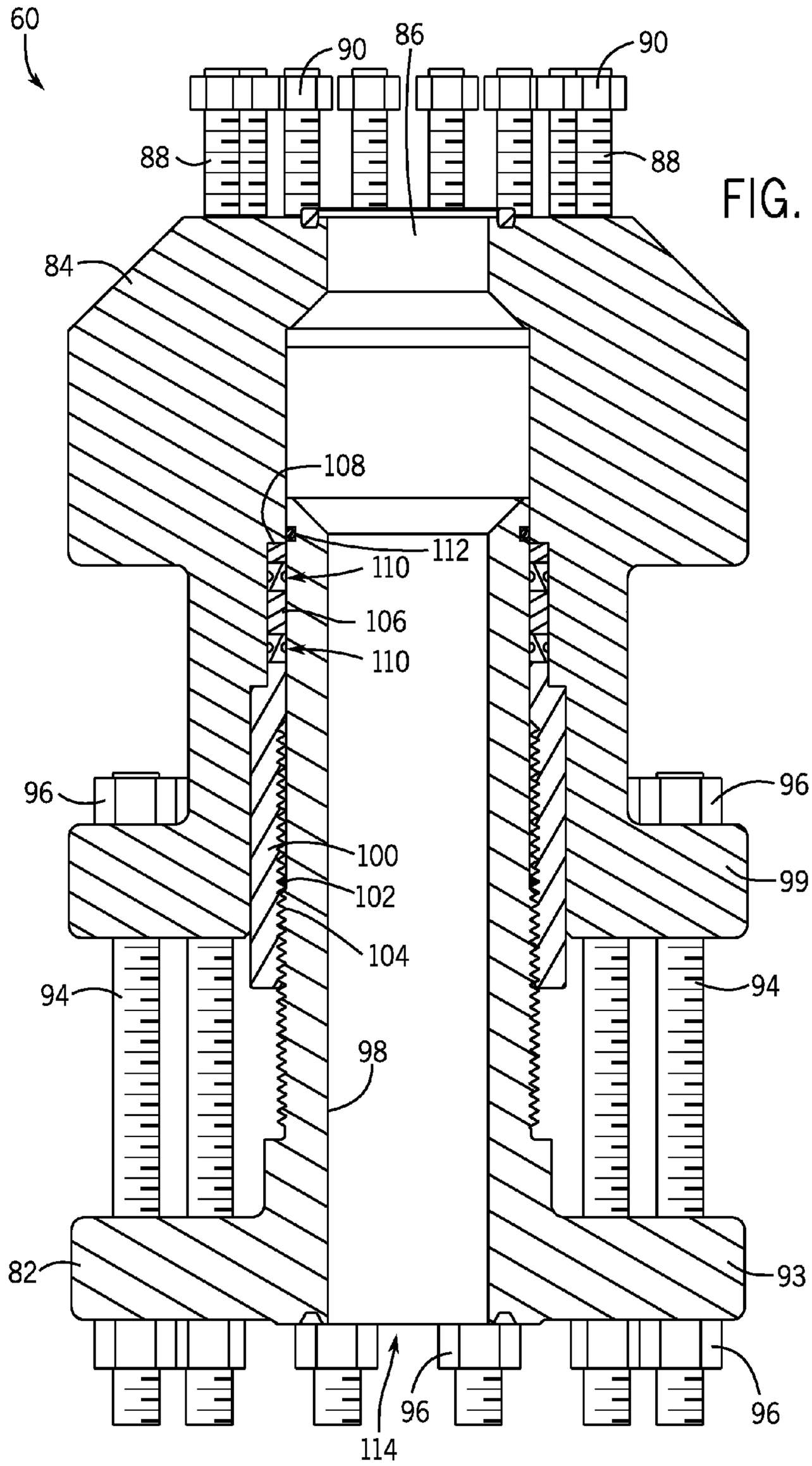
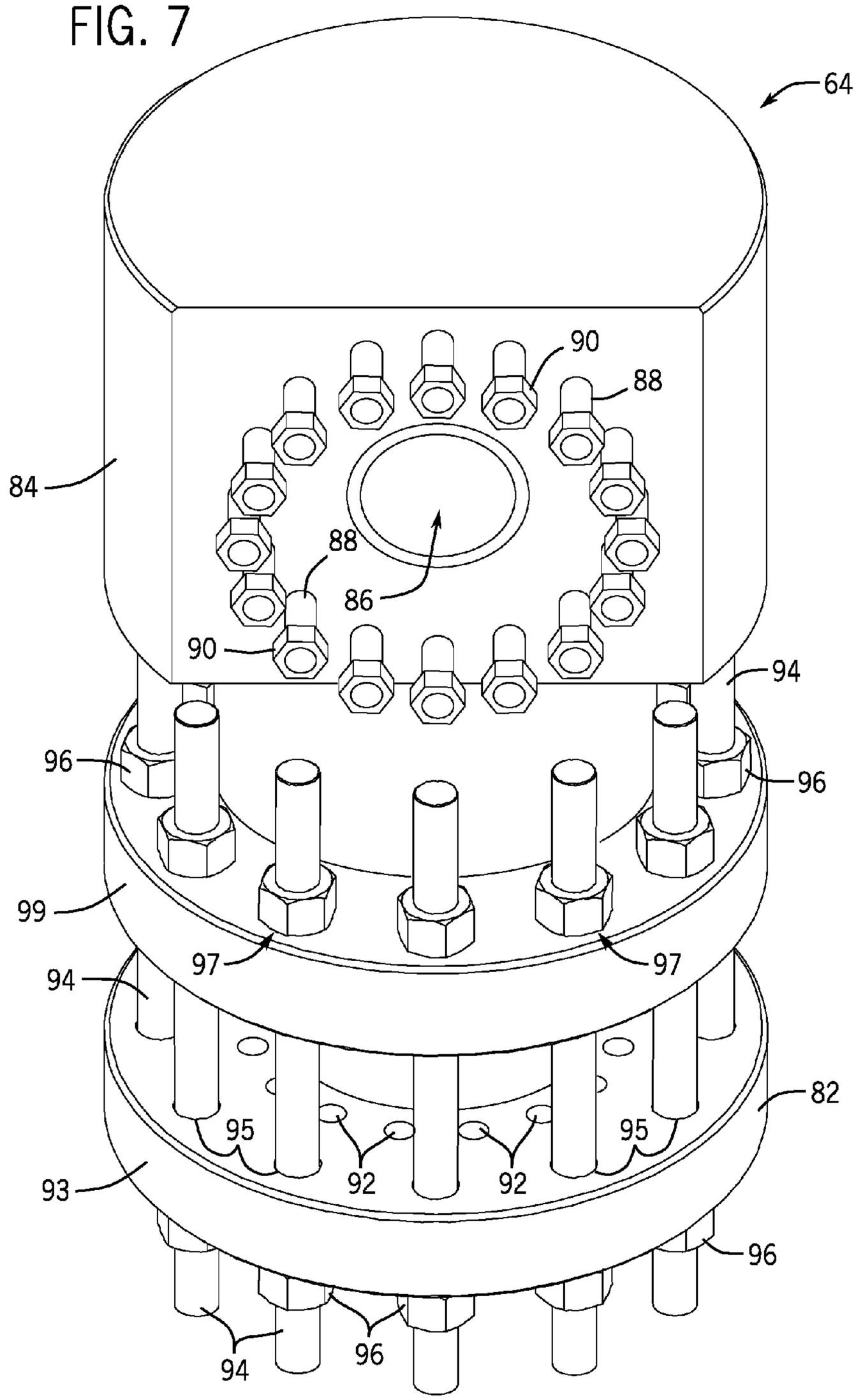

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FIG. 6

FIG. 7



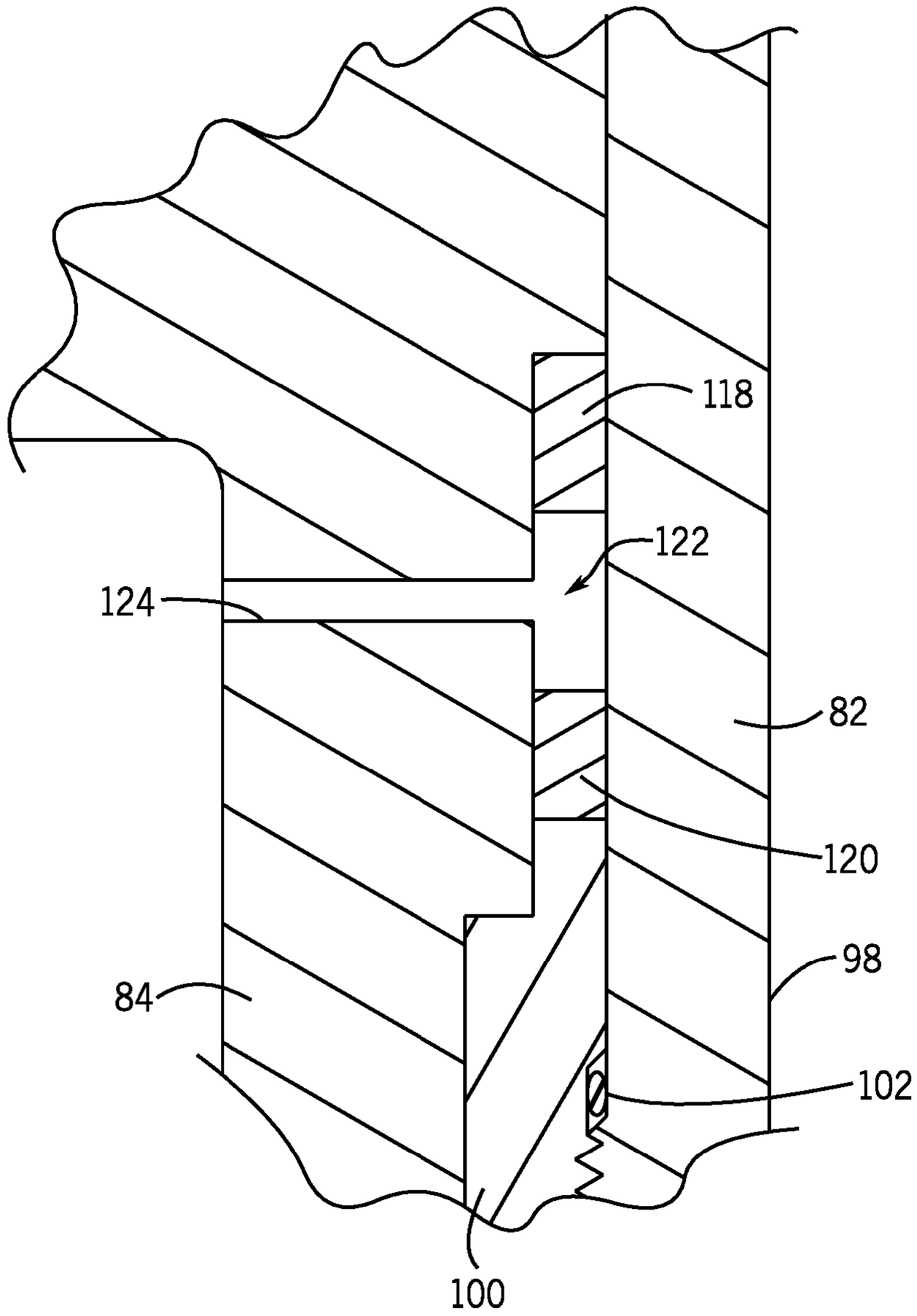


FIG. 8

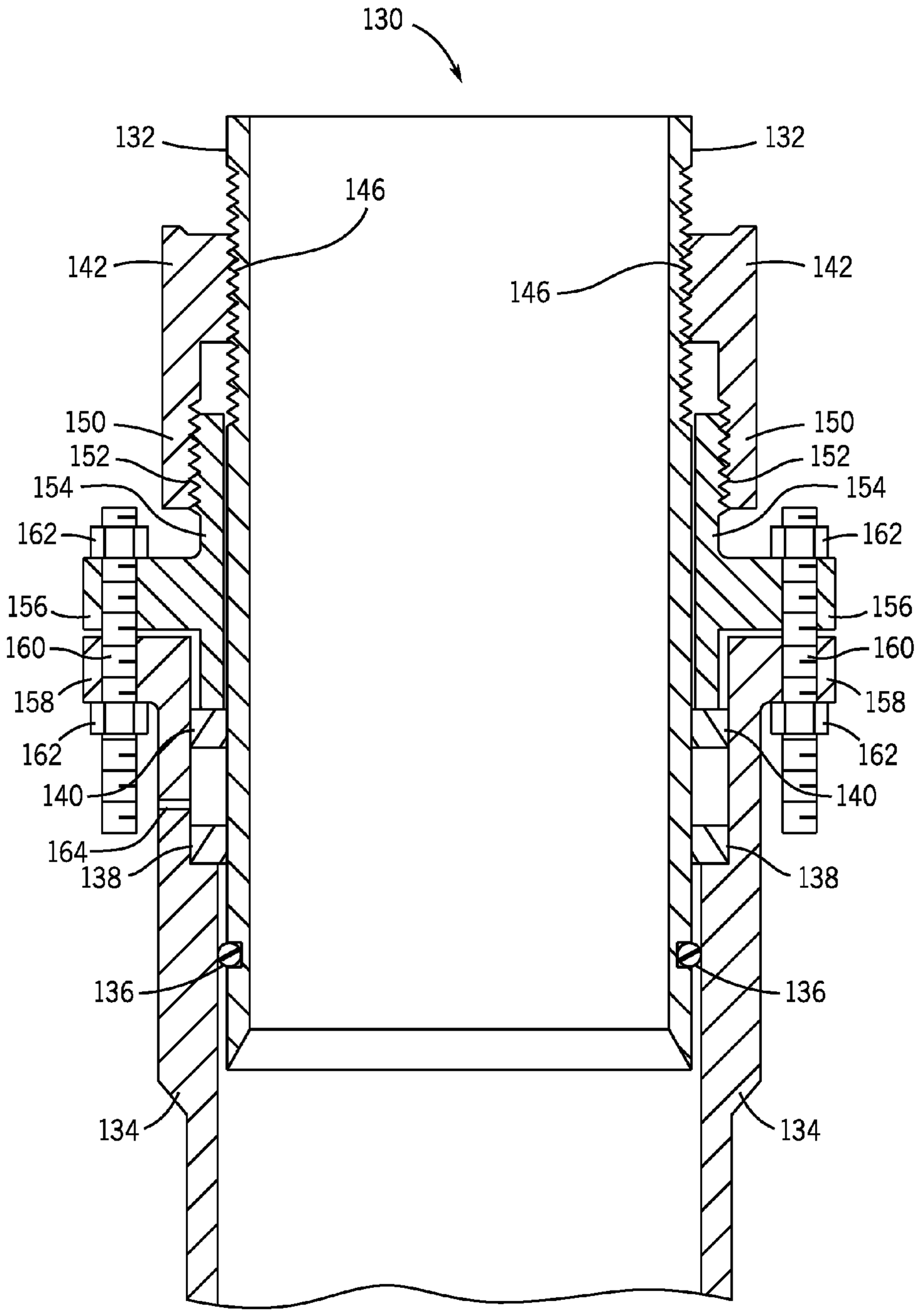

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FIG. 9

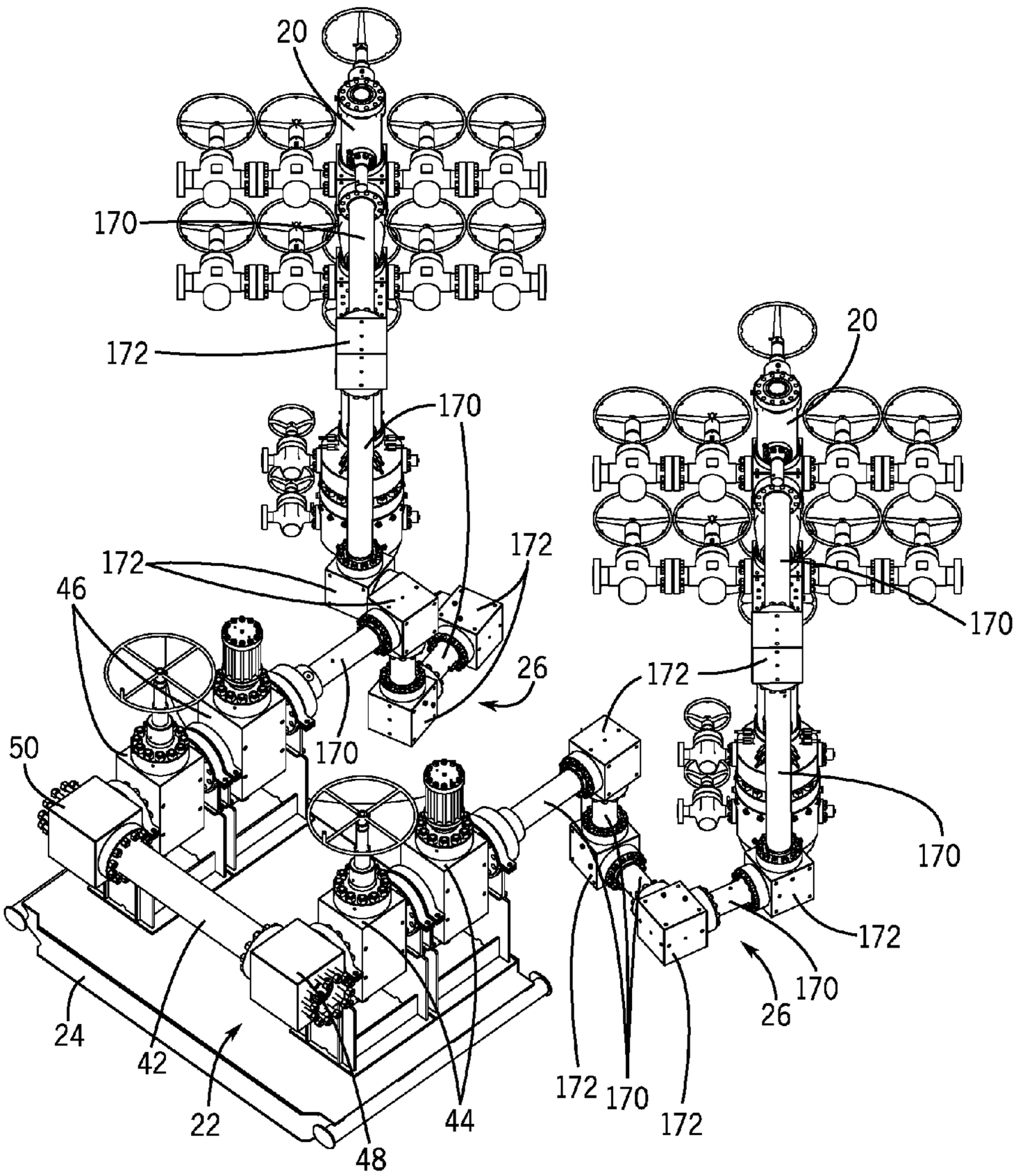
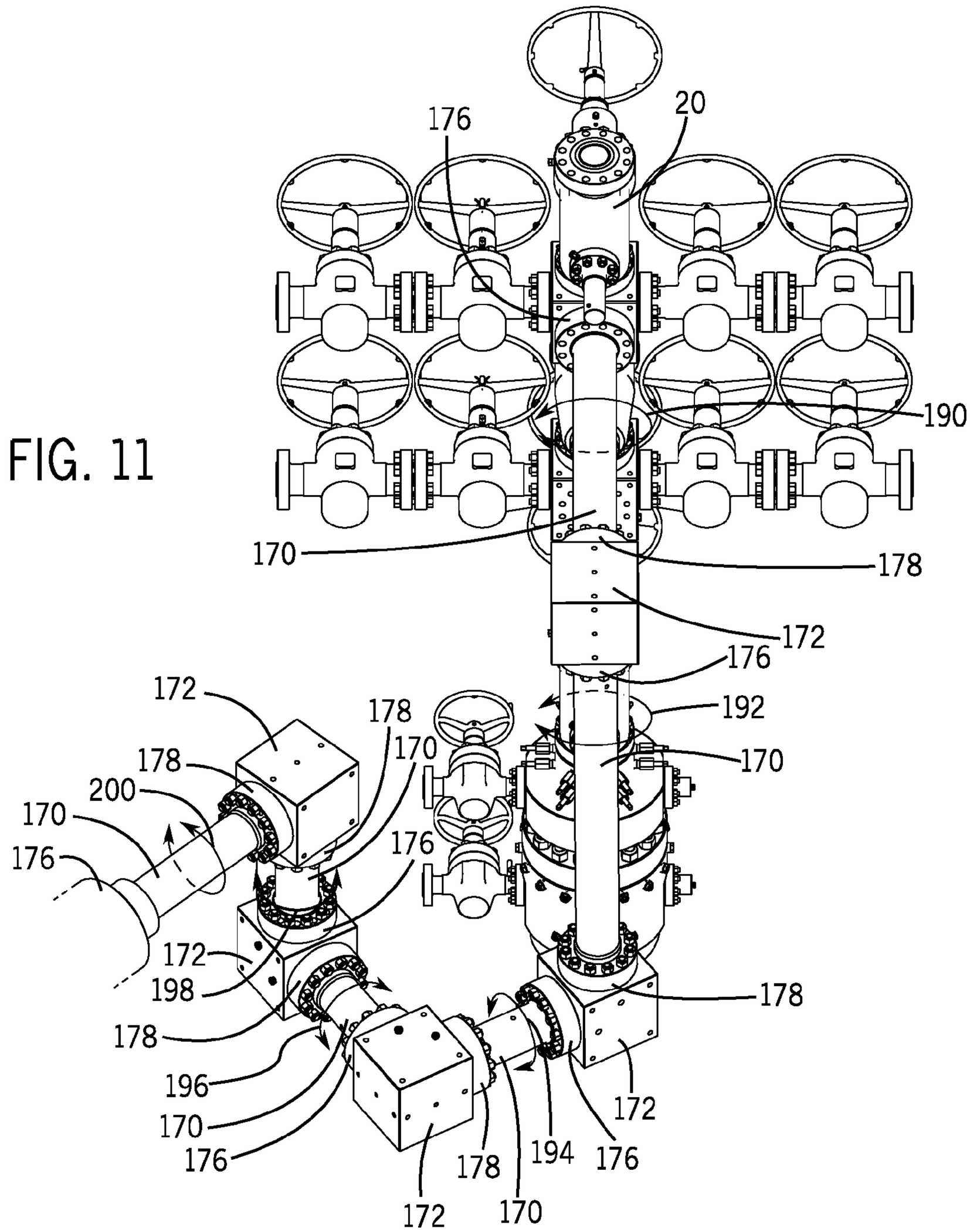

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FIG. 10

FIG. 11


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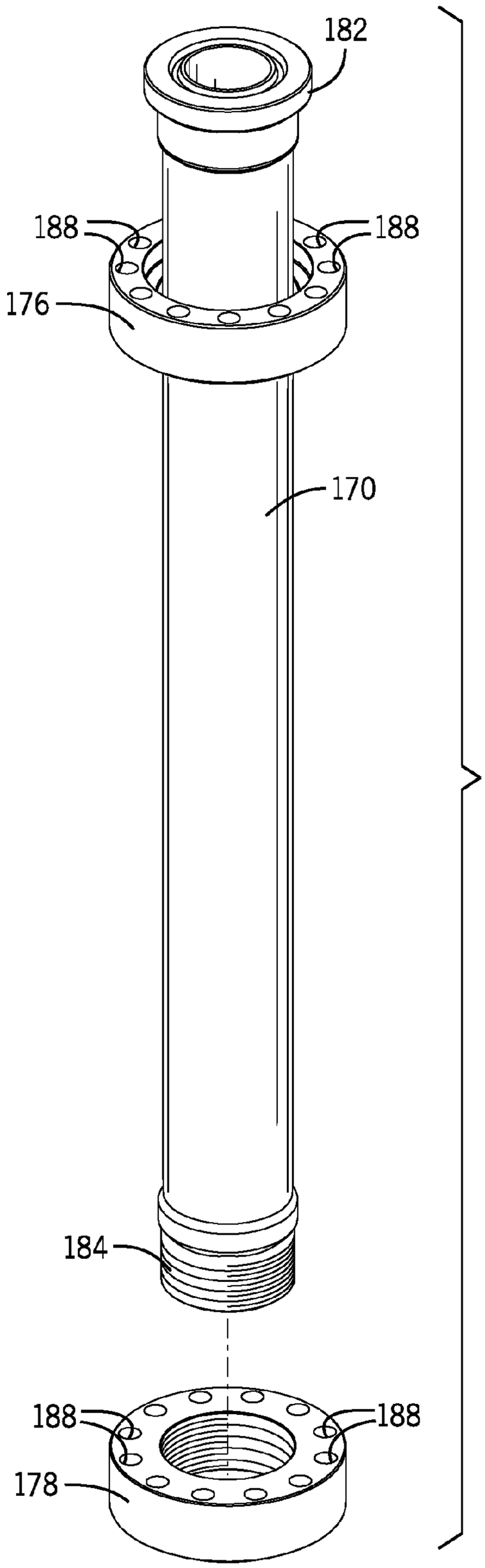


FIG. 12

FRACTURING FLUID DISTRIBUTION SYSTEMS AND METHODS

BACKGROUND

This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the presently described embodiments. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present embodiments. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

In order to meet consumer and industrial demand for natural resources, companies often invest significant amounts of time and money in searching for and extracting oil, natural gas, and other subterranean resources from the earth. Particularly, once a desired subterranean resource is discovered, drilling and production systems are often employed to access and extract the resource. These systems may be located onshore or offshore depending on the location of a desired resource. Further, such systems generally include a wellhead assembly through which the resource is extracted. These wellhead assemblies may include a wide variety of components, such as various casings, valves, fluid conduits, and the like, that control drilling or extraction operations.

Additionally, such wellhead assemblies may use a fracturing tree and other components to facilitate a fracturing process and enhance production from a well. As will be appreciated, resources such as oil and natural gas are generally extracted from fissures or other cavities formed in various subterranean rock formations or strata. To facilitate extraction of such resources, a well may be subjected to a fracturing process that creates one or more man-made fractures in a rock formation. This facilitates, for example, coupling of pre-existing fissures and cavities, allowing oil, gas, or the like to flow into the wellbore. Such fracturing processes typically include injecting a fracturing fluid—which is often a mixture including sand and water—into the well to increase the well's pressure and form the man-made fractures. A fracturing manifold may provide fracturing fluid to one or more fracturing trees via fracturing lines (e.g., pipes). But the fracturing manifolds and associated fracturing trees are typically large and heavy, and may be mounted to other equipment at a fixed location, making adjustments between the fracturing manifold and a fracturing tree difficult.

SUMMARY

Certain aspects of some embodiments disclosed herein are set forth below. It should be understood that these aspects are presented merely to provide the reader with a brief summary of certain forms the invention might take and that these aspects are not intended to limit the scope of the invention. Indeed, the invention may encompass a variety of aspects that may not be set forth below.

Embodiments of the present disclosure generally relate to fracturing systems having a fracturing manifold. In certain embodiments, a fracturing system includes a fracturing manifold coupled to one or multiple fracturing trees. Each fracturing tree can be coupled to the fracturing manifold via a single fluid conduit extending between the fracturing manifold and the respective fracturing tree. In some instances, the single fluid conduit extending between the fracturing manifold and a fracturing tree includes a large-bore fracturing line.

Various refinements of the features noted above may exist in relation to various aspects of the present embodiments. Further features may also be incorporated in these various aspects as well. These refinements and additional features may exist individually or in any combination. For instance, various features discussed below in relation to one or more of the illustrated embodiments may be incorporated into any of the above-described aspects of the present disclosure alone or in any combination. Again, the brief summary presented above is intended only to familiarize the reader with certain aspects and contexts of the some embodiments without limitation to the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of certain embodiments will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

FIG. **1** generally depicts an adjustable fracturing system in accordance with an embodiment of the present disclosure;

FIG. **2** is a diagram of the adjustable fracturing system of FIG. **1** with a fracturing manifold coupled to multiple fracturing trees in accordance with an embodiment of the present disclosure;

FIG. **3** is a perspective view of certain components of the adjustable fracturing system, including the fracturing manifold, one fracturing tree, and several adjustment joints in accordance with an embodiment of the present disclosure;

FIG. **4** is a perspective view of an adjustment joint in the form of a fracturing head in accordance with an embodiment of the present disclosure;

FIG. **5** is a cross-section of the fracturing head of FIG. **4** in accordance with an embodiment of the present disclosure;

FIG. **6** generally depicts the fracturing head of FIGS. **4** and **5** following adjustment of the fracturing head to increase its length in accordance with an embodiment of the present disclosure;

FIG. **7** is a perspective view of an adjustment joint in the form of a fracturing head having inlet and outlet ports that are not axially aligned with each other in accordance with an embodiment of the present disclosure;

FIG. **8** is a partial cross-section of a fracturing head including a test port to enable integrity testing between two seals of the fracturing head in accordance with an embodiment of the present disclosure;

FIG. **9** is a cross-section of an adjustment joint in the form of a pipe connector having a length that may be varied in accordance with an embodiment of the present disclosure;

FIG. **10** is a perspective view of certain components of an adjustable fracturing system, including fluid conduits having multiple pipes connected between the fracturing manifold and two fracturing trees, in accordance with an embodiment of the present disclosure;

FIG. **11** is a detail view of one of the fluid conduits of FIG. **10**; and

FIG. **12** generally depicts one pipe of the fluid conduit of FIG. **11** as having a swivel connection on one end that allows rotation of the pipe with respect to another portion of the fluid conduit in accordance with one embodiment.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

One or more specific embodiments of the present disclosure will be described below. In an effort to provide a

concise description of these embodiments, all features of an actual implementation may not be described in the specification. It should be appreciated that in the development of any such actual implementation, as in any engineering or design project, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which may vary from one implementation to another. Moreover, it should be appreciated that such a development effort might be complex and time consuming, but would nevertheless be a routine undertaking of design, fabrication, and manufacture for those of ordinary skill having the benefit of this disclosure.

When introducing elements of various embodiments, the articles "a," "an," "the," and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. Moreover, any use of "top," "bottom," "above," "below," other directional terms, and variations of these terms is made for convenience, but does not require any particular orientation of the components.

Turning now to the present figures, an example of a fracturing system **10** is provided in FIGS. **1** and **2** in accordance with one embodiment. The fracturing system **10** facilitates extraction of natural resources (e.g., oil or natural gas) from a well **12** via a wellbore **14** and a wellhead **16**. Particularly, by injecting a fracturing fluid into the well **12**, the fracturing system **10** increases the number or size of fractures in a rock formation or strata to enhance recovery of natural resources present in the formation. In the presently illustrated embodiment, the well **12** is a surface well accessed by equipment of wellhead **16** installed at surface level (i.e., on ground **18**). But it will be appreciated that natural resources may be extracted from other wells, such as platform or subsea wells.

The fracturing system **10** includes various components to control flow of a fracturing fluid into the well **12**. For instance, the depicted fracturing system **10** includes a fracturing tree **20** and a fracturing manifold **22**. The fracturing tree **20** includes at least one valve that controls flow of the fracturing fluid into the wellhead **16** and, subsequently, into the well **12**. Similarly, the fracturing manifold **22** includes at least one valve that controls flow of the fracturing fluid to the fracturing tree **20** by a conduit or fluid connection **26** (e.g., pipes).

The fracturing manifold **22** is mounted on at least one skid **24** (e.g., a platform mounted on rails) to enable movement of the fracturing manifold **22** with respect to the ground **18**. As depicted in FIG. **2**, the fracturing manifold **22** is connected to provide fracturing fluid to multiple fracturing trees **20** and wellheads **16**. But it is noted that the fracturing manifold **22** may instead be coupled to a single fracturing tree **20** in full accordance with the present techniques. In one embodiment in which the fracturing manifold **22** is coupled to multiple fracturing trees **20**, various valves of the fracturing manifold **22** may be mounted on separate skids **24** to enable variation in the spacing between the valves. And in at least some instances, as described in further detail below, such a configuration allows for easier alignment of the fluid connection **26** between the fracturing manifold **22** and the fracturing tree **20**.

Fracturing fluid from a supply **28** is provided to the fracturing manifold **22**. In FIG. **1**, a connector **30** receives fracturing fluid from the supply **28** through a conduit or fluid connection **32** (e.g., pipes or hoses) and then transmits the fluid to the fracturing manifold **22** by way of a subterranean conduit or fluid connection **34** (e.g., pipes). In one embodiment, the fracturing fluid supply **28** is provided by one or more trucks that deliver the fracturing fluid, connect to the connector **30**, and pump the fluid into the fracturing manifold **22** via the connector **30** and connections **32** and **34**. In another embodiment, the fracturing fluid supply **28** is in the form of a reservoir from which fluid may be pumped into the fracturing manifold **22**. But any other suitable sources of fracturing fluid and manners for transmitting such fluid to the fracturing manifold may instead be used.

A portion **40** of the fracturing system **10** is illustrated in FIG. **3** in accordance with one embodiment. In the depicted embodiment, the portion **40** includes the fracturing tree **20** and the fracturing manifold **22**, as well as several adjustment joints that enable alignment of the connection line (i.e., fluid connection **26**) between the fracturing tree **20** and the fracturing manifold **22**. The manifold **22** includes a conduit **42** that routes fracturing fluid to valves **44** and **46**. These valves **44** and **46** are coupled to connecting blocks **48** and **50** of the conduit **42** to receive fracturing fluid from the fluid supply **28** via connections **32** and **24**. The fracturing fluid may then be routed through fluid connection **26** to a respective fracturing tree **20**. Although the present embodiment includes two valves **44** and two valves **46**, any other suitable number of valves may instead be used to control flow of fracturing fluid to fracturing trees **20**. Further, while the depicted fluid connection **26** includes a single flow path or conduit (which may be a fracturing line with a seven-inch bore in one instance) between the fracturing tree **20** and the fracturing manifold **22**, a fracturing system may include a greater number of conduits between the fracturing manifold and a fracturing tree in other embodiments.

The fracturing tree **20** is provided in the form of a horizontal fracturing tree in FIG. **3**, though other embodiments may include a different style of fracturing tree (e.g., a vertical tree). The depicted fracturing tree **20** includes valves **52** to control flow of fracturing fluid through a horizontal portion of the tree **20**. The tree **20** also includes a master valve **54** to control flow of fluids (e.g., fracturing fluids or production fluids) to or from the attached wellhead **16** (FIG. **1**), and a port **56** allowing access to the wellhead **16** through the master valve **54**. In other embodiments, the valve **54** may be omitted (e.g., in a composite tree arrangement with all valves integral to one block).

The portion **40** of the fracturing system **10** also includes extendable adjustment joints that facilitate connection of the fracturing manifold **22** to the fracturing tree **20**. In the presently illustrated embodiment, the adjustment joints are provided in the form of adjustable fracturing heads **60**, **62**, and **64** (also commonly referred to as "goat heads"), though other forms of adjustment joints are also envisaged and may be used in accordance with the present techniques. In operation, the fracturing tree **20** may be mounted at a fixed location (i.e., coupled to the wellhead **16**). The fluid connection **26** is aligned and coupled between the fracturing tree **20** and the fracturing manifold **22**. The adjustment joints (e.g., the fracturing heads **60**, **62**, and **64** in FIG. **3**) facilitate such alignment and coupling of the fluid connection by allowing an operator to manipulate the position of the fluid connection **26** by changing a dimension (e.g., length or height) of the adjustment joint. By providing three adjustment joints, each with a different axis of movement (i.e., up-and-down, forward-and-backward, and left-and-right), adjustments can be made to help facilitate coupling of the fracturing manifold **22** to the fracturing tree **20**.

For example, the conduit **42** includes a fracturing head **60** that may be extended or retracted (as represented by arrow

68) to vary the length of the conduit **42** and the distance between the valves **44** and **46** (which may be mounted on separate skids **24**, as discussed above, to allow relative motion between the valves **44** and **46**). Such variation also provides a first degree of freedom in aligning the fluid connection **26** between the fracturing tree **20** and the fracturing manifold **22**. In other words, the adjustment joint in conduit **42** allows the distance between the seal points of the fluid connection **26** at the fracturing tree **20** and at the fracturing manifold **22** to be varied in a first dimension.

Likewise, the fluid connection **26** in FIG. **3** includes the fracturing head **62** to vary the length of the fluid connection **26** in a second dimension, as represented by arrow **70**. The adjustability of the fracturing head **62** provides a second degree of freedom in aligning the connection between the fracturing tree **20** and the fracturing manifold **22**. Further, the portion **40** includes the fracturing head **64** having a variable length in a third dimension (as represented by arrow **72**), thus providing a third degree of freedom in aligning the fluid connection **26** between the fracturing tree **20** and the fracturing manifold **22**. These three degrees of freedom are provided by three adjustment joints having different directions of adjustment that are not parallel, and in some embodiments (such as in FIG. **3**) the directions of adjustment are orthogonal to one another. In addition to these three translational degrees of freedom, one or more of the adjustment joints (e.g., fracturing heads **60**, **62**, and **64**) may also be rotated about their axes, as indicated by arrows **69**, **71**, and **73**, to provide rotational degrees of freedom. For example, the presently depicted embodiment provides six degrees of freedom (three translational and three rotational).

While large fracturing lines (e.g., with a seven-inch bore) are traditionally difficult to adjust between a fracturing manifold and a fracturing tree, the adjustability provided in the presently disclosed system **10** enables large fracturing lines to be aligned and connected to such components more efficiently. Consequently, as depicted in FIG. **3**, a single fluid connection **26** may be provided in the form of a large-bore fracturing line, rather than using multiple smaller-bore fracturing lines between the fracturing manifold and a given fracturing tree.

While the presently depicted embodiment includes three adjustment joints, it is noted that other embodiments may include fewer adjustment joints providing fewer degrees of freedom in aligning the fluid connection **26**. For instance, a single adjustment joint may be provided to give one translational degree of freedom (e.g., up-and-down, forward-and-backward, or left-and-right) in aligning the fracturing tree **20** and the fracturing manifold **22** for the fluid connection **26**. Or two adjustment joints may be provided to give two translational degrees of freedom. Such adjustment joints may also provide rotational degrees of freedom as noted above. Further still, multiple adjustment joints may be aligned coaxially to provide adjustability at different locations within the system **10** (e.g., the manifold **22** may include multiple, coaxial adjustment joints).

For clarity, only a single fluid connection **26** and a single fracturing tree **20** (both of which receive fracturing fluid from the valves **44**) are depicted in FIG. **3** as part of portion **40** of the fracturing system **10**. But it will be appreciated that the fracturing system **10** may include additional fluid connections **26** and fracturing trees **20** (see, e.g., FIG. **2**). For example, valves **46** may be coupled (e.g., via outlet **74**) to another fluid connection **26** leading to a different fracturing tree **20** on another wellhead **16**. Further, the conduit **42** may extend beyond the depicted connection blocks **48** and **50** to route fracturing fluid to additional valves and associated fracturing trees **20**. And the conduit **42** may include additional adjustment joints to enable movement of such additional valves relative to another portion of the manifold **22**, thereby facilitating alignment of these valves with their associated fracturing trees **20**.

The fracturing head **60**, in accordance with one embodiment, is illustrated in greater detail in FIGS. **4-6**. In the depicted embodiment, the fracturing head **60** includes a body having a first portion **82** and a second portion **84**. The body portions **82** and **84** are configured to move with respect to one another to vary a dimension of the fracturing head and facilitate connection of the fracturing manifold **22** and the fracturing tree **20** as described above. The fracturing head **60** includes fluid ports **86** and **114** (FIG. **5**) to transmit fluid through the fracturing head **60**. In some embodiments, such as when installed in the fracturing system **10** in the manner depicted in FIG. **3**, the fluid port **86** may be considered an output port and the fluid port **114** may be considered an inlet port. In addition to the fluid port **86**, the second body portion **84** includes a set of studs **88** and nuts **90** for connecting the fracturing head **60** to another component (e.g., via an API flange or other connector). Similarly, the first body portion **82** includes through holes **92** arranged in a flange **93** about the fluid port **114** for coupling to another component (e.g., also coupled to an API flange via additional studs and nuts or to another connector). The first body portion **82** includes an additional set of through holes **95** positioned radially outward from the through holes **92**. The through holes **95** are aligned with mating holes **97** in a flange **99** of the second body portion **84**, and the first and second body portions **82** and **84** are secured to one another with studs **94** (through the holes **95** and **97**) and nuts **96**.

As depicted in FIGS. **5** and **6**, a bore **98** extends through the fracturing head **60** between the fluid ports **86** and **114**. The bore **98** may have a diameter similar or identical to that of the components coupled to the fluid ports **86** and **114**, such as seven inches in one embodiment (though other diameters may be used for the bore **98**, as well as for other components). The bore may also be sized to match the inner diameter of the production casing in the well (i.e., a full bore arrangement) to facilitate the passage of tools, plugs, or the like through the fracturing head **60**. The fracturing head **60** includes an adjustment collar **100** that may be rotated on threads **104** by a user to translate the collar **100** with respect to the body portion **82** or **84** of the fracturing head **60** on which the collar is threaded (i.e., first body portion **82** in FIGS. **5** and **6**). Movement of the adjustment collar **100** allows adjustment of the length of the fracturing head **60** and the distance between fluid ports **86** and **114**. Particularly, as illustrated in FIG. **6**, nuts **96** may be loosened on the studs **94** and the adjustable collar **100** may be moved along the first body portion **82** to lengthen the fracturing head **60**. In this manner, the length (or what may instead be considered the height) of the fracturing head **60** may be varied to aid in aligning and coupling the fracturing manifold **22** and the fracturing tree **20** via the fluid connection **26**, as discussed above. The fracturing head **60**, as well as other adjustment joints in the system **10** (e.g., the fracturing heads **62** and **64** or the pipe connector **130** of FIG. **9**), may be constructed to allow for any desired amount of variation in dimension. For instance, the adjustment joints may be constructed to allow dimensional variation (e.g., lengthening) of seven inches in one embodiment, of twelve inches in another embodiment, and of eighteen inches in still another embodiment. Still further, it is noted that in addition to the translational and rotational degrees of freedom facilitated through use of the presently disclosed adjustment joints, angular adjustment

between elements of the fracturing system **10** can be enabled through the inclusion of pivot joints or other suitable couplings.

The fracturing head **60** also includes various sealing elements to inhibit fluid leakage. For instance, as depicted, fracturing head **60** includes sealing elements **102**, **106**, **108**, **110**, and **112**. The sealing elements are formed of any suitable material, such as an elastomer or metal. In one embodiment, the seals **110** include CANH™ seals available from Cameron International Corporation of Houston, Tex. Also, in one embodiment movement of the collar **100** pre-loads or energizes one or more of the seals of the fracturing head **60**.

As depicted in FIG. **7**, the fracturing head **64** is generally similar to the fracturing head **60** (and the fracturing head **62**, which is identical to the fracturing head **60** in one embodiment) but includes a fluid port **86** on a side face of the body portion **84** rather than on the top face. As illustrated in FIG. **3**, such an arrangement enables the fracturing head **64** to connect a pipe of fluid connection **26** with the fracturing tree **20** via a bore bent at an angle (e.g., at a right angle) to change the direction of fluid flowing through the fracturing head **64**. And a dimension of the fracturing head **64** may be varied in the same manner as described above with respect to fracturing head **60**, thereby facilitating alignment and coupling of the fracturing tree **20** and the fracturing manifold **22** with the fluid connection **26**.

In one embodiment illustrated in FIG. **8**, a fracturing head (e.g., fracturing head **60**, **62**, or **64**) includes seals **118** and **120** (rather than sealing elements **106**, **108**, and **110**) disposed in an annular space **122**. The seals **118** and **120** are formed of any suitable material, and may include metal CANH™ seals in one embodiment. The annular space **122** is bound by the body portion **82**, the body portion **84**, and the adjustable collar **100**. A test port **124** extends from the annular space **122** (e.g., at a location between the seals **118** and **120**) to an exterior surface of the body portion **84** to allow connection of a pressure monitoring device to enable monitoring or testing of the integrity of the seals **118** and **120**.

While the adjustment joints of the fracturing system **10** have been described above in the form as fracturing heads, other embodiments may use other adjustment joints in addition to, or in place of, the fracturing heads. For example, one or more of the fracturing heads **60**, **62**, and **64** of FIG. **3** may be replaced by other adjustment joints in additional embodiments. One example of another adjustment joint is depicted in FIG. **9** in the form of a pipe connector **130**. The connector **130** includes a first tubular member **132** and a second tubular member **134**. The tubular members **132** and **134** may be pipes (e.g., of the fluid connection **26** or conduit **42**), or they may be coupled to pipes or other conduits in any suitable fashion. The opposite ends of the connector include an inlet and an outlet, allowing fracturing fluid to flow through the connector **130** via the bores of either the members **132** and **134** themselves or of the pipes or other conduits joined by the connector **130**.

The connector **130** is configured to enable relative movement between the tubular members **132** and **134** to allow variation in the length of the connector **130**. Like the fracturing heads **60**, **62**, and **64**, the connector **130** may be constructed to allow any desired range of variation in length, such as a range of seven inches or twelve inches. Various seals **136**, **138**, and **140** are provided between the tubular members **132** and **134**. In one embodiment, the seal **136** is an elastomeric seal and the seals **138** and **140** are metal CANH™ seals.

The connector **130** also includes a collar **142** (which may also be referred to herein as union nut **142**) that cooperates with a flanged collar **154** to adjust the length of the connector **130**. The union nut **142** may be coupled to the first tubular member **132** in any suitable manner. In the depicted embodiment, threads **146** allow the union nut **142** to be threaded onto the tubular member **132**. The union nut **142** includes an end **150** that engages the collar **154** via threads **152**, and rotation of the union nut **142** causes the collar **154** to move along the axis of the connector **130** with respect to the tubular member **132**. A flange **156** of the collar **154** is coupled to a mating flange **158** of the tubular member **134** by studs **160** and nuts **162**. Consequently, rotation of the union nut **142** also causes the second tubular member **134** to be moved with respect to the first tubular member **132**, thereby enabling the connector **130** to be lengthened or shortened through such operation. The connector **130** may also include a test port **164** to enable monitoring of the integrity of seals **138** and **140** in a manner similar to that described above with respect to test port **124** (FIG. **8**).

Another embodiment in which fluid conduits **26** are adjustable to facilitate coupling of the fluid conduits **26** between the fracturing manifold **22** and fracturing trees **20** is generally depicted in FIG. **10**. In this embodiment, the adjustment joints for the fracturing system are provided in the form of rotatable pipe joints **170** and connection blocks **172** (e.g., elbow blocks) of the fluid conduits **26**. The ability to rotate components of the fluid conduits **26** provides rotational degrees of freedom similar to those described above, and enables the fluid conduits **26** to be more easily positioned and connected between the fracturing manifold **22** and the fracturing trees **20**. As presently illustrated, the fluid conduits **26** with rotatable components have three rotational degrees of freedom, although other embodiments could have fewer than three. In some instances, the adjacent pipes **170** and connection blocks **172** could be rotated to desired positions before assembling these components together (e.g., via a studded connection). But in at least some embodiments, the fluid conduit **26** includes a swivel connection that enables rotation of one portion of the fluid conduit **26** with respect to another portion of the fluid conduit **26** while those portions are connected to one another.

One example of such an arrangement is depicted in FIG. **11**. In this embodiment, the fluid conduit **26** includes a number of swivel connections (having swivel rings **176**) that allow pipes **170** and connection blocks **172** to rotate with respect to one another. Each pipe **170** is depicted in FIG. **11** as having a swivel connection (with a swivel ring **176**) at one end and a fixed, non-swivel connection (with a threaded flange **178**) at its other end, although fewer pipes **170** could have swivel connections in other embodiments.

An example of a pipe **170** having such connections is depicted in greater detail in FIG. **12** in accordance with one embodiment. In this example, the pipe **170** includes a flange **182** at one end and a threaded surface **184** at its other end. When the pipe **170** is assembled in the fluid conduit **26**, the flange **182** is received within the swivel ring **176**. This allows the flange **182** (along with the pipe **170**) to rotate with respect to the swivel ring **176** and to the component to which the swivel ring **176** is attached (e.g., a connection block **172**, the fracturing manifold **22**, or a fracturing tree **20**). The threaded flange **178** can be connected to the threaded surface **184** to allow that end of the pipe **170** to also be connected to another component of the fluid conduit **26**. As depicted, the swivel ring **176** and the threaded flange **178** include through holes **188** to allow them to be connected to other

components via studded connections. But other kinds of connections could also be used in accordance with the present technique.

Returning now to FIG. **11**, it can be seen that the swivel connections enable the rotation of the pipes **170** and the connection blocks **172**, as generally represented by arrows **190**, **192**, **194**, **196**, **198**, and **200**. The swivel connection at one end of a pipe **170** allows the pipe **170** to be rotated about its axis to change the orientation of the connection block **172** (which rotates with the pipe **170**) coupled to the pipe **170** at the fixed connection opposite the swivel. And through the rotation of these components, overall dimensions of the fluid conduit **26** can be changed to accommodate variances in distances and elevations between the fracturing manifold **22** and the fracturing trees **20**. That is, by rotating the various components of the fluid conduit **26**, the pipes **170** may be extended and retracted to position the fluid conduit **26** appropriately for coupling between the fracturing manifold **22** and a fracturing tree **20**.

Like some other embodiments described above, the fracturing system depicted in FIG. **11** uses only a single fluid conduit **26** per fracturing tree **20** rather than using multiple, smaller fluid conduits. In one embodiment, the bore of the fluid conduit is seven and one-sixteenth inches at the end of the conduit **26** that receives fracturing fluid from the manifold **22** and is five and one-eighth inches at the end of the conduit **26** connected to the fracturing tree. But it will be appreciated that conduits **26** may have different dimensions in other embodiments. Additionally, although the pipes **170** are shown connected orthogonally to one another via the connection blocks **172** in the present embodiment, other embodiments could include pipes **170** connected to one another at different angles.

While the aspects of the present disclosure may be susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and have been described in detail herein. But it should be understood that the invention is not intended to be limited to the particular forms disclosed. Rather, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the following appended claims.

The invention claimed is:

1. A system comprising:

a fracturing manifold;

a plurality of fracturing trees coupled to the fracturing manifold; and

a plurality of fluid conduits, wherein the plurality of fracturing trees is coupled to the fracturing manifold via the plurality of fluid conduits, multiple fracturing trees of the plurality of fracturing trees are each coupled to the fracturing manifold by only a single fluid conduit of the plurality of fluid conduits to facilitate receipt by each of the multiple fracturing trees of fracturing fluid from the fracturing manifold via its respective single fluid conduit, each of the single fluid conduits coupling a respective fracturing tree of the multiple fracturing trees to the fracturing manifold includes a rigid fluid conduit and does not include an additional manifold connected between the respective fracturing tree and the fracturing manifold, each rigid fluid conduit extends from the respective fracturing tree to the fracturing manifold and includes an adjustable fluid conduit that allows an operator to vary a dimension of the rigid fluid conduit to facilitate coupling of the rigid fluid conduit between its respective fracturing tree and the fracturing manifold, the adjustable fluid conduit includes a linearly variable adjustment joint that enables the operator to vary the dimension of the rigid fluid conduit to facilitate coupling of the rigid fluid conduit between its respective fracturing tree and the fracturing manifold.

2. The system of claim **1**, wherein the rigid fluid conduit includes a plurality of pipe joints coupled to one another.

3. The system of claim **2**, wherein the plurality of pipe joints includes multiple elbows for changing direction of flow of fracturing fluid through the rigid fluid conduit.

4. The system of claim **1**, wherein each of the single fluid conduits coupling a respective fracturing tree of the multiple fracturing trees to the fracturing manifold includes a large-bore fracturing line.

5. The system of claim **4**, wherein the large-bore fracturing line has a seven-inch bore.

6. The system of claim **1**, wherein the adjustment joint includes a goat head.

7. A system comprising:

a fracturing manifold;

a fracturing tree;

a fluid conduit coupled between the fracturing manifold and the fracturing tree so as to allow the fracturing tree to receive fracturing fluid from the fracturing manifold through the fluid conduit, wherein the fluid conduit includes a plurality of pipe joints; and

a goat head attached to a pipe joint of the plurality of pipe joints so as to allow fracturing fluid to flow between the pipe joint and the goat head, wherein the goat head includes a bore extending through the goat head from an inlet to an outlet of the goat head, the bore extending through the goat head has equal diameters at the inlet and the outlet of the goat head, and the fluid conduit coupled between the fracturing manifold and the fracturing tree is the only fluid conduit coupled between the fracturing manifold and the fracturing tree that allows receipt of fracturing fluid by the fracturing tree from the fracturing manifold during fracturing.

8. The system of claim **7**, wherein the fluid conduit includes an adjustment joint that provides at least one degree of freedom during connection of the fluid conduit between the fracturing manifold and the fracturing tree.

9. The system of claim **7**, wherein the pipe joint attached to the goat head is attached to the outlet of the goat head.

10. The system of claim **7**, wherein the pipe joint attached to the goat head is attached to the inlet of the goat head.

11. A system comprising:

a fracturing manifold;

a fracturing tree;

a fluid conduit coupled between the fracturing manifold and the fracturing tree so as to allow the fracturing tree to receive fracturing fluid from the fracturing manifold through the fluid conduit, wherein the fluid conduit includes a plurality of pipe joints;

a goat head attached to a pipe joint of the plurality of pipe joints so as to allow fracturing fluid to flow between the pipe joint and the goat head, wherein the goat head includes a bore extending through the goat head from an inlet to an outlet of the goat head, and the bore extending through the goat head has equal diameters at the inlet and the outlet of the goat head; and

an additional goat head, wherein an additional pipe joint of the plurality of pipe joints is attached to the additional goat head so as to allow fracturing fluid to flow between the additional pipe joint and the additional goat head.

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