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Gar et al.

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(54) **REDUCED BACKLASH SEALING/ANCHORING ASSEMBLY**

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(73) Assignee: **Halliburton Energy Services, Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(51) **Int. Cl.**

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E21B 33/10	(2006.01)
E21B 33/12	(2006.01)
E21B 33/128	(2006.01)

(52) **U.S. Cl.**
CPC ***E21B 23/01*** (2013.01); ***E21B 33/10*** (2013.01); ***E21B 33/1216*** (2013.01); ***E21B 33/128*** (2013.01)

(58) **Field of Classification Search**
CPC E21B 33/128; F16L 55/132
See application file for complete search history.

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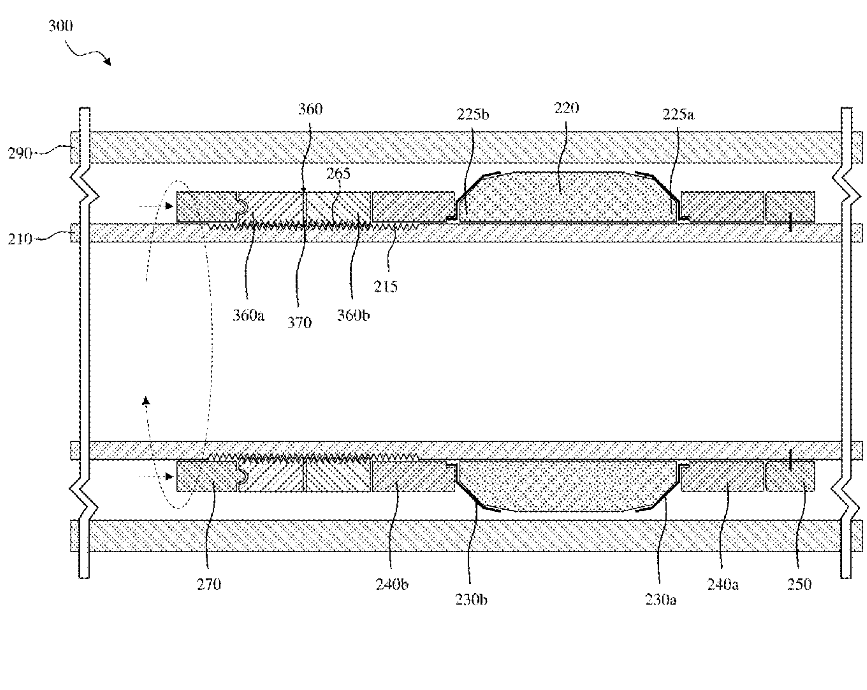
(74) *Attorney, Agent, or Firm* — Scott Richardson; Parker Justiss, P.C.

(57) **ABSTRACT**

Provided is a sealing/anchoring assembly, a well system, and a method. The sealing/anchoring assembly, in one aspect, includes a mandrel, a sealing/anchoring element positioned about the mandrel, and a setting sleeve coupled with a first end of the sealing/anchoring element. The sealing/anchoring assembly, in one aspect, further includes an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state.

20 Claims, 27 Drawing Sheets



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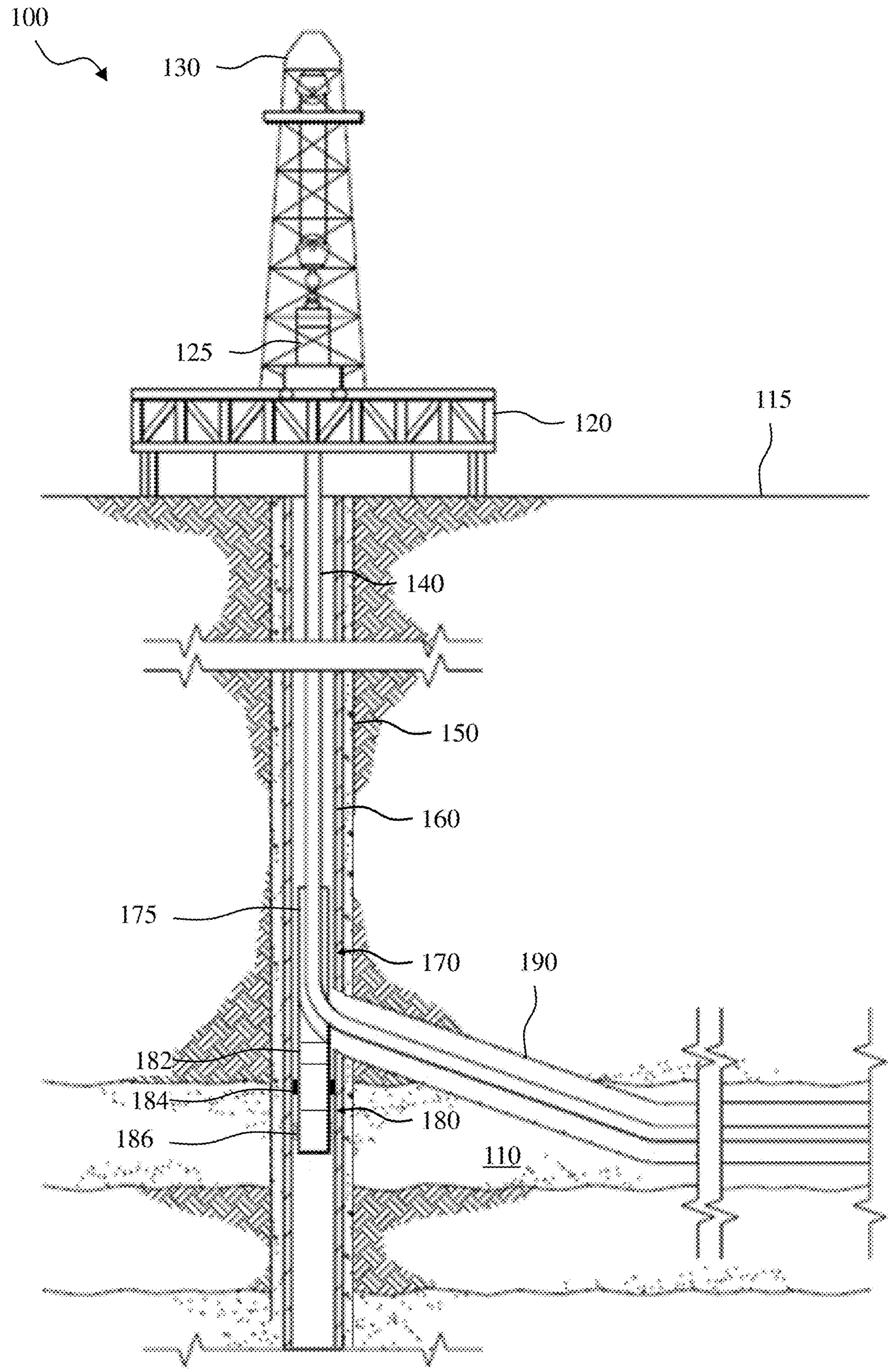

FIG. 1

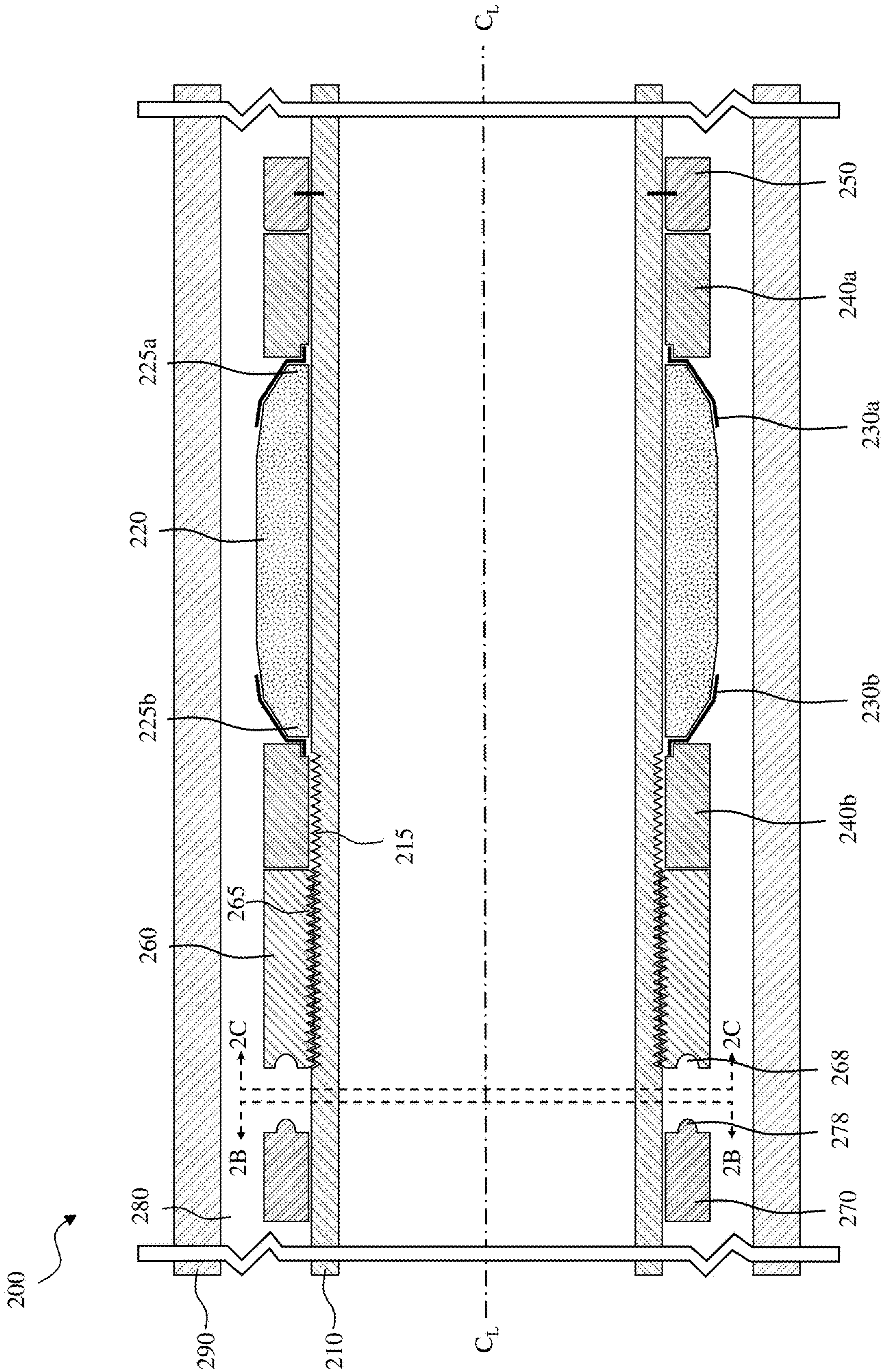

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FIG. 2A

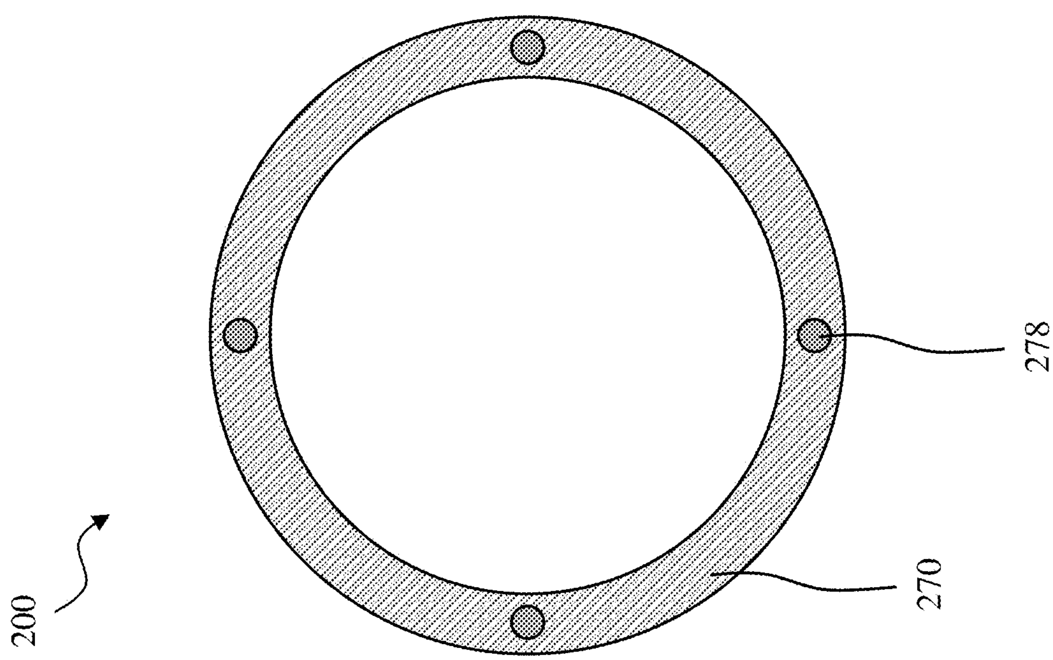

FIG. 2B

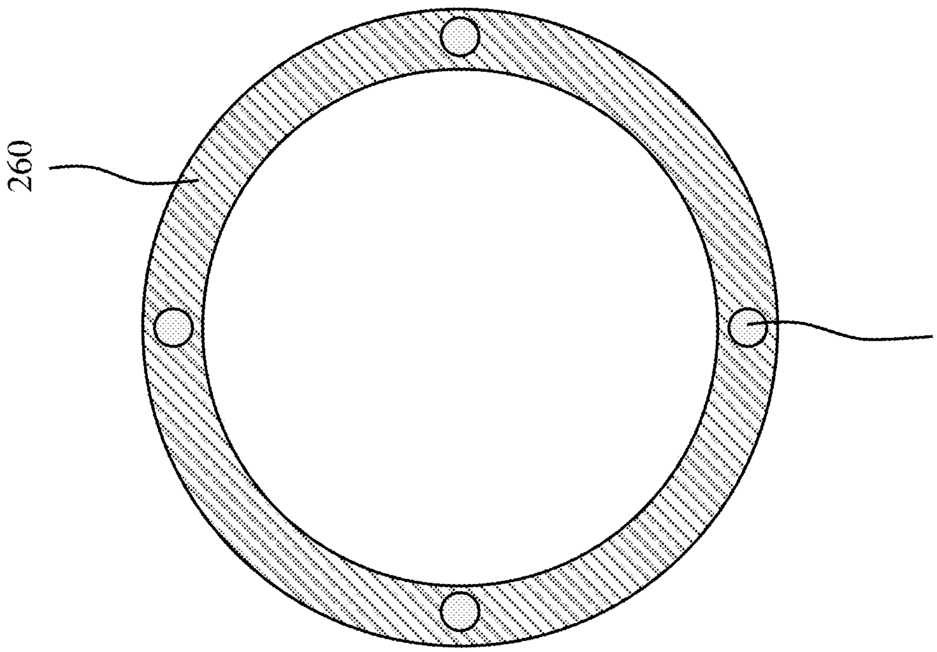

FIG. 2C

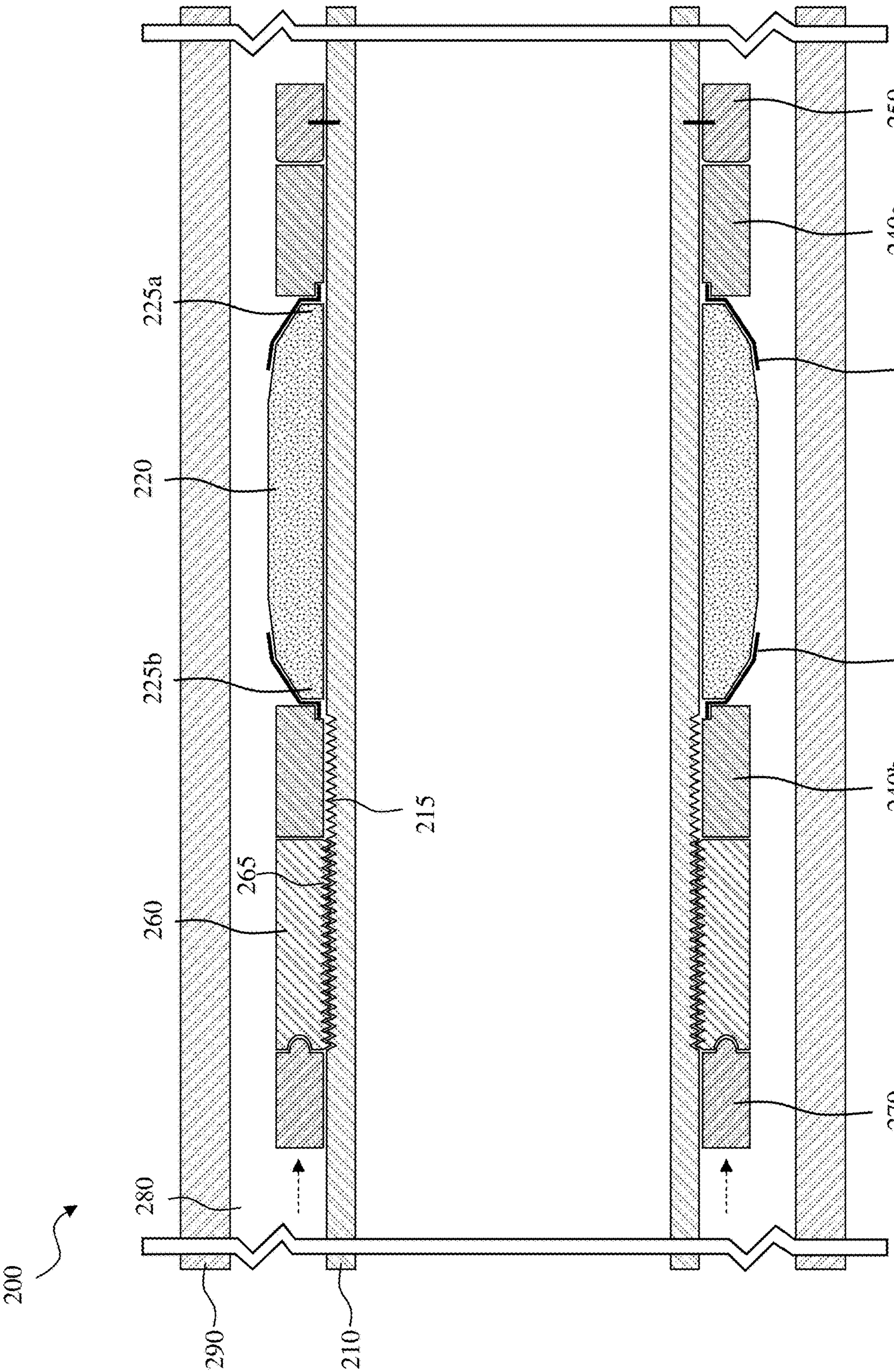

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FIG. 2D

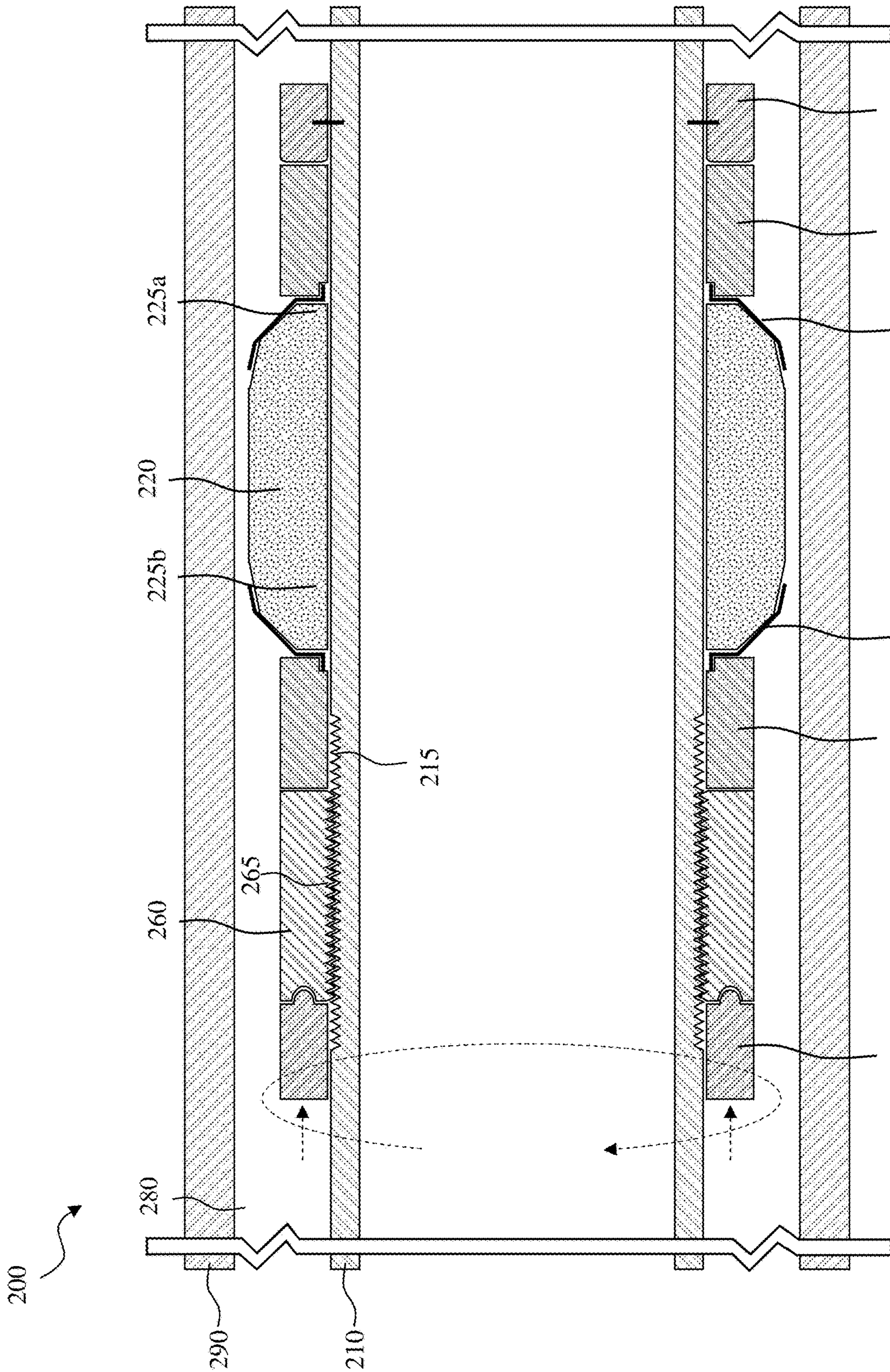
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FIG. 2E

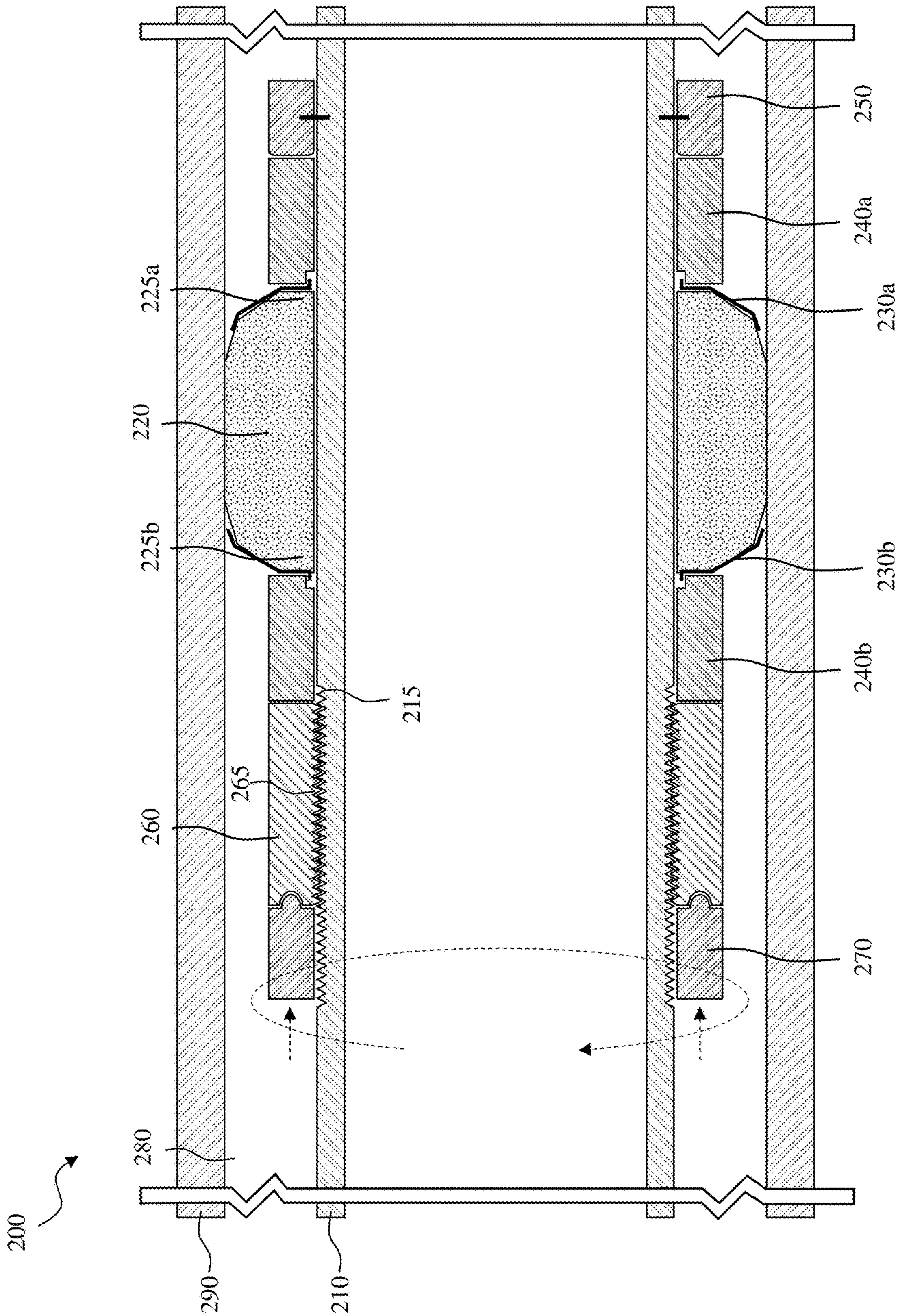
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FIG. 2F

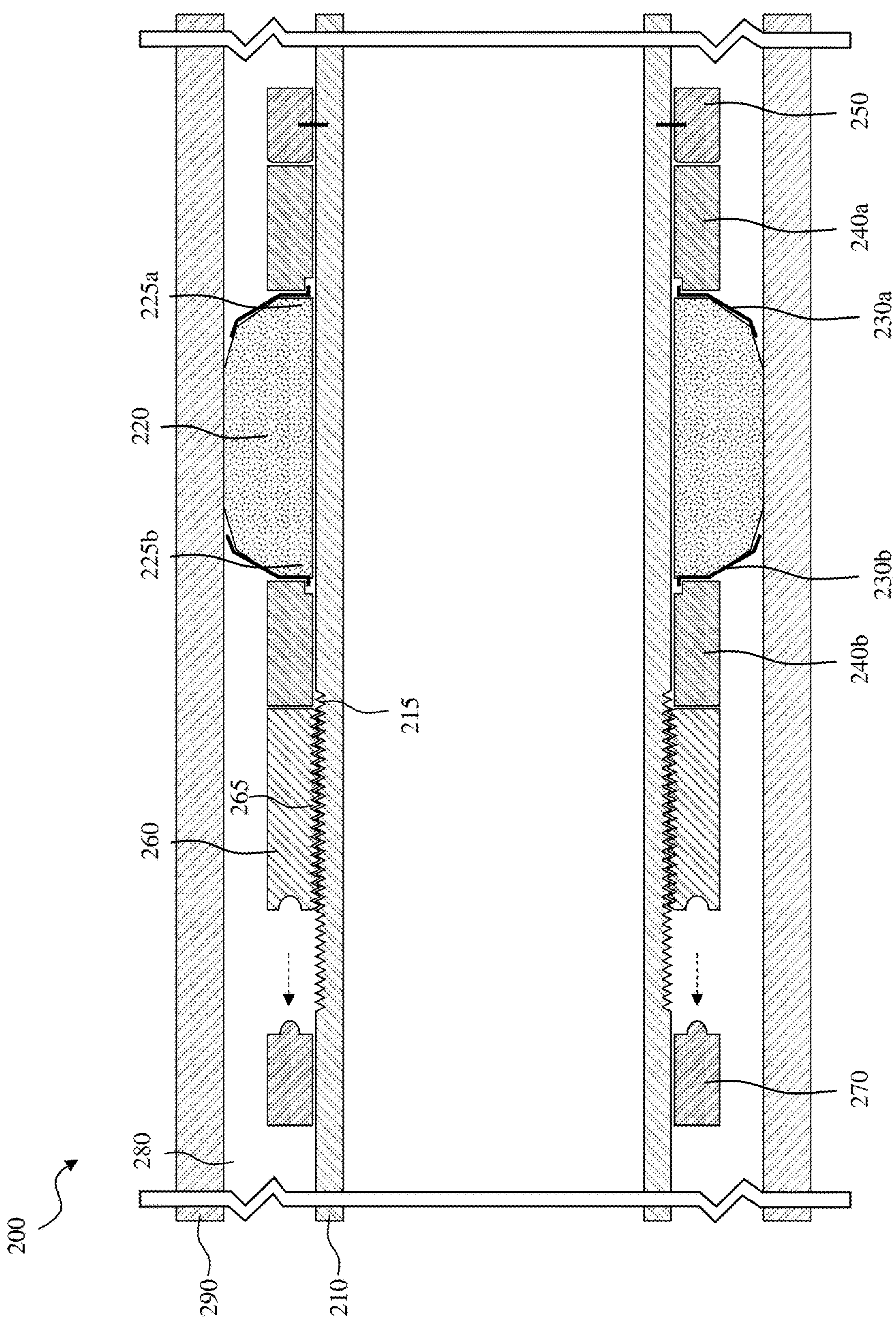

250
240a
225a
230a
220
225b
230b
240b
215
265
260
270
280
200
290
210

FIG. 2G

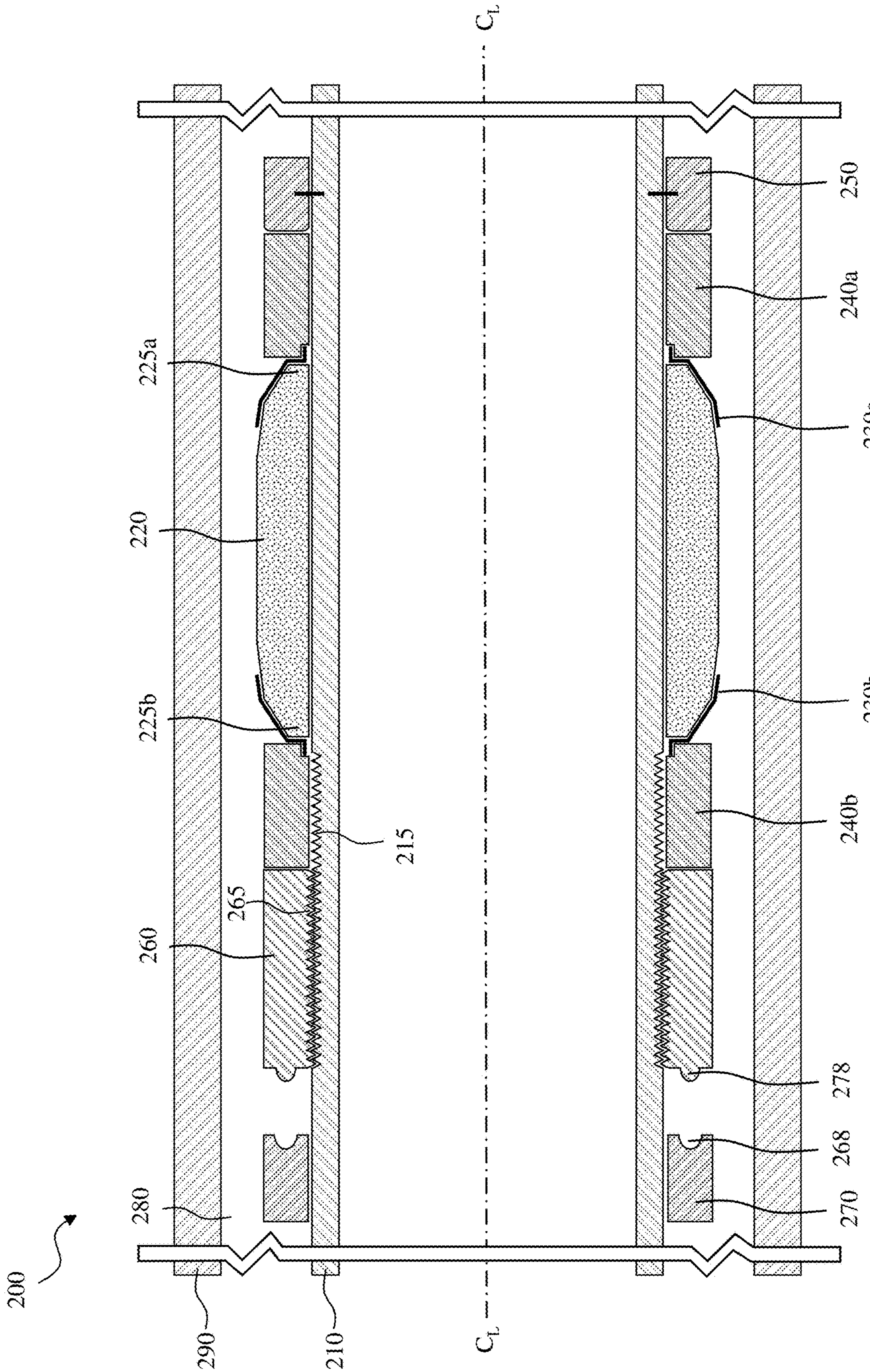

C_L
250
240a
225a
230a
220
230b
225b
240b
215
265
260
278
268
280
270
200
290
210
C_L

FIG. 2H

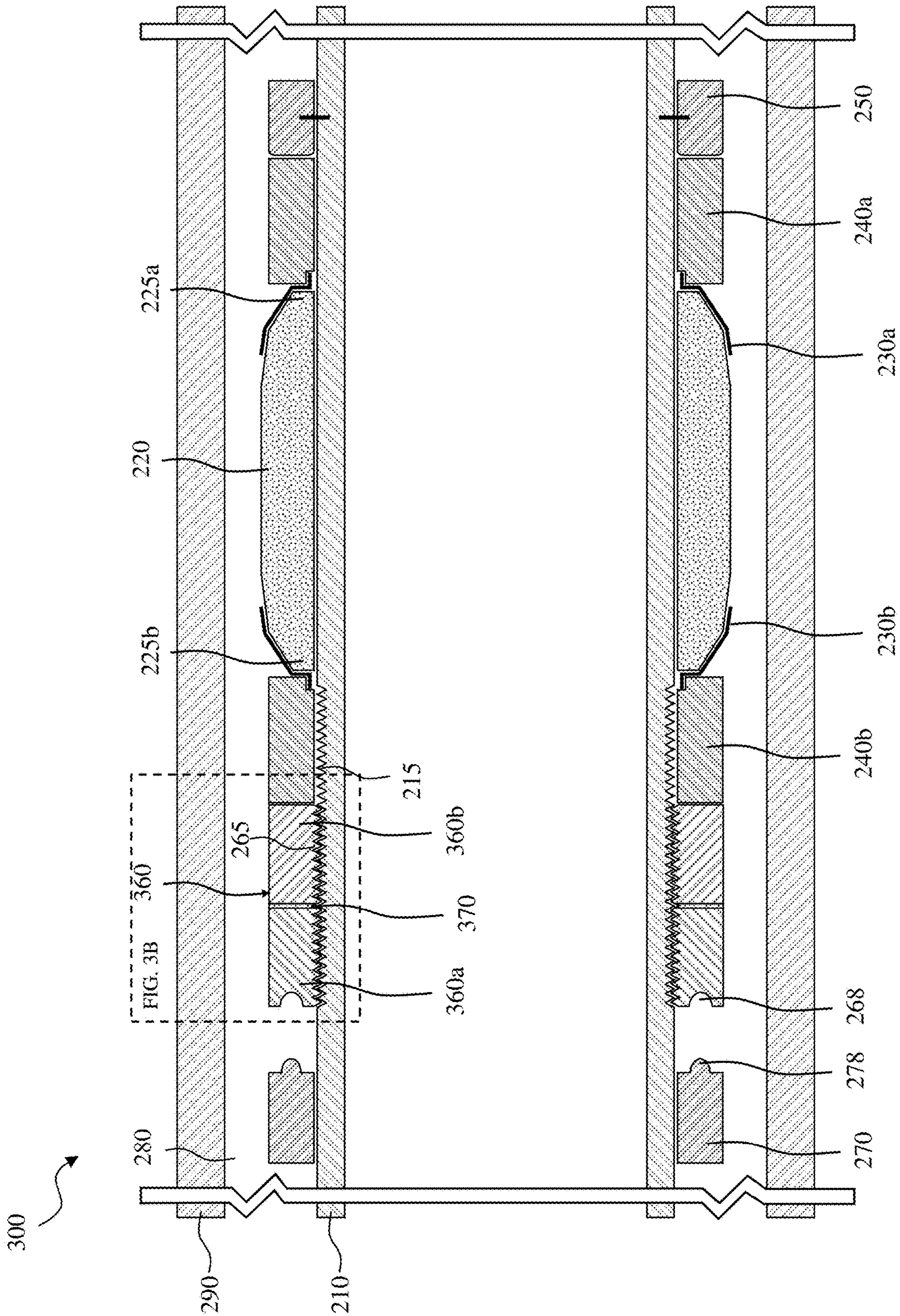

300
280
290
210
270
278
268
360a
370
360
FIG. 3B
265
360b
215
240b
225b
230b
220
225a
230a
240a
250

FIG. 3A

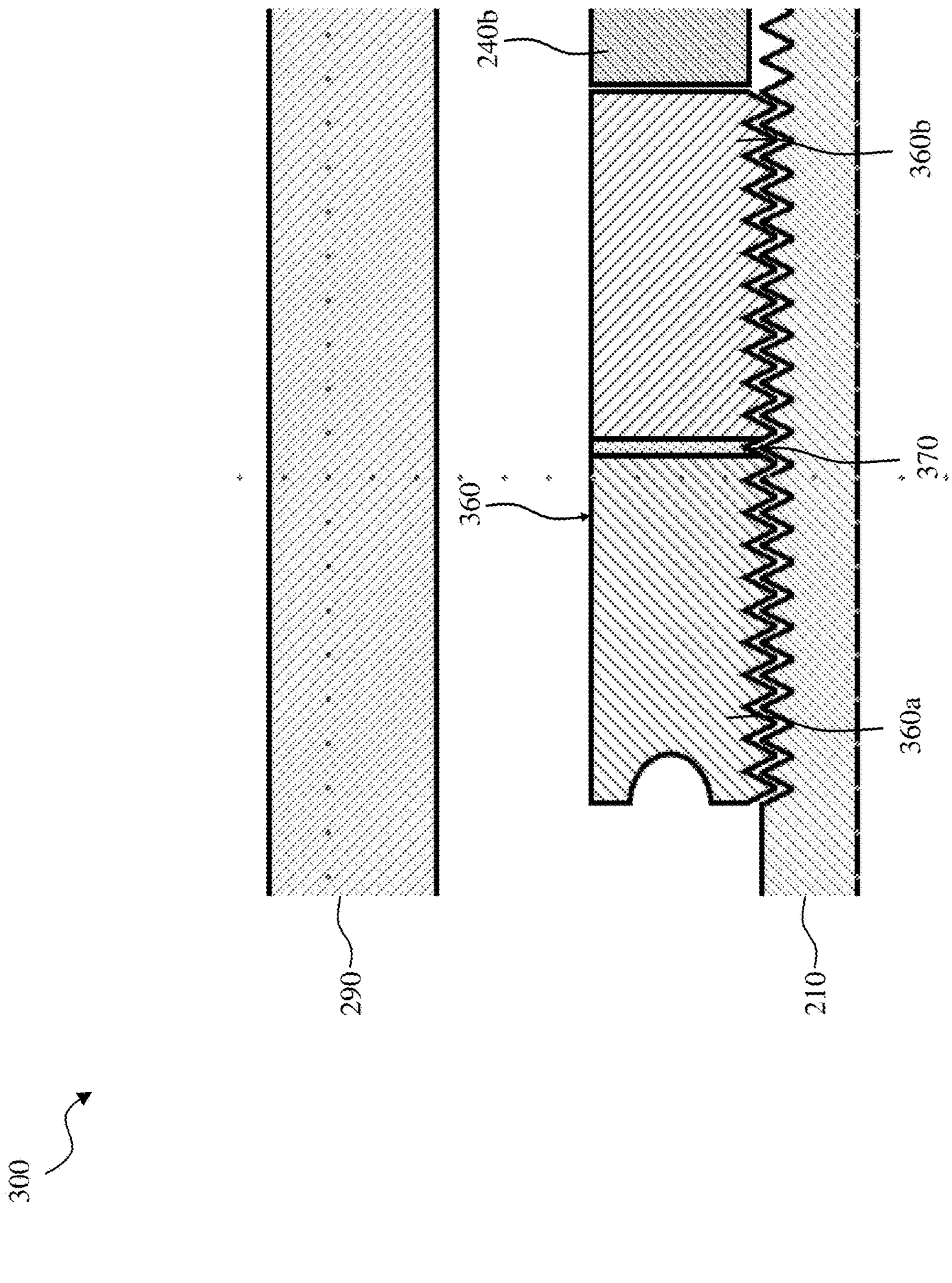


FIG. 3B

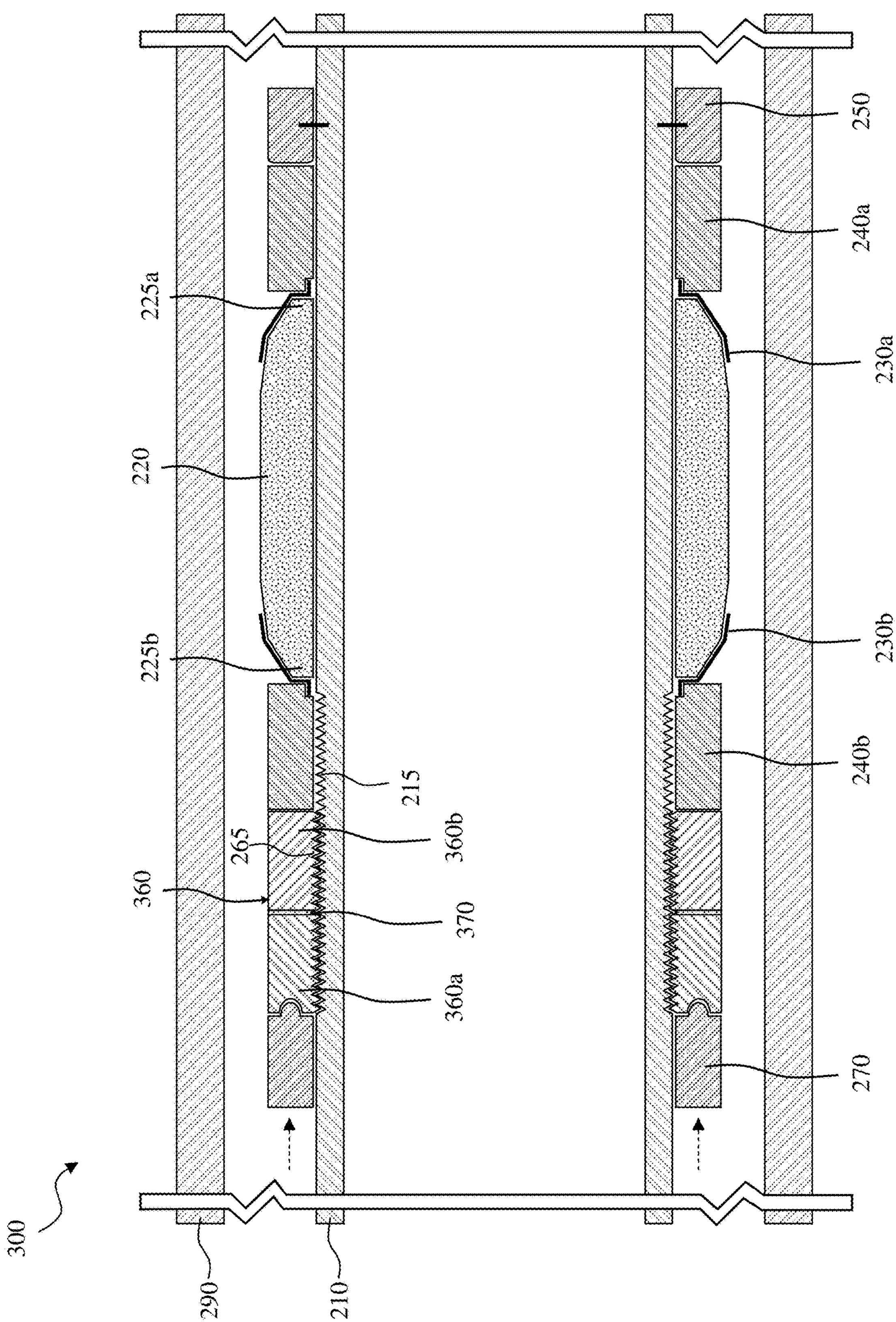

250
240a
225a
230a
220
225b
230b
240b
215
265
360b
360
370
360a
270
300
290
210

FIG. 3C

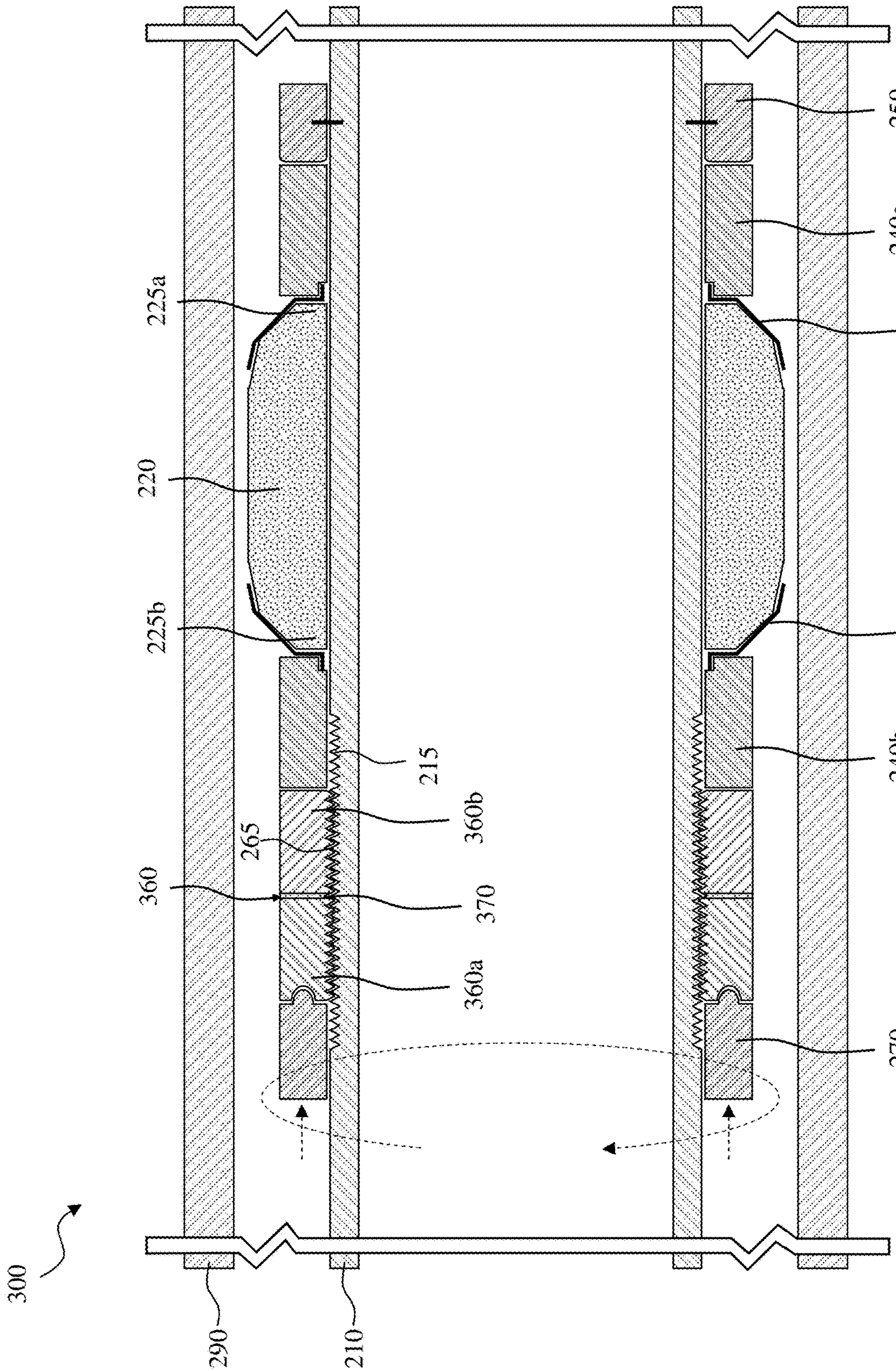

250
240a
225a
230a
220
225b
230b
215
240b
360b
265
360
370
360a
270
300
290
210

FIG. 3D

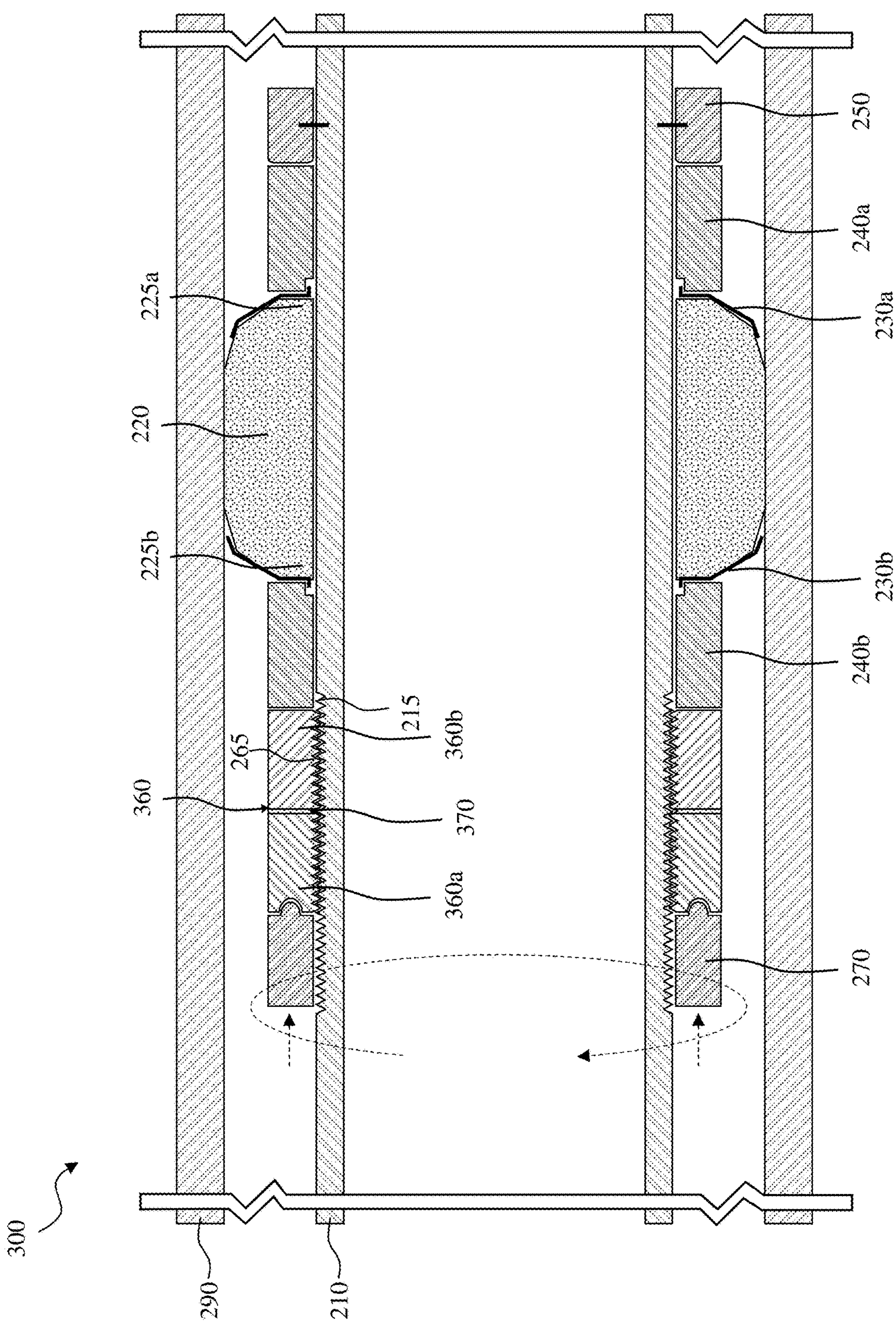
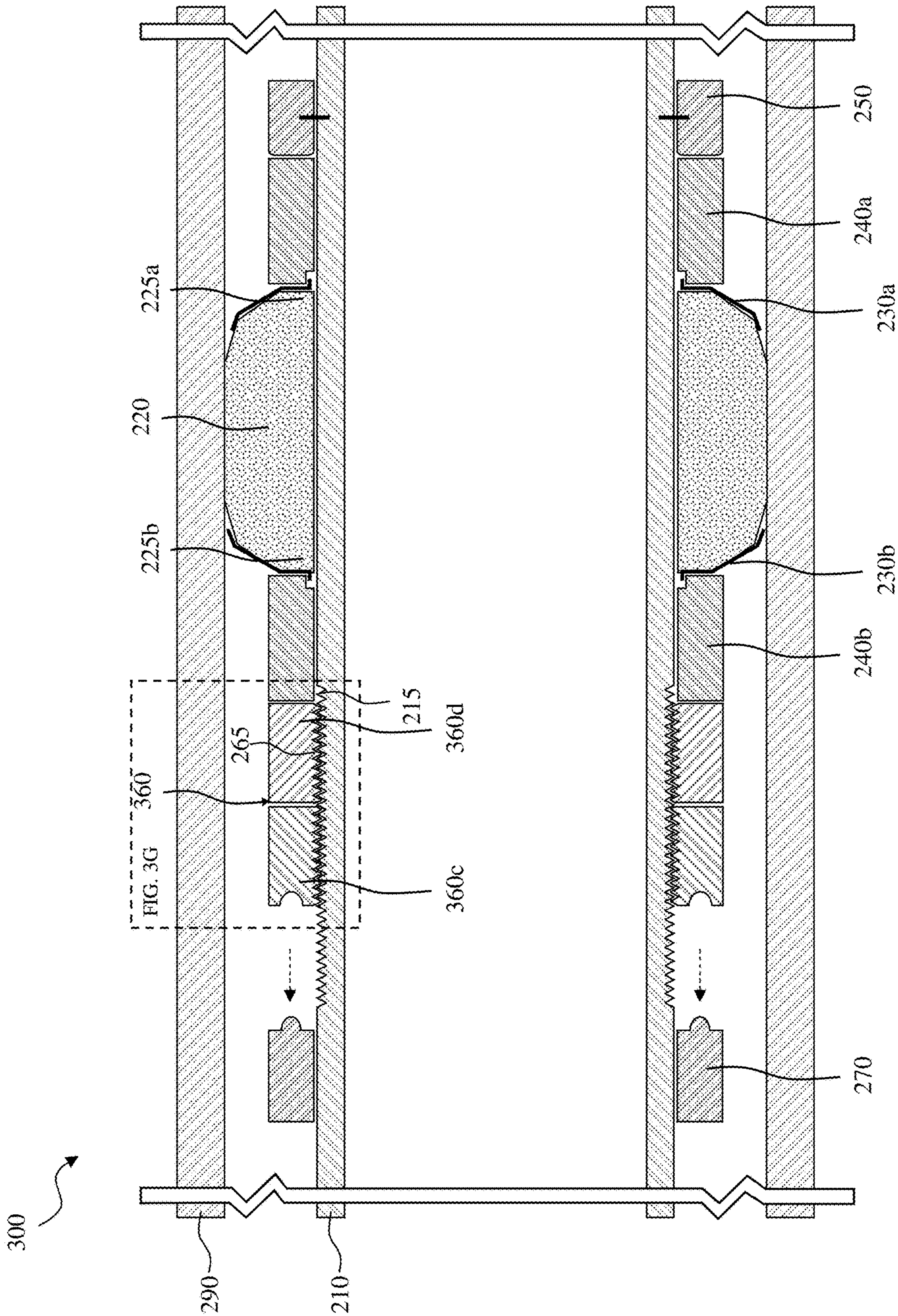

300
290
210
225a
220
225b
360
265
215
360b
370
360a
250
240a
230a
230b
240b
270

FIG. 3E



250
240a
225a
230a
220
225b
230b
240b
215
360d
265
360
FIG. 3G
360c
270
300
290
210

FIG. 3F

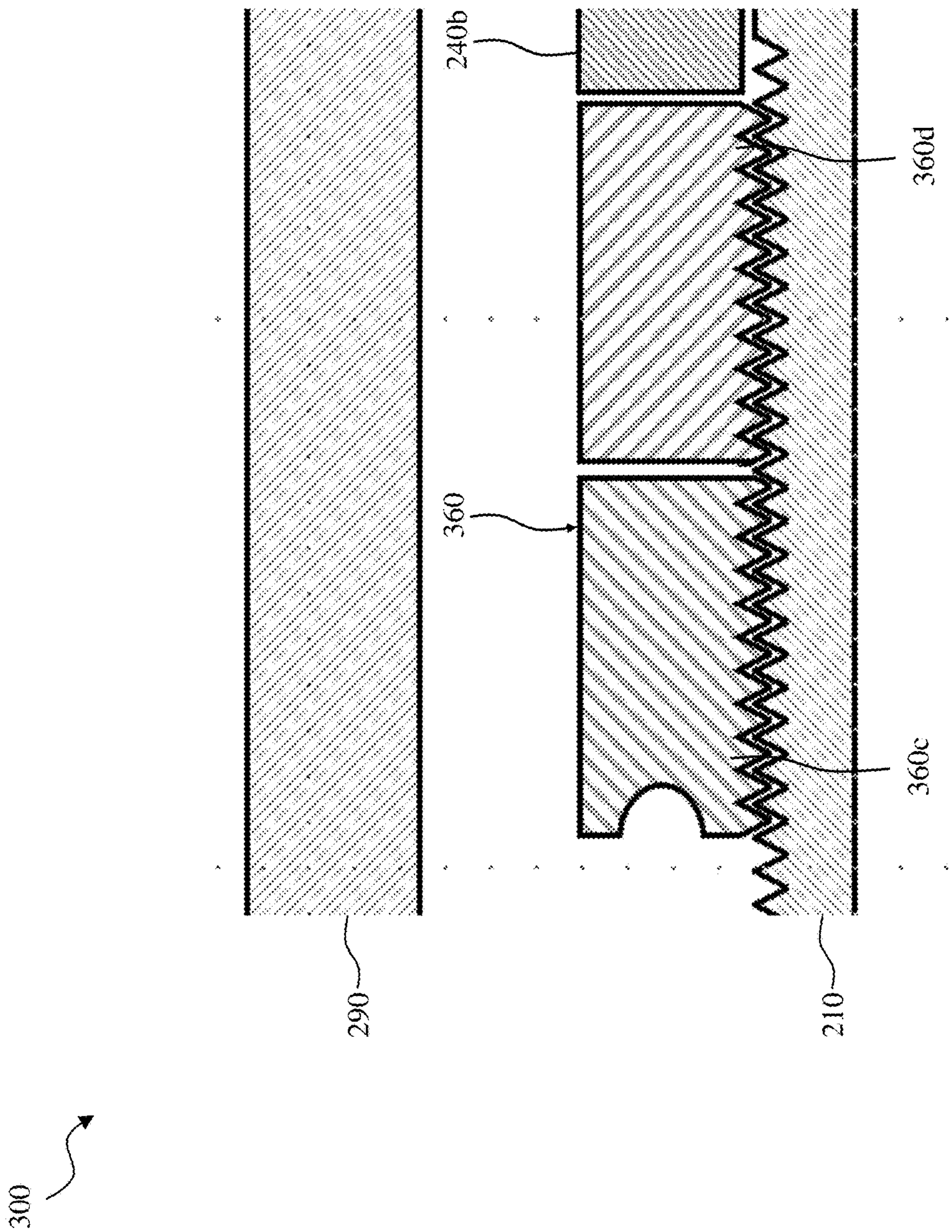
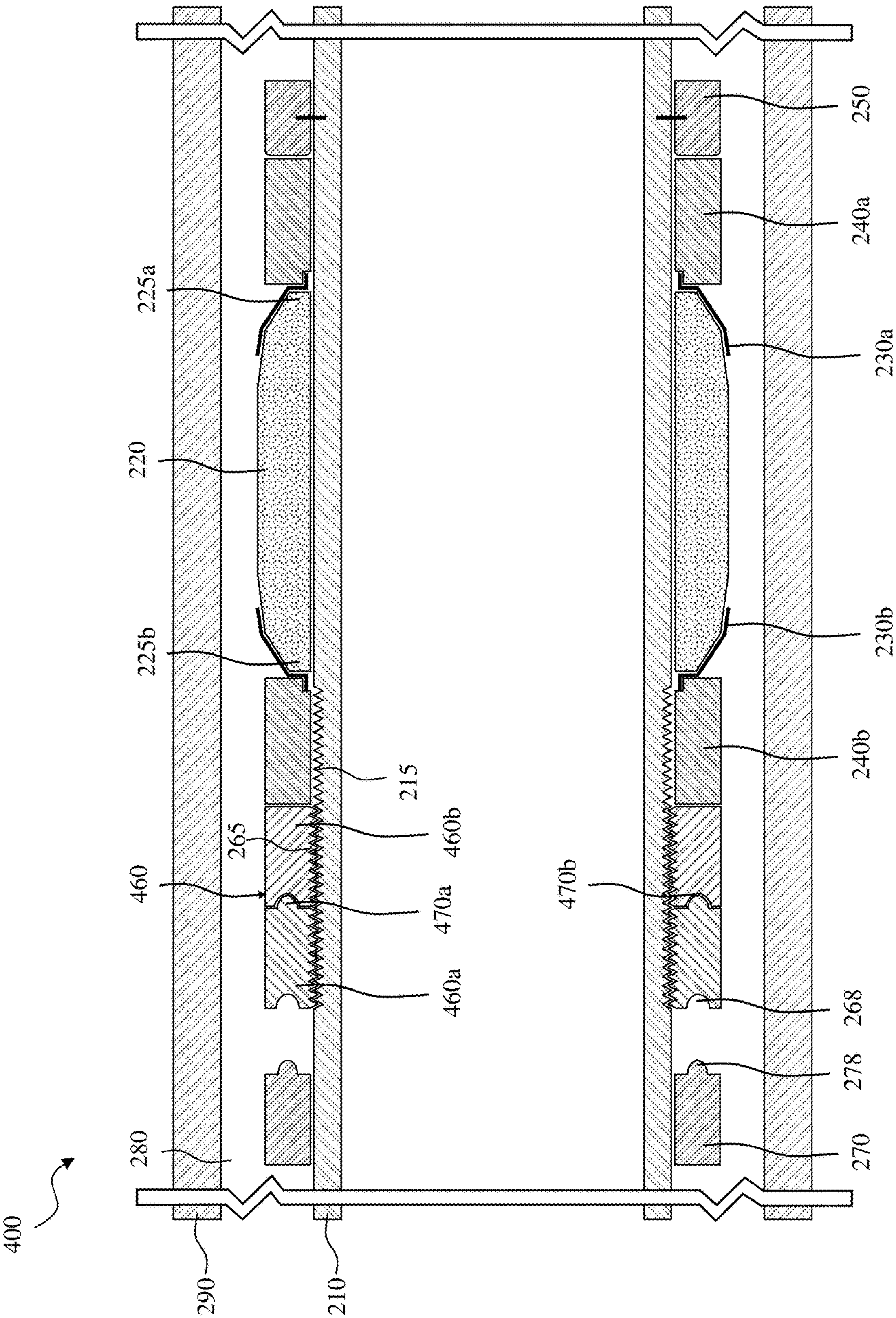


FIG. 3G



400
280
290
210
225a
220
225b
215
265
460
460b
470a
460a
470b
250
240a
230a
230b
240b
268
278
270

FIG. 4A

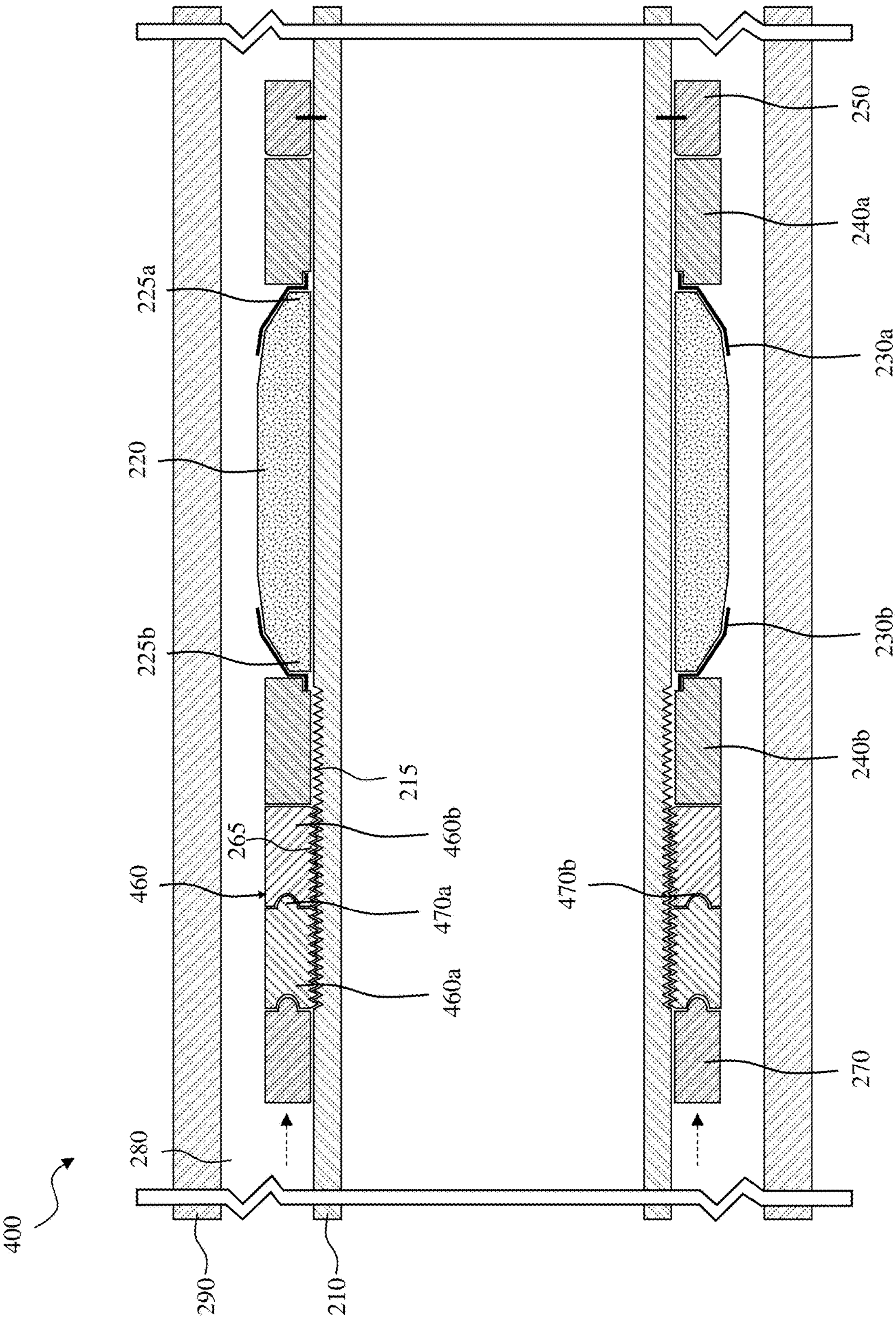
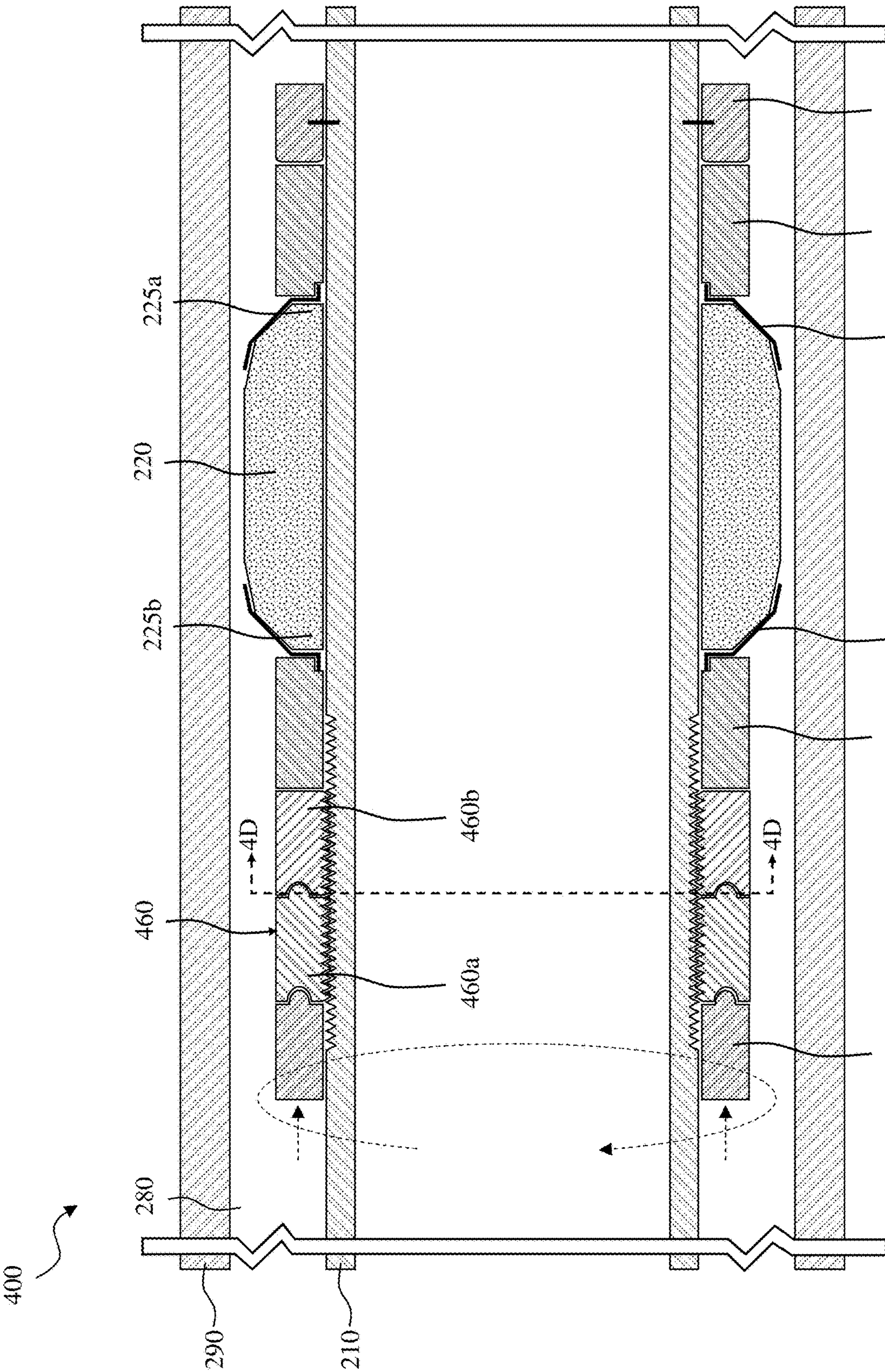

250
240a
225a
230a
220
225b
230b
215
240b
265
460b
460
470a
470b
460a
270
280
400
290
210

FIG. 4B



250
240a
225a
230a
220
225b
230b
240b
460b
4D
4D
460
460a
270
280
400
290
210

FIG. 4C

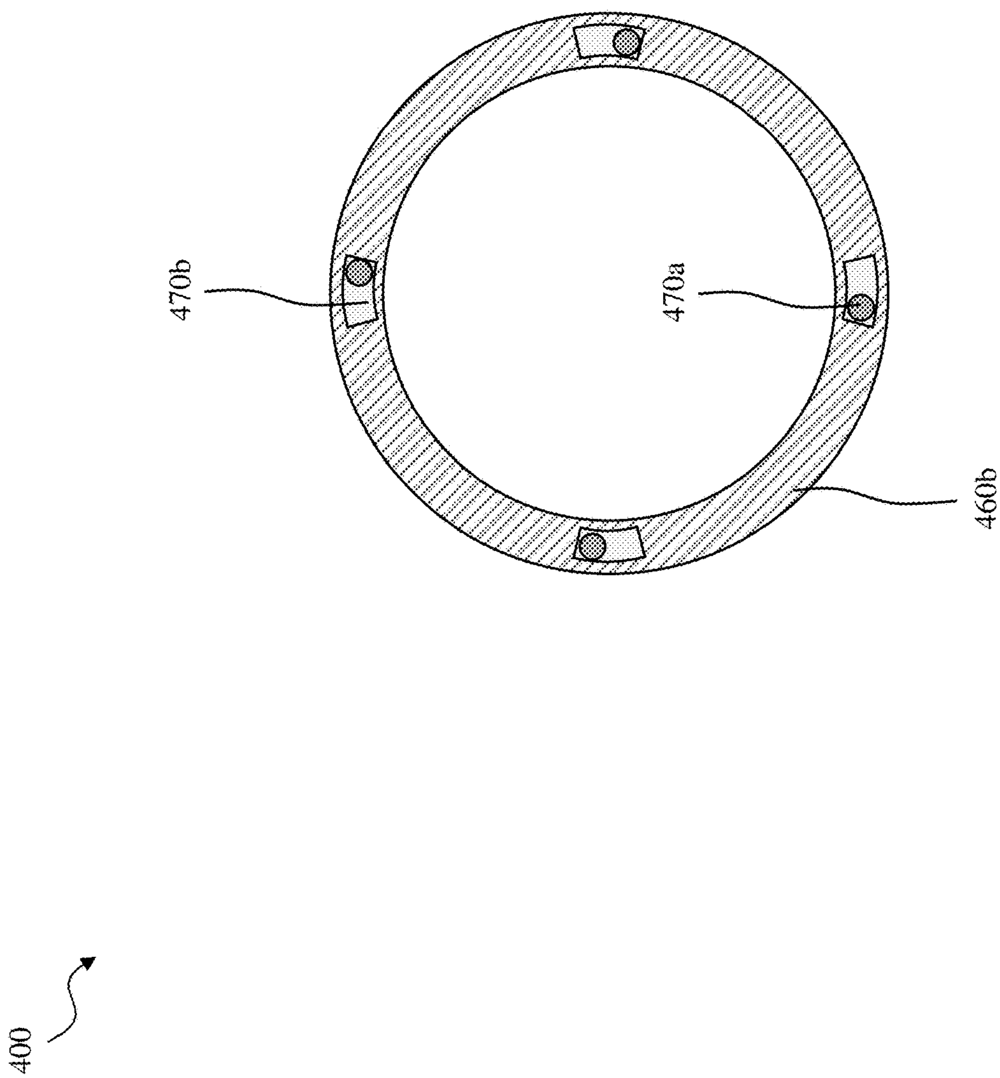
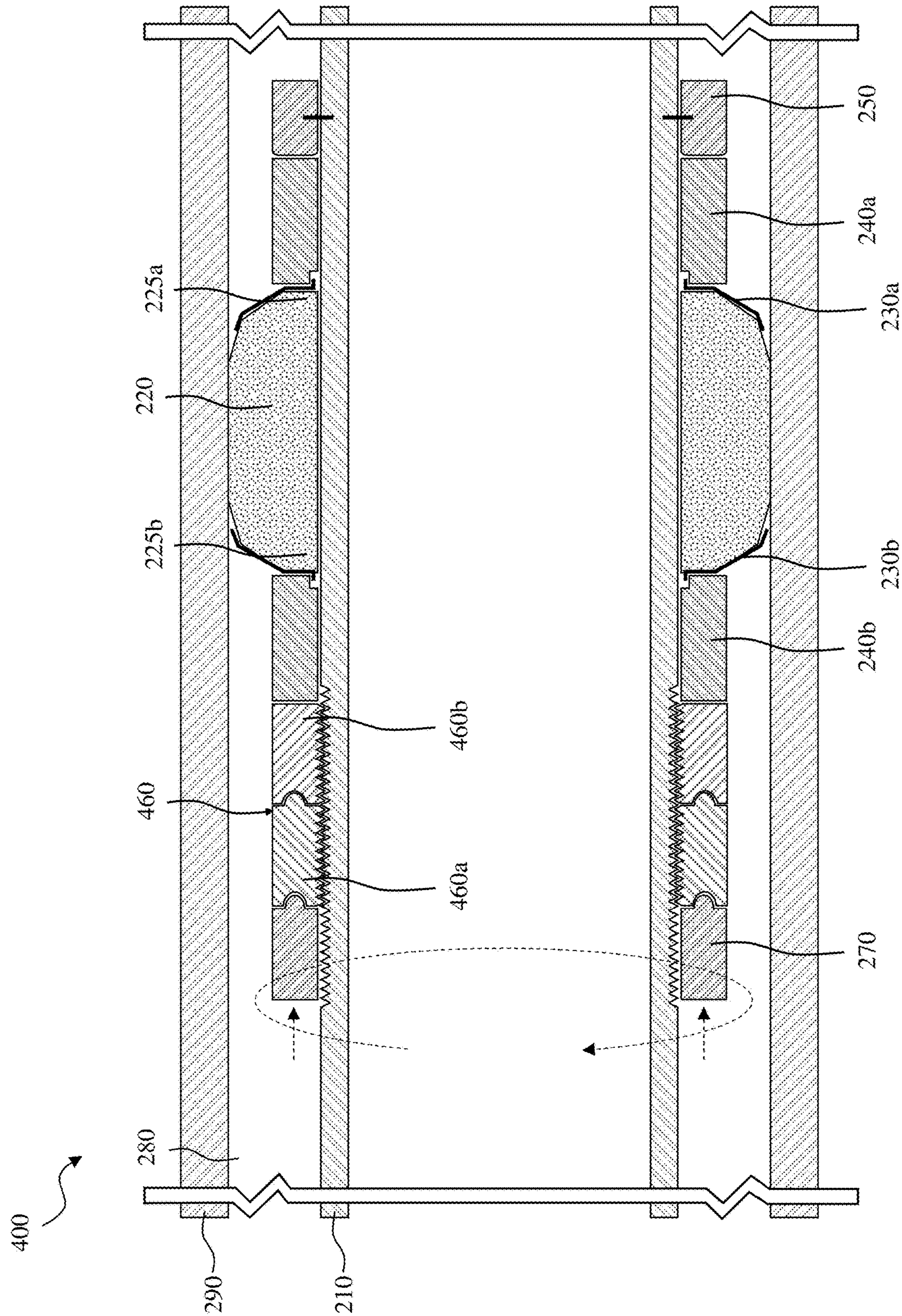


FIG. 4D



250
240a
225a
230a
220
225b
230b
240b
460b
460
460a
270
280
400
290
210

FIG. 4E

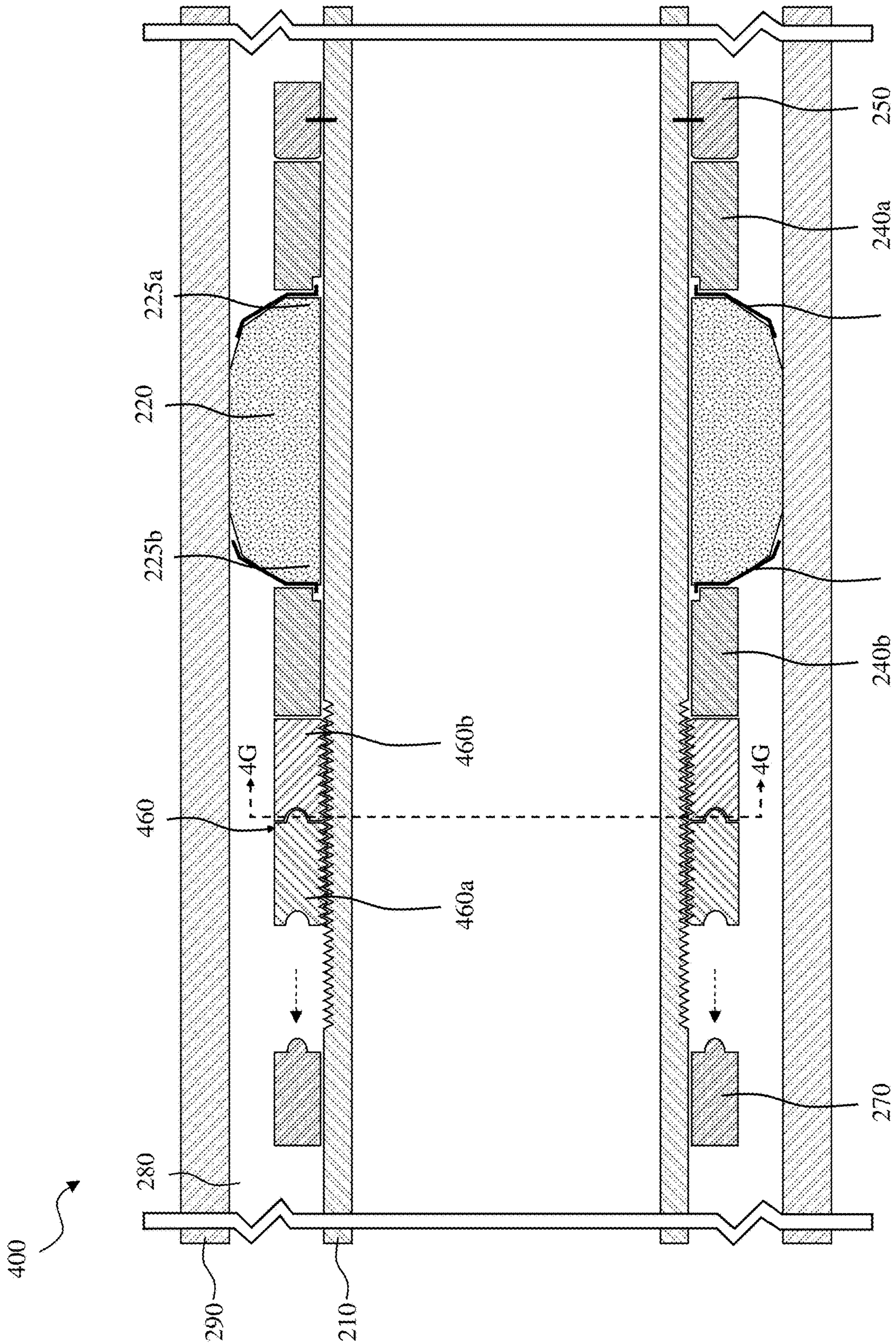

225a
220
225b
460
460b
460a
4G
4G
250
240a
230a
230b
240b
270
280
400
290
210

FIG. 4F

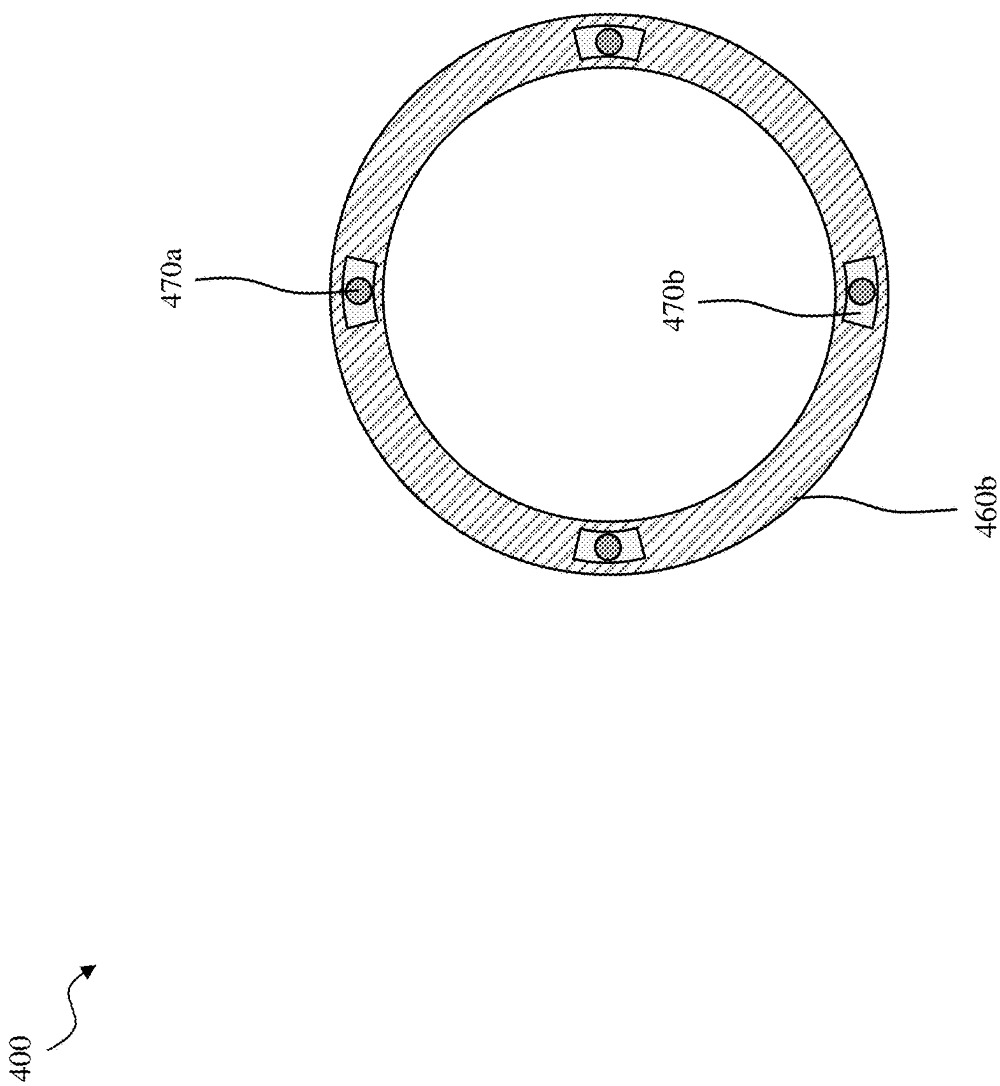
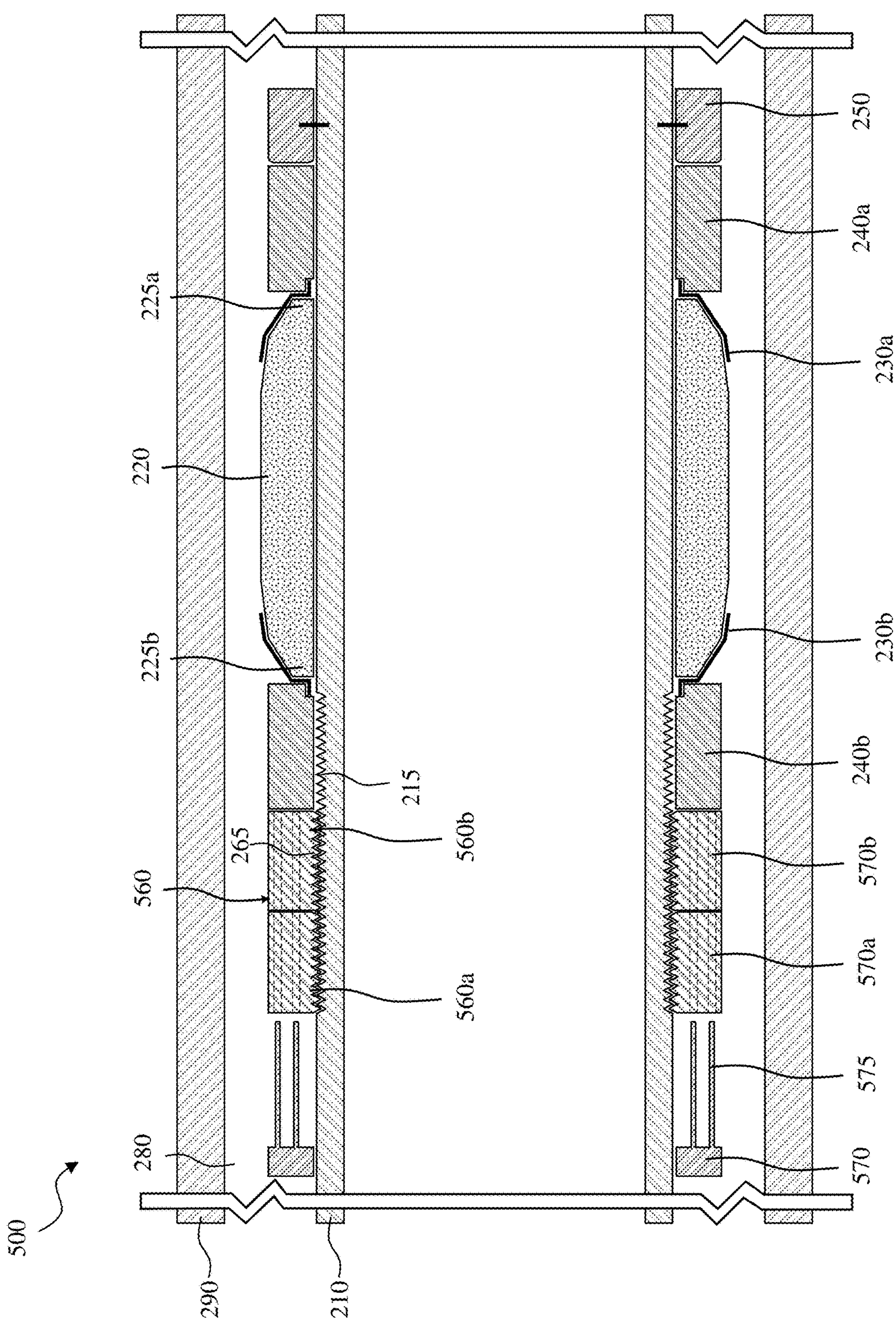


FIG. 4G



225a
220
225b
265
560
280
500
290
210
215
560b
560a
250
240a
230a
230b
240b
570b
570a
575
570

FIG. 5A

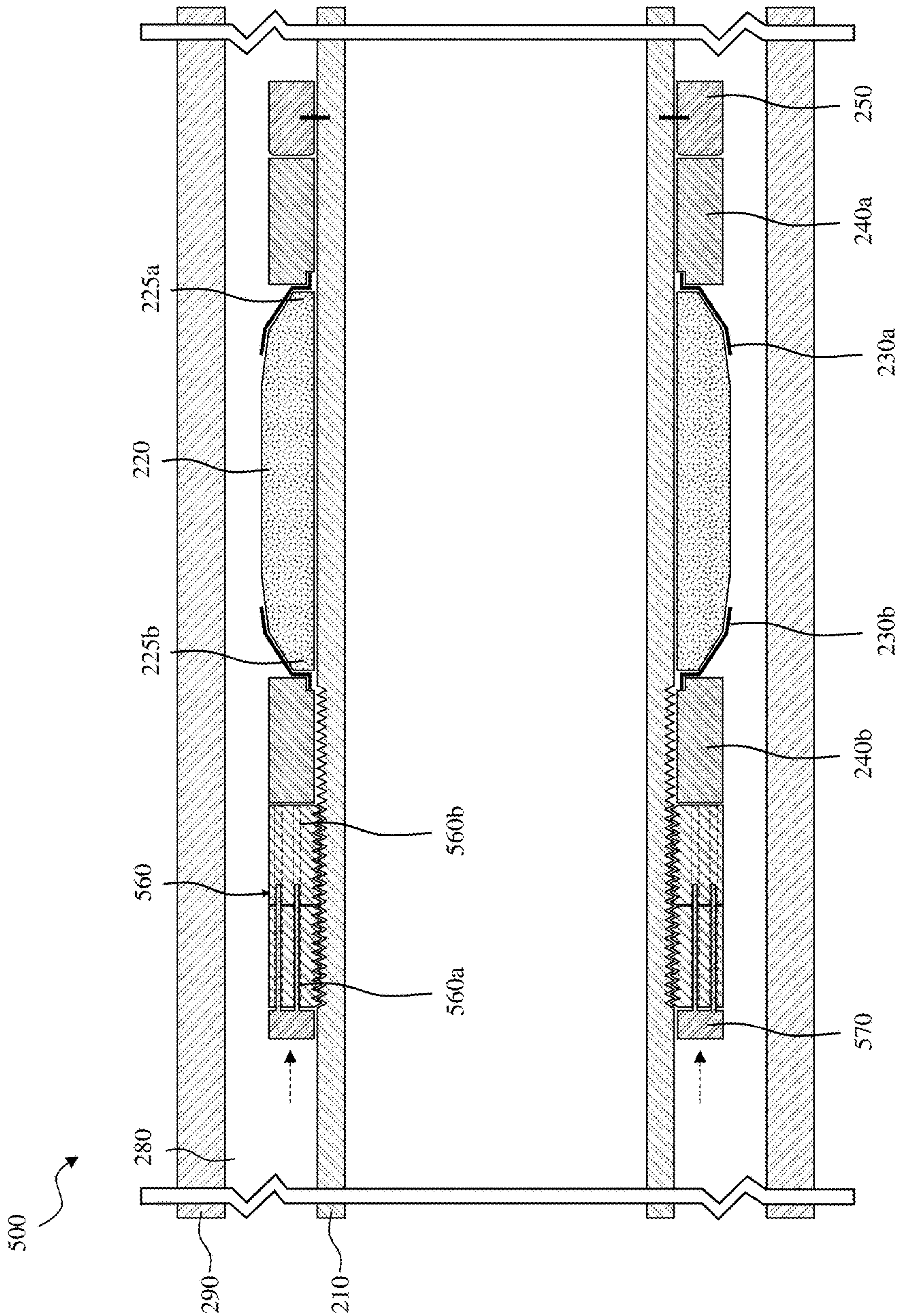

500
280
290
210
225a
220
225b
560
560b
560a
250
240a
230a
230b
240b
570

FIG. 5B

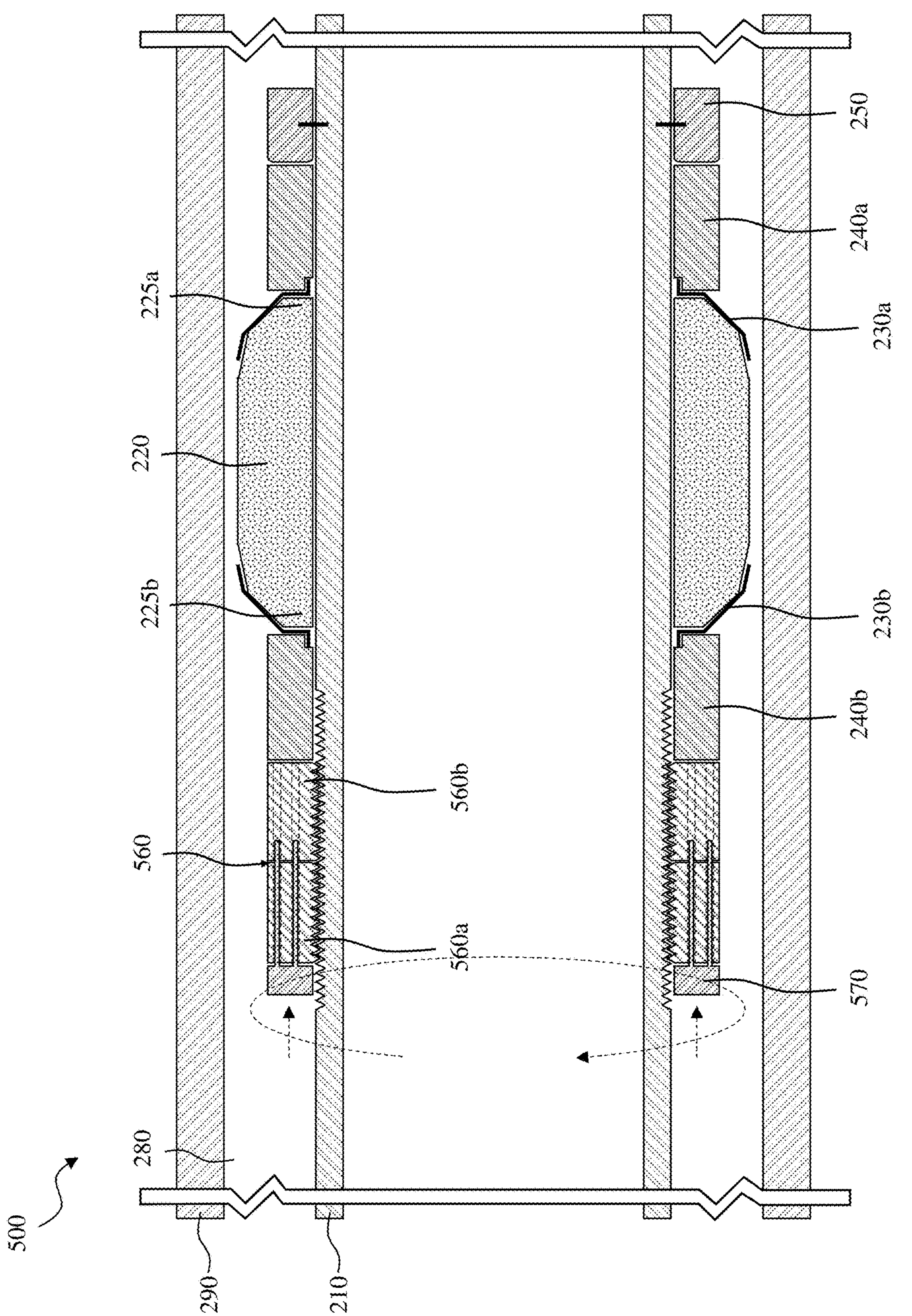

250
240a
225a
230a
220
225b
230b
240b
560b
560
560a
570
280
500
290
210

FIG. 5C

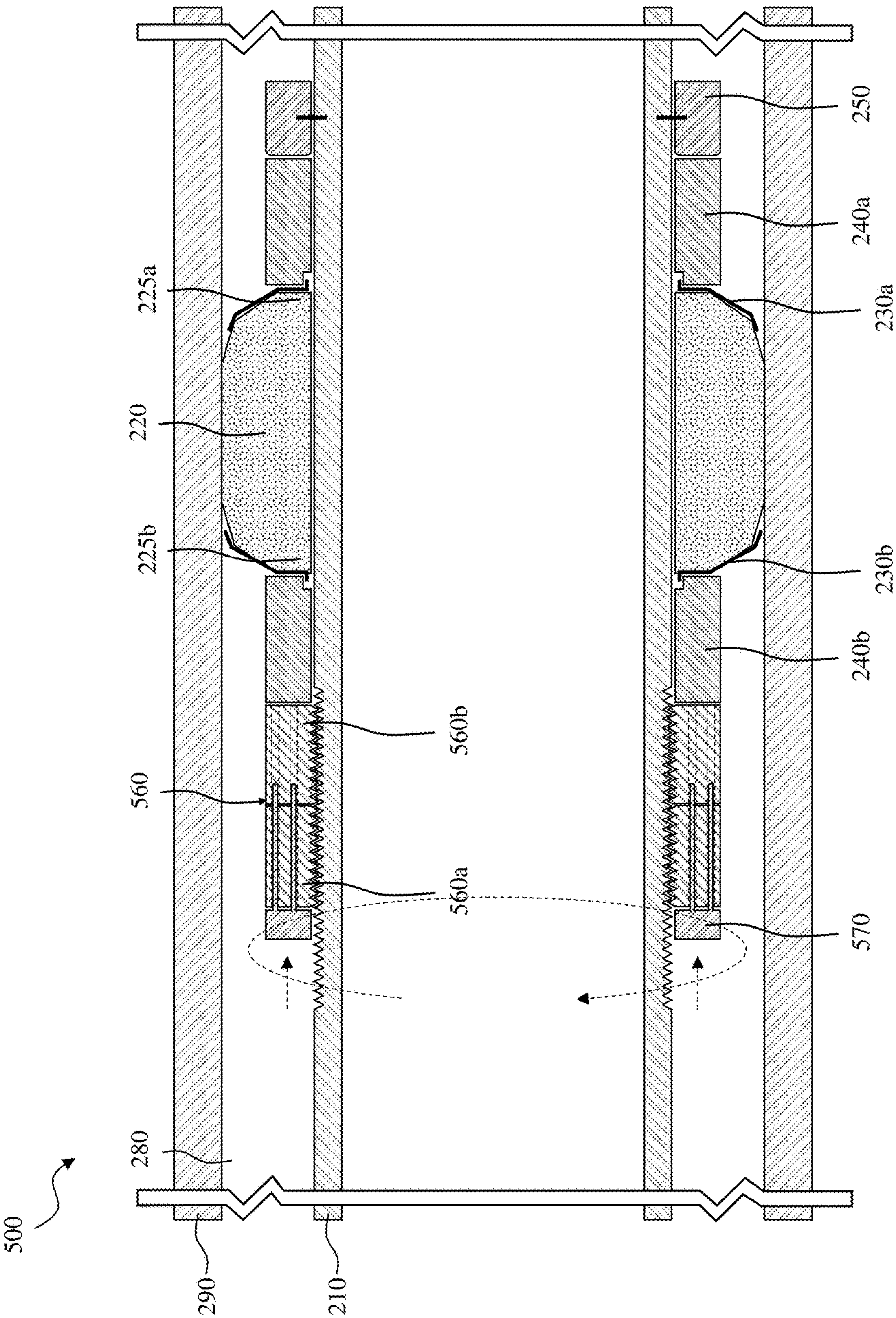

500
290
210
280
560
560a
560b
220
225a
225b
250
240a
230a
230b
240b
570

FIG. 5D

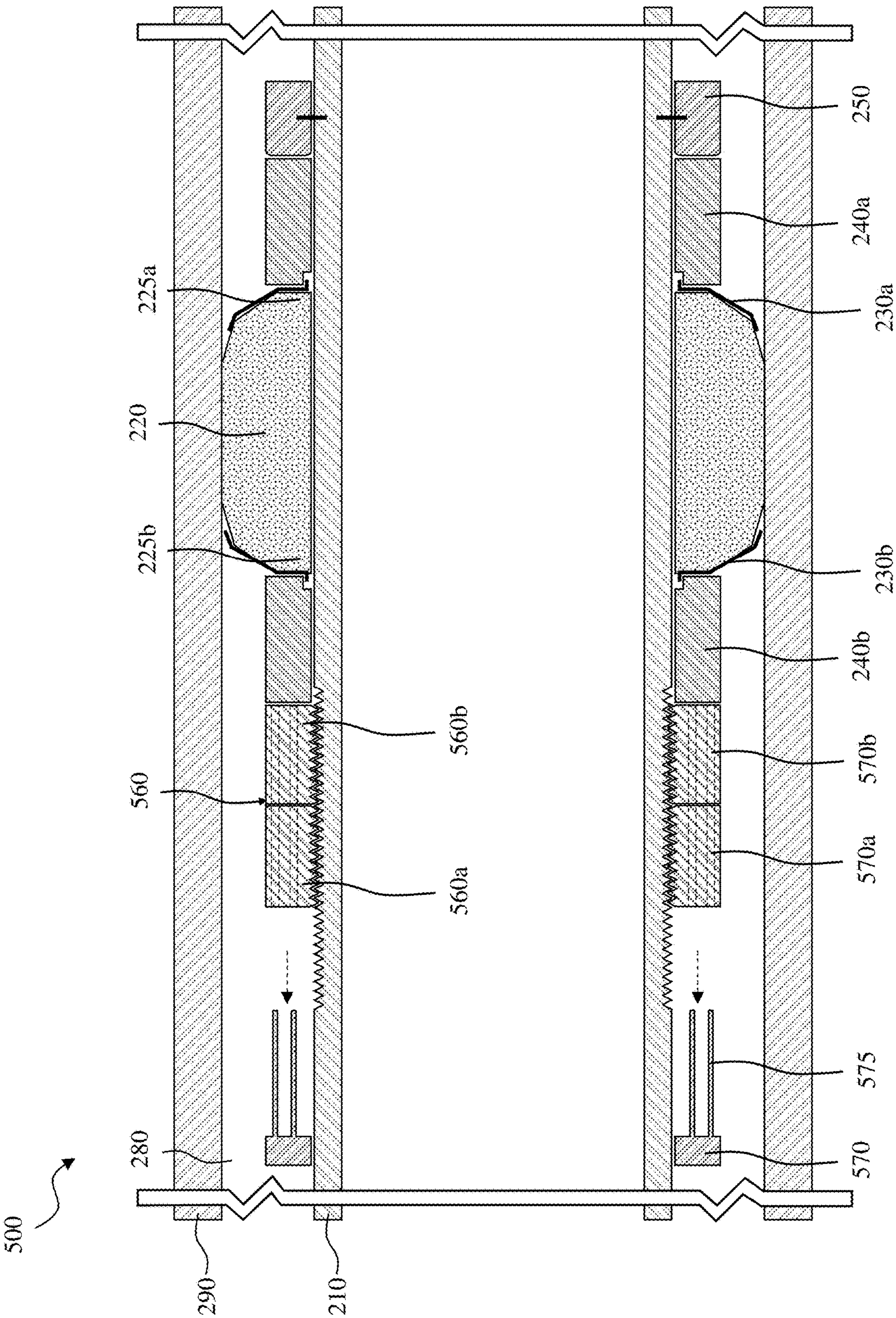

250
240a
225a
230a
220
225b
230b
240b
560b
560
570b
570a
560a
575
280
570
500
290
210

FIG. 5E

REDUCED BACKLASH SEALING/ANCHORING ASSEMBLY

BACKGROUND

A typical sealing tool (e.g., packer, bridge plug, frac plug, etc.) generally has one or more sealing elements or "rubbers" that are employed to provide a fluid-tight seal radially between a mandrel of the sealing tool, and the casing or wellbore into which the sealing tool is disposed. Such a sealing tool is commonly conveyed into a subterranean wellbore suspended from tubing extending to the earth's surface.

To prevent damage to the elements of the sealing tool while the sealing tool is being conveyed into the wellbore, the sealing elements may be carried on the mandrel in a retracted or uncompressed state, in which they are radially inwardly spaced apart from the casing. When the sealing tool is set, the sealing elements radially expand, thereby sealing against the mandrel and the casing and/or wellbore. In certain embodiments, the sealing elements are axially compressed between element retainers that straddle them, which in turn radially expand the sealing elements.

BRIEF DESCRIPTION

Reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIG. **1** illustrates a schematic view of a well system designed, manufactured and operated according to one or more embodiments disclosed herein;

FIGS. **2**A through **2**H illustrate different cross-sectional views of various deployment states of a sealing/anchoring assembly designed, manufactured and/or operated according to one or more embodiments of the disclosure;

FIGS. **3**A through **3**G illustrate different cross-sectional views of various deployment states of a sealing/anchoring assembly designed, manufactured and/or operated according to one or more alternative embodiments of the disclosure;

FIGS. **4**A through **4**G illustrate different cross-sectional views of various deployment states of a sealing/anchoring assembly designed, manufactured and/or operated according to one or more alternative embodiments of the disclosure; and

FIGS. **5**A through **5**E illustrate different cross-sectional views of various deployment states of a sealing/anchoring assembly designed, manufactured and/or operated according to one or more alternative embodiments of the disclosure.

DETAILED DESCRIPTION

In the drawings and descriptions that follow, like parts are typically marked throughout the specification and drawings with the same reference numerals, respectively. The drawn figures are not necessarily to scale. Certain features of the disclosure may be shown exaggerated in scale or in somewhat schematic form and some details of certain elements may not be shown in the interest of clarity and conciseness. The present disclosure may be implemented in embodiments of different forms.

Specific embodiments are described in detail and are shown in the drawings, with the understanding that the present disclosure is to be considered an exemplification of the principles of the disclosure, and is not intended to limit the disclosure to that illustrated and described herein. It is to be fully recognized that the different teachings of the

embodiments discussed herein may be employed separately or in any suitable combination to produce desired results.

Unless otherwise specified, use of the terms "connect." "engage," "couple," "attach," or any other like term describing an interaction between elements is not meant to limit the interaction to direct interaction between the elements and may also include indirect interaction between the elements described. Unless otherwise specified, use of the terms "up," "upper." "upward." "uphole." "upstream," or other like terms shall be construed as generally away from the bottom, terminal end of a well; likewise, use of the terms "down," "lower," "downward," "downhole." "downstream," or other like terms shall be construed as generally toward the bottom, terminal end of a well, regardless of the wellbore orientation. Use of any one or more of the foregoing terms shall not be construed as denoting positions along a perfectly vertical axis. Unless otherwise specified, use of the term "subterranean formation" shall be construed as encompassing both areas below exposed earth and areas below earth covered by water such as ocean or fresh water.

Body lock rings are traditionally a critical part of a scaling tool, for example used to hold the setting load once the sealing elements of the sealing tool are set, and prior to differential pressure application. The present disclosure, however, has acknowledged that backlash or set back of the body lock ring is an inherent drawback of common locking systems. This back lash or set back often results in reduction in setting force and relaxation of the sealing elements, which eventually affects the sealing element performance, particularly for large size sealing tools (e.g., the larger the back lash the bigger reduction in setting force). Similar problems may occur in anchoring tools employing body lock rings.

Given the foregoing acknowledgments, the present disclosure has designed a new scaling/anchoring assembly that does away with the conventional body lock ring system. For example, the new sealing/anchoring assembly employs an internally threaded setting sleeve that is coupled to a rotary motor. Accordingly, as the rotary motor rotates about the mandrel, the internally threaded setting sleeve rotates and axially translates along the mandrel to axially compress the sealing/anchoring elements, and thus move them from their radially retracted state to their radially expanded state. In the case of a sealing assembly, the sealing elements would radially expand to seal an annulus between the mandrel and a surrounding tubular (e.g., wellbore casing). In the case of an anchoring assembly, the anchoring elements would radially expand to engage the surrounding tubular (e.g., wellbore casing), and thus axially fix the mandrel relative to the surrounding tubular. In contrast to conventional body lock rings, the threaded setting sleeve does not have significant issues (e.g., any issues) with back lash or set back.

A reduced backlash sealing/anchoring assembly according to the disclosure is based on a simple idea of using rotary motor (e.g., hydraulic or electrical rotary motor), instead of a conventional hydraulic piston, to torque an internally threaded setting sleeve running on an externally threaded mandrel and pushing against the element backup system to set the scaling element. Once the sealing element is set, the rotary motor can be retrieved and pulled back. Once the rotary motor is retrieved, the threaded sleeve is axially locked in its position through the threaded connection with mandrel resulting in limited back lash (e.g., literally zero back lash). In other words, the setting axial force is resisted by the threaded connection where there is no axial set back (back lash) because the threaded connection cannot be un-torqued by the scaling element reaction. To release and retrieve the sealing element, the rotary motor will be used with reversed rotation to un-torque the setting sleeve and unload the sealing element.

Certain main components in this concept are the internally threaded setting sleeve and the rotary motor. The mandrel is only partially threaded at OD within the travel length of the internally threaded setting sleeve, which is equal or larger than the sealing element setting stroke length. Unlike conventional systems, a sealing/anchoring assembly according to the present disclosure may be void of a body lock ring or slip biting mechanism.

In at least one embodiment, the rotary motor torques the internally threaded setting sleeve through a male-to-female connections at the interface. In one embodiment, the tip of the rotary motor has male connections with protruded parts while the back end of the internally threaded setting sleeve has female connections with recessed parts. Such male-to-female connection is only used for torque-and-push mechanism. Once the sealing element is set, the rotary motor is simply pulled back and disconnected from the internally threaded setting sleeve. As mentioned, in at least one embodiment the mandrel is only partially threaded at OD within the travel length of the internally threaded setting sleeve, which is equal or larger than sealing element stroke length. To release the locking system and the sealing element, the internally threaded setting sleeve is untortured by reversing the rotary mechanism.

FIG. **1** is a schematic view of a well system **100** designed, manufactured and operated according to one or more embodiments disclosed herein. The well system **100** includes a platform **120** positioned over a subterranean formation **110** located below the earth's surface **115**. The platform **120**, in at least one embodiment, has a hoisting apparatus **125** and a derrick **130** for raising and lowering one or more downhole tools including pipe strings, such as a drill string **140**. Although a land-based oil and gas platform **120** is illustrated in FIG. **1**, the scope of this disclosure is not thereby limited, and thus could potentially apply to offshore applications. The teachings of this disclosure may also be applied to other land-based well systems different from that illustrated.

As shown, a main wellbore **150** has been drilled through the various earth strata, including the subterranean formation **110**. The term "main" wellbore is used herein to designate a wellbore from which another wellbore is drilled. It is to be noted, however, that a main wellbore **150** does not necessarily extend directly to the earth's surface, but could instead be a branch of yet another wellbore. A casing string **160** may be at least partially cemented within the main wellbore **150**. The term "casing" is used herein to designate a tubular string used to line a wellbore. Casing may actually be of the type known to those skilled in the art as a "liner" and may be made of any material, such as steel or composite material and may be segmented or continuous, such as coiled tubing. The term "lateral" wellbore is used herein to designate a wellbore that is drilled outwardly from its intersection with another wellbore, such as a main wellbore. Moreover, a lateral wellbore may have another lateral wellbore drilled outwardly therefrom.

In the embodiment of FIG. **1**, a whipstock assembly **170** according to one or more embodiments of the present disclosure is positioned at a location in the main wellbore **150**. Specifically, the whipstock assembly **170** could be placed at a location in the main wellbore **150** where it is desirable for a lateral wellbore **190** to exit. Accordingly, the whipstock assembly **170** may be used to support a milling tool used to penetrate a window in the main wellbore **150**, and once the window has been milled and a lateral wellbore **190** formed, in some embodiments, the whipstock assembly **170** may be retrieved and returned uphole by a retrieval tool.

The whipstock assembly **170**, in at least one embodiment, includes a whipstock element section **175**, as well as a sealing/anchoring assembly **180** coupled to a downhole end thereof. The sealing/anchoring assembly **180**, in one or more embodiments, includes an orienting receptacle tool assembly **182**, a sealing assembly **184**, and an anchoring assembly **186**. In at least one embodiment, the anchoring assembly **186** axially, and optionally rotationally, fixes the whipstock assembly **170** within the casing string **160**. The sealing assembly **184**, in at least one embodiment, seals (e.g., provides a pressure tight seal) an annulus between the whipstock assembly **170** and the casing string **160**. The orienting receptacle tool assembly **182**, in one or more embodiments, along with a collet and one or more orienting keys, may be used to land and positioned a guided milling assembly and/or the whipstock element section **175** within the casing string **160**.

The elements of the whipstock assembly **170** may be positioned within the main wellbore **150** in one or more separate steps. For example, in at least one embodiment, the scaling/anchoring assembly **180**, including the orienting receptacle tool assembly **182**, sealing assembly **184** and the anchoring assembly **186** are run in hole first, and then set within the casing string **160**. Thereafter, the sealing assembly **184** may be pressure tested. Thereafter, the whipstock element section **175** may be run in hole and coupled to the sealing/anchoring assembly **180**, for example using the orienting receptacle tool assembly **182**. What may result is the whipstock assembly **170** illustrated in FIG. **1**.

Turning now to FIGS. **2**A through **2**G, illustrated are different cross-sectional views of various deployment states of a sealing/anchoring assembly **200** designed, manufactured and/or operated according to one or more embodiments of the disclosure. The scaling/anchoring assembly **200**, in the illustrated embodiment of FIGS. **2**A through **2**G, includes a mandrel **210**. The mandrel **210**, in the illustrated embodiment, is centered about a centerline (CL). The scaling/anchoring assembly **200**, in at least the embodiment of FIGS. **2**A through **2**G, additionally includes a bore **290** positioned around the mandrel **210**. The bore **290**, in at least one embodiment, is a wellbore. The bore **290**, in at least one other embodiment, is a tubular positioned within a wellbore, such as a casing, production tubing, etc. In accordance with one aspect of the disclosure, the mandrel **210** and the bore **290** form an annulus **280**.

In accordance with one embodiment of the disclosure, the sealing/anchoring assembly **200** includes one or more sealing/anchoring elements **220** (e.g., one or more elastomeric scaling/anchoring elements) having a first end **225***a* and a second end **225***b* positioned about the mandrel **210**. The one or more sealing/anchoring elements **220** are operable to move between a radially retracted state, such as that shown in FIG. **2**A, and a radially expanded state, such as that shown in FIGS. **2**B through **2**G. While a single sealing/anchoring element **220** is illustrated in FIGS. **2**A through **2**G, other embodiments exist wherein multiple sealing/anchoring elements **220** are employed. In the embodiment of FIGS. **2**A through **2**G, the one or more sealing/anchoring elements **220** comprise a non-swellable elastomer.

In the illustrated embodiment of FIGS. **2**A through **2**G, first and second backup shoes **230***a*, **230***b*, straddle the first and second ends **225***a*, **225***b*, respectively, of the one or more scaling/anchoring elements **220**. Further to the embodiment of FIGS. **2**A through **2**G, first and second collar sleeves

240*a*, **240***b* straddle the first and second backup shoes **230***a*, **230***b*, respectively. In at least one embodiment, the first and second collar sleeves **240***a*, **240***b* are non-threaded first and second collar sleeves. In the embodiment of FIGS. **2**A through **2**G, a setting sleeve **250** (e.g., an axially fixed setting sleeve) is coupled with the first end **225***a* of the one or more sealing/anchoring elements **220** (e.g., through the first backup shoe **230***a* and first collar sleeve **240***a*). Those skilled in the art understand and appreciate the desire and/or need for the first and second backup shoes **230***a*. **230***b*, including preventing extrusion of the one or more scaling/anchoring elements **220**. Similarly, those skilled in the art appreciate the desire and/or need for the first and second collar sleeves **240***a*, **240***b*. For example, in the illustrated embodiment of FIGS. **2**A through **2**G, the first and second collar sleeves **240***a*, **240***b* are configured to axially slide relative to one another to move the one or more sealing/anchoring elements **220** between the radially retracted state of FIG. **2**A and the radially expanded state of FIGS. **2**B through **2**G.

The sealing/anchoring assembly **200** of FIGS. **2**A through **2**G additionally includes an internally threaded setting sleeve **260** coupled with the second end **225***b* of the sealing/anchoring element **220** (e.g., through the second backup shoe **230***b* and second collar sleeve **240***b*). In the illustrated embodiment, the internally threaded setting sleeve **260** is configured to employ its internal threads **265** to rotate and axially translate along the mandrel **210**, to move the sealing/anchoring element between the radially retracted state of FIG. **2**A and the radially expanded state of FIGS. **2**B through **2**G. For example, in the embodiment of FIGS. **2**A through **2**G, the mandrel **210** has reciprocal external threads **215**. Accordingly, the internal threads **265** of the internally threaded setting sleeve **260** are configured to engage with the external threads **215** of the mandrel **210** to move the sealing/anchoring element **220** between the radially retracted state of FIG. **2**A and the radially expanded state of FIGS. **2**B through **2**G.

The sealing/anchoring assembly **200** of FIGS. **2**A through **2**G additionally includes a rotary motor **270** coupled to the internally threaded setting sleeve **260**. In the illustrated embodiment, the rotary motor **270** (e.g., hydraulic rotary motor, radial piston hydraulic rotary motor, electric rotary motor, etc.) is configured to rotate and axially translate the internally threaded setting sleeve **260** to move the one or more sealing/anchoring elements **220** between the radially retracted state of FIG. **2**A and the radially expanded state of FIGS. **2**B through **2**G. For example, in the illustrated embodiment, the rotary motor **270** is configured to rotate and axially translate the internally threaded setting sleeve **260** to shorten a distance between the internally threaded setting sleeve **260** and the setting sleeve **250** (e.g., axially fixed setting sleeve) thereby compressing the one or more sealing/anchoring elements **220** into the radially expanded state of FIGS. **2**B through **2**G.

In one or more embodiments, the rotary motor **270** has one of a male member or female member, and the internally threaded setting sleeve **260** has the other of the female member or the male member. Accordingly, the male and female members are configured to engage one another to rotationally fix the rotary motor **270** with the internally threaded setting sleeve **260**. In the embodiment of FIGS. **2**A through **2**G, the rotary motor **270** has one or more male members **278** on a downhole face thereof and the internally threaded setting sleeve **260** has one or more female members **268** on an uphole face thereof, the one or more male members **278** of the rotary motor **270** configured to engage with the one or more female members **268** of the internally threaded setting sleeve **260** to rotationally fix the rotary motor **270** with the internally threaded setting sleeve **260**. However, other embodiments may exist wherein the rotary motor has one or more female members and the internally threaded setting sleeve **260** has one or more male members, such as shown in FIG. **2**H.

FIG. **2**A illustrates the sealing/anchoring assembly **200** in a run-in-hole state, and thus its scaling/anchoring element **220** is in a radially retracted state. FIGS. **2**B and **2**C illustrate cross-sectional views of the rotary motor **270** and internally threaded setting sleeve **260**, respectively. FIG. **2**D illustrates the sealing/anchoring assembly **200** as the rotary motor **270** has engaged the internally threaded setting sleeve **260**. FIG. **2**E illustrates the sealing/anchoring assembly **200** after the rotary motor **270** begins to rotate and axially translate the internally threaded setting sleeve **260**. FIG. **2**F illustrates the sealing/anchoring assembly **200** after the sealing/anchoring element **220** is in its fully radially expanded state. FIG. **2**G illustrates the sealing/anchoring assembly **200** after the rotary motor **270** has disengaged from the internally threaded setting sleeve **260**. As discussed above, the threads **265** of the internally threaded setting sleeve **260**, and in the embodiment of FIGS. **2**A through **2**G the threads **265** of the internally threaded setting sleeve **260** along with the external threads **215** in the mandrel **210**, help reduce (e.g., prevent) the back lash or set back issues disclosed above. Moreover, if necessary, the rotary motor **270** could reengage the internally threaded setting sleeve **260** while rotating in an opposite direction to move the one or more sealing/anchoring elements **220** from the radially expanded state back to the radially retracted state.

While the embodiment of FIGS. **2**A through **2**G is configured as a scaling assembly employing one or more different sealing elements, other embodiments exist wherein the scaling/anchoring assembly is an anchoring assembly employing one or more different anchoring elements.

Turning to FIGS. **3**A through **3**G, depicted are various deployment states for a scaling/anchoring assembly **300** designed, manufactured, and operated according to an alternative embodiment of the disclosure. The sealing/anchoring assembly **300** of FIGS. **3**A through **3**G is similar in many respects to the sealing/anchoring assembly **200** of FIGS. **2**A through **2**G. Accordingly, like reference numbers have been used to illustrate similar, if not identical, features. The sealing/anchoring assembly **300** differs, for the most part, from the scaling/anchoring assembly **200**, in that the sealing/anchoring assembly **300** employs a different internally threaded setting sleeve **360**. In the embodiment of FIGS. **3**A through **3**G, the internally threaded setting sleeve **360** includes a first setting sleeve portion **360***a* and a second setting sleeve portion **360***b*. Further to the embodiment of FIGS. **3**A through **3**G, a dissolvable material **370** is positioned between the first setting sleeve portion **360***a* and the second setting sleeve portion **360***b*. In accordance with this embodiment, the dissolvable material **370** is configured to remain intact until the sealing/anchoring element **220** is in its fully radially expanded state (e.g., as shown in FIGS. **3**E and **3**F), and thereafter dissolve leaving independent locking first and second setting sleeve portions **360***c*, **360***d*. At this stage, the independent locking first and second setting sleeve portions **360***c*, **360***d* are no longer rotationally coupled. Most of the sealing/anchoring element **220** setting load will be resisted by the second setting sleeve portion **360***d* and backed up by the first setting sleeve portion **360***c*, for example to resist any possible thread loosening (e.g., that may occur by way of vibration or any other mechanism).

In one or more embodiments, the independent locking first and second setting sleeve portions **360**c, **360**d have male/female connections (e.g., each having a female connection) for future retrieval by the reversed rotary motor **270**. In this embodiment, the independent locking first and second setting sleeve portions **360**c, **360**d would need to be sequentially retrieved.

FIG. **3**A illustrates the sealing/anchoring assembly **300** in a run-in-hole state, and thus its sealing/anchoring element **220** is in a radially retracted state. FIG. **3**B is a zoomed in view of the internally threaded setting sleeve **360** including the first setting sleeve portion **360**a, the second setting sleeve portion **360**b, and the dissolvable material **370**. FIG. **3**C illustrates the sealing/anchoring assembly **300** as the rotary motor **270** has engaged the internally threaded setting sleeve **360**. FIG. **3**D illustrates the sealing/anchoring assembly **300** after the rotary motor **270** begins to rotate and axially translate the internally threaded setting sleeve **360**. FIG. **3**E illustrates the sealing/anchoring assembly **300** after the sealing/anchoring element **220** is in its fully radially expanded state. FIG. **3**F illustrates the sealing/anchoring assembly **300** after the rotary motor **270** has disengaged from the internally threaded setting sleeve **360**. FIG. **3**G is a zoomed in view of the internally threaded setting sleeve **360** including the independent locking first and second setting sleeve portions **360**c, **360**d.

Turning to FIGS. **4**A through **4**G, depicted are various deployment states for a sealing/anchoring assembly **400** designed, manufactured and operated according to an alternative embodiment of the disclosure. The sealing/anchoring assembly **400** of FIGS. **4**A through **4**G is similar in many respects to the sealing/anchoring assembly **300** of FIGS. **3**A through **3**G. Accordingly, like reference numbers have been used to illustrate similar, if not identical, features. The sealing/anchoring assembly **400** differs, for the most part, from the sealing/anchoring assembly **300**, in that the sealing/anchoring assembly **400** employs a different internally threaded setting sleeve **460**. In the embodiment of FIGS. **4**A through **4**G, the first setting sleeve portion **460**a has one of a male member **470**a or female member **470**b, and the second setting sleeve portion **460**b has the other of the female member **470**b or the male member **470**a. In this embodiment, the male and female member **470**a, **470**b are configured to rotationally fix the first setting sleeve portion **460**a and the second setting sleeve portion **460**b as the sealing/anchoring element **220** is moving from the radially retracted state to the radially expanded state, but allow the second setting sleeve portion **460**b to be at least partially rotationally free from the first setting sleeve portion **460**a once the sealing/anchoring element **220** is in its fully radially expanded state, thereby leaving independent locking first and second setting sleeve portions. For example, in at least one embodiment the female member **470**b is an arced slot that is larger than the male member **470**a (e.g., as shown in FIGS. **4**D and **4**G), which allows for the foregoing.

In at least one embodiment, once the sealing/anchoring element **220** is set and before retrieving the rotary motor **270**, a small un-twisting may be applied to the first setting sleeve portion **460**a releasing the rotational constraint between the first and second setting sleeve portions **460**a, **460**b. In at least one embodiment, the axial constraint may still be maintained through an optional compressible disk or washer (not shown) located between the first and second setting sleeve portions **460**a, **460**b. Therefore, any potential loosening of the second setting sleeve portion **460**b is resisted by the first setting sleeve portion **460**a. For retrieval, the rotary motor **270** may un-torque the first setting sleeve portion **460**a, which will automatically un-torque and release the second setting sleeve portion **460**b, and ultimately the sealing/anchoring element **220** subsequently.

FIG. **4**A illustrates the sealing/anchoring assembly **400** in a run-in-hole state, and thus its sealing/anchoring element **220** is in a radially retracted state. FIG. **4**B illustrates the sealing/anchoring assembly **400** as the rotary motor **270** has engaged the internally threaded setting sleeve **460**. FIG. **4**C illustrates the sealing/anchoring assembly **400** after the rotary motor **270** begins to rotate and axially translate the internally threaded setting sleeve **460**. FIG. **4**D illustrates a cross-sectional view of an interaction between the first and second setting sleeve portions **460**a, **460**b of FIG. **4**C. FIG. **4**E illustrates the sealing/anchoring assembly **400** after the sealing/anchoring element **220** is in its fully radially expanded state. FIG. **4**F illustrates the sealing/anchoring assembly **400** after the rotary motor **270** has disengaged from the internally threaded setting sleeve **460**. FIG. **4**G illustrates a cross-sectional view of an interaction between the first and second setting sleeve portions **460**a, **460**b of FIG. **4**F.

Turning to FIGS. **5**A through **5**E, depicted are various deployment states for a sealing/anchoring assembly **500** designed, manufactured and operated according to an alternative embodiment of the disclosure. The sealing/anchoring assembly **500** of FIGS. **5**A through **5**E is similar in many respects to the sealing/anchoring assembly **300** of FIGS. **3**A through **3**G. Accordingly, like reference numbers have been used to illustrate similar, if not identical, features. The sealing/anchoring assembly **500** differs, for the most part, from the sealing/anchoring assembly **300**, in that the sealing/anchoring assembly **500** employs a different internally threaded setting sleeve **560**. In the embodiment of FIGS. **5**A through **5**E, the first setting sleeve portion **560**a and the second setting sleeve portion **560**b include one or more axially aligned passageways **570**a. **570**b therethrough. In this embodiment, the one or more axially aligned passageways **570**a, **570**b are configured to receive one or more related post members **575** from a rotary motor **570** coupled thereto. Accordingly, the first and second setting sleeve portions **560**a, **560**b are rotationally fixed relative to one another when the one or more related post members **575** are within the one or more axially aligned passageways **570**a, **570**b, but are independent locking first and second setting sleeve portions free to rotate relative to one another when the one or more related post members **575** are not within the one or more axially aligned passageways **570**a, **570**b.

In at least one embodiment, there is no mechanical connection between the first setting sleeve portion **560**a and the second setting sleeve portion **560**b, but the one or more related post members **575** penetrate the one or more axially aligned passageways **570**a, **570**b, and thus rotate the first setting sleeve portion **560**a and the second setting sleeve portion **560**b at the same time. Retrieval of the sealing/anchoring assembly **500** is reverse of the setting process, where the first setting sleeve portion **560**a and the second setting sleeve portion **560**b will be un-torqued by the rotary motor **570** having the one or more related post members **575**.

FIG. **5**A illustrates the sealing/anchoring assembly **500** in a run-in-hole state, and thus its sealing/anchoring element **220** is in a radially retracted state. FIG. **5**B illustrates the sealing/anchoring assembly **500** as the rotary motor **570** has engaged the internally threaded setting sleeve **560**. FIG. **5**C illustrates the sealing/anchoring assembly **500** after the rotary motor **570** begins to rotate and axially translate the internally threaded setting sleeve **560**. FIG. **5**D illustrates the sealing/anchoring assembly **500** after the sealing/anchoring element **220** is in its fully radially expanded state. FIG. **5**E illustrates the sealing/anchoring assembly **500** after the rotary motor **570** has disengaged from the internally threaded setting sleeve **560**.

Aspects disclosed herein include:

A. An anchoring/scaling assembly, the anchoring/sealing assembly including: 1) a mandrel; 2) a sealing/anchoring element positioned about the mandrel; 3) a setting sleeve coupled with a first end of the sealing/anchoring element; and 4) an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state

B. A well system, the well system including: 1) a wellbore located in a subterranean formation; and 2) a sealing/anchoring assembly positioned in the wellbore, the sealing/anchoring assembly including: a) a mandrel; b) a scaling/anchoring element positioned about the mandrel; c) a setting sleeve coupled with a first end of the sealing/anchoring element; and d) an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state.

C. A method, the method including: 1) positioning a sealing/anchoring assembly within a wellbore located in a subterranean formation, the sealing/anchoring assembly including: a) a mandrel; b) a sealing/anchoring element positioned about the mandrel; c) a setting sleeve coupled with a first end of the sealing/anchoring element; and d) an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state; 2) coupling a rotary motor with the internally threaded setting sleeve; and 3) actuating the rotary motor to rotate and axially translate the internally threaded setting sleeve to move the sealing/anchoring element from the radially retracted state to the radially expanded state.

Aspects A, B and C may have one or more of the following additional elements in combination: Element 1: wherein the mandrel has external threads to move the sealing/anchoring element between the radially retracted state and the radially expanded state. Element 2: further including a rotary motor coupled to the internally threaded setting sleeve, the rotary motor configured to rotate and axially translate the internally threaded setting sleeve to move the sealing/anchoring element between the radially retracted state and the radially expanded state. Element 3: wherein the rotary motor has one of a male member or female member, and the internally threaded setting sleeve has an other of the female member or the male member, the male and female members configured to rotationally fix the rotary motor with the internally threaded setting sleeve. Element 4: wherein the rotary motor has one or more male members on a downhole face thereof and the internally threaded setting sleeve has one or more female members on an uphole face thereof, the one or more male members of the rotary motor configured to engage with the one or more female members of the internally threaded setting sleeve to rotationally fix the rotary motor with the internally threaded setting sleeve. Element 5: wherein the internally threaded setting sleeve includes a first setting sleeve portion and a second setting sleeve portion. Element 6: further including a dissolvable material positioned between the first setting sleeve portion and the second setting sleeve portion, the dissolvable material configured to remain intact until the sealing/anchoring element is in its fully radially expanded state and thereafter dissolve leaving independent locking first and second setting sleeve portions. Element 7: wherein the first setting sleeve portion has one of a male member or female member, and the second setting sleeve portion has an other of the female member or the male member, the male and female members configured to rotationally fix the first setting sleeve portion and the second setting sleeve portion as the sealing/anchoring element is moving from the radially retracted state to the radially expanded state but allow the second setting sleeve portion to be at least partially rotationally free from the first setting sleeve portion once the scaling/anchoring element is in its fully radially expanded state, thereby leaving independent locking first and second setting sleeve portions. Element 8: wherein the first setting sleeve portion and the second setting sleeve portion include one or more axially aligned passageways therethrough, the one or more axially aligned passageways configured to receive one or more related post members from a rotary motor coupled thereto, such that the first and second setting sleeve portions are rotationally fixed relative to one another when the one or more related post members are within the one or more axially aligned passageways but are independent locking first and second setting sleeve portions free to rotate relative to one another when the one or more related post members are not within the one or more axially aligned passageways. Element 9: further including a first collar sleeve disposed between the first end of the sealing/anchoring element and the setting sleeve and a second collar sleeve disposed between the second end of the sealing/anchoring element and the internally threaded setting sleeve. Element 10: further including a first backup shoe disposed between the first end of the sealing/anchoring element and the first collar sleeve and a second backup shoe disposed between the second end of the sealing/anchoring element and the second collar sleeve. Element 11: wherein the setting sleeve is an axially fixed setting sleeve. Element 12: wherein the wellbore is a main wellbore, and further including a lateral wellbore extending from the main wellbore, the sealing/anchoring assembly positioned proximate an intersection between the main wellbore and the lateral wellbore.

Those skilled in the art to which this application relates will appreciate that other and further additions, deletions, substitutions and modifications may be made to the described embodiments.

What is claimed is:

1. A sealing/anchoring assembly, comprising:
- a mandrel;
- a sealing/anchoring element positioned about the mandrel;
- a setting sleeve coupled with a first end of the sealing/anchoring element; and
- an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state, wherein the internally threaded setting sleeve includes a first setting sleeve portion and a second setting sleeve portion, and further including a dissolvable material positioned between the first setting sleeve portion and the second setting sleeve portion, the

dissolvable material configured to remain intact until the sealing/anchoring element is in its fully radially expanded state and thereafter dissolve leaving independent locking first and second setting sleeve portions.

2. The sealing/anchoring assembly as recited in claim **1**, wherein the mandrel has external threads, the internal threads of the internally threaded setting sleeve configured to engage with the external threads to move the sealing/anchoring element between the radially retracted state and the radially expanded state.

3. The sealing/anchoring assembly as recited in claim **1**, further including a first collar sleeve disposed between the first end of the sealing/anchoring element and the setting sleeve and a second collar sleeve disposed between the second end of the sealing/anchoring element and the internally threaded setting sleeve.

4. The sealing/anchoring assembly as recited in claim **3**, further including a first backup shoe disposed between the first end of the sealing/anchoring element and the first collar sleeve and a second backup shoe disposed between the second end of the sealing/anchoring element and the second collar sleeve.

5. The sealing/anchoring assembly as recited in claim **3**, wherein the setting sleeve is an axially fixed setting sleeve.

6. The sealing/anchoring assembly as recited in claim **1**, further including a rotary motor coupled to the internally threaded setting sleeve, the rotary motor configured to rotate and axially translate the internally threaded setting sleeve to move the sealing/anchoring element between the radially retracted state and the radially expanded state.

7. The sealing/anchoring assembly as recited in claim **6**, wherein the rotary motor has one of a male member or female member, and the internally threaded setting sleeve has an other of the female member or the male member, the male and female members configured to rotationally fix the rotary motor with the internally threaded setting sleeve.

8. The sealing/anchoring assembly as recited in claim **7**, wherein the rotary motor has one or more male members on a downhole face thereof and the internally threaded setting sleeve has one or more female members on an uphole face thereof, the one or more male members of the rotary motor configured to engage with the one or more female members of the internally threaded setting sleeve to rotationally fix the rotary motor with the internally threaded setting sleeve.

9. A well system, comprising:

a wellbore located in a subterranean formation; and

a sealing/anchoring assembly positioned in the wellbore, the sealing/anchoring assembly including:

a mandrel;

a sealing/anchoring element positioned about the mandrel;

a setting sleeve coupled with a first end of the sealing/anchoring element;

an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state, wherein the internally threaded setting sleeve includes a first setting sleeve portion and a second setting sleeve portion, and further including a dissolvable material positioned between the first setting sleeve portion and the second setting sleeve portion, the dissolvable material configured to remain intact until the sealing/anchoring element is in its fully radially expanded state and thereafter dissolve leaving independent locking first and second setting sleeve portions.

10. The well system as recited in claim **9**, wherein the wellbore is a main wellbore, and further including a lateral wellbore extending from the main wellbore, the sealing/anchoring assembly positioned proximate an intersection between the main wellbore and the lateral wellbore.

11. The well system as recited in claim **9**, wherein the mandrel has external threads, the internal threads of the internally threaded setting sleeve configured to engage with the external threads to move the sealing/anchoring element between the radially retracted state and the radially expanded state.

12. The well system as recited in claim **9**, further including a first collar sleeve disposed between the first end of the sealing/anchoring element and the setting sleeve and a second collar sleeve disposed between the second end of the sealing/anchoring element and the internally threaded setting sleeve.

13. The well system as recited in claim **12**, further including a first backup shoe disposed between the first end of the sealing/anchoring element and the first collar sleeve and a second backup shoe disposed between the second end of the sealing/anchoring element and the second collar sleeve.

14. The well system as recited in claim **12**, wherein the setting sleeve is an axially fixed setting sleeve.

15. The well system as recited in claim **9**, further including a rotary motor coupled to the internally threaded setting sleeve, the rotary motor configured to rotate and axially translate the internally threaded setting sleeve to move the sealing/anchoring element between the radially retracted state and the radially expanded state.

16. The well system as recited in claim **15**, wherein the rotary motor has one of a male member or female member, and the internally threaded setting sleeve has an other of the female member or the male member, the male and female members configured to rotationally fix the rotary motor with the internally threaded setting sleeve.

17. The well system as recited in claim **16**, wherein the rotary motor has one or more male members on a downhole face thereof and the internally threaded setting sleeve has one or more female members on an uphole face thereof, the one or more male members of the rotary motor configured to engage with the one or more female members of the internally threaded setting sleeve to rotationally fix the rotary motor with the internally threaded setting sleeve.

18. A method, comprising:

positioning a sealing/anchoring assembly within a wellbore located in a subterranean formation, the sealing/anchoring assembly including:

a mandrel;

a sealing/anchoring element positioned about the mandrel;

a setting sleeve coupled with a first end of the sealing/anchoring element; and

an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state, wherein the internally threaded setting sleeve includes a first setting sleeve portion and a second setting sleeve portion, and further including a dissolvable material positioned between the first setting sleeve portion and the second setting sleeve portion, the dissolvable material configured to remain intact until the sealing/anchoring element is in its fully radially expanded state and thereafter dissolve leaving independent locking first and second setting sleeve portions;

coupling a rotary motor with the internally threaded setting sleeve; and

actuating the rotary motor to rotate and axially translate the internally threaded setting sleeve to move the sealing/anchoring element from the radially retracted state to the radially expanded state.

19. A sealing/anchoring assembly, comprising:

a mandrel;

a sealing/anchoring element positioned about the mandrel;

a setting sleeve coupled with a first end of the sealing/anchoring element;

an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state, wherein the internally threaded setting sleeve includes a first setting sleeve portion and a second setting sleeve portion, wherein the first setting sleeve portion has one of a male member or female member, and the second setting sleeve portion has an other of the female member or the male member, the male and female members configured to rotationally fix the first setting sleeve portion and the second setting sleeve portion as the sealing/anchoring element is moving from the radially retracted state to the radially expanded state but allow the second setting sleeve portion to be at least partially rotationally free from the first setting sleeve portion once the sealing/anchoring element is in its fully radially expanded state, thereby leaving independent locking first and second setting sleeve portions; and

a rotary motor positioned about the mandrel, the rotary motor configured to axially translate along the mandrel without rotating to engage the internally threaded setting sleeve, and then after engaging the internally threaded setting sleeve rotate and axially translate to rotate and axially translate the internally threaded setting sleeve along the mandrel.

20. A sealing/anchoring assembly, comprising:

a mandrel;

a sealing/anchoring element positioned about the mandrel;

a setting sleeve coupled with a first end of the sealing/anchoring element;

an internally threaded setting sleeve coupled with a second end of the sealing/anchoring element, the internally threaded setting sleeve configured to employ its internal threads to rotate and axially translate along the mandrel to move the sealing/anchoring element between a radially retracted state a radially expanded state, wherein the internally threaded setting sleeve includes a first setting sleeve portion and a second setting sleeve portion, wherein the first setting sleeve portion and the second setting sleeve portion include one or more axially aligned passageways therethrough, the one or more axially aligned passageways configured to receive one or more related post members from a rotary motor coupled thereto, such that the first and second setting sleeve portions are rotationally fixed relative to one another when the one or more related post members are within the one or more axially aligned passageways but are independent locking first and second setting sleeve portions free to rotate relative to one another when the one or more related post members are not within the one or more axially aligned passageways; and

the rotary motor positioned about the mandrel, the rotary motor configured to axially translate along the mandrel without rotating to engage the internally threaded setting sleeve, and then after engaging the internally threaded setting sleeve rotate and axially translate to rotate and axially translate the internally threaded setting sleeve along the mandrel.

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