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(54) **ENERGY TRANSFER MECHANISM FOR A JUNCTION ASSEMBLY TO COMMUNICATE WITH A LATERAL COMPLETION ASSEMBLY**

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E21B 47/13 (2006.01)

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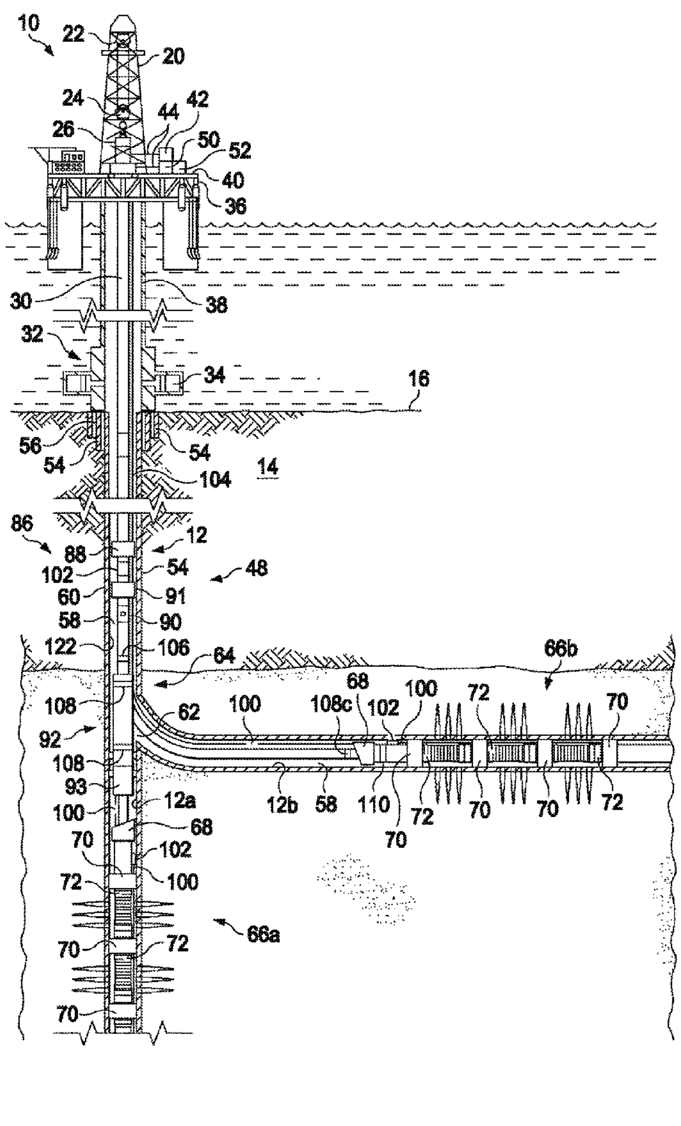
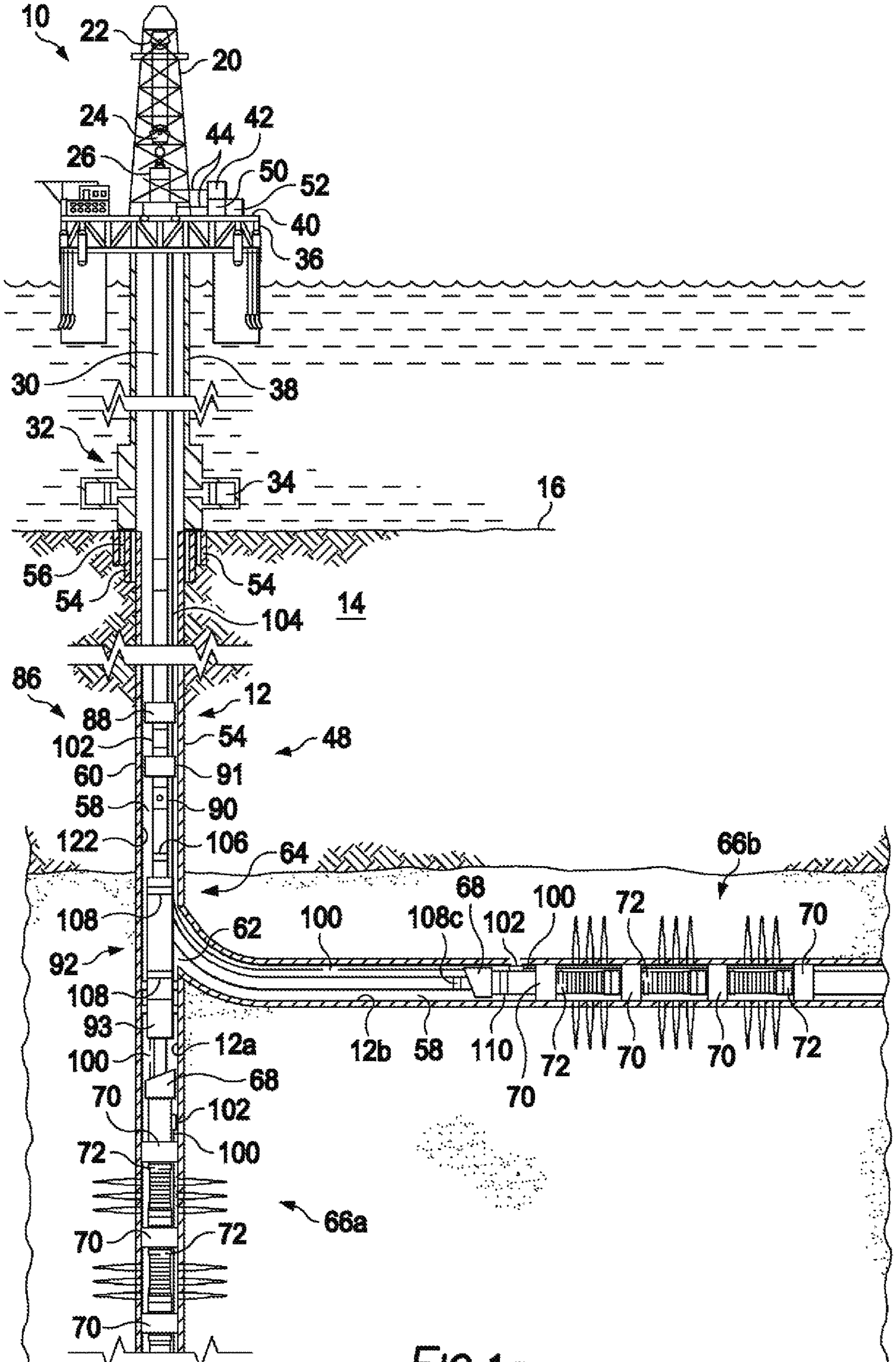
(57) **ABSTRACT**

A system and method to controlling fluid flow to/from multiple intervals in a lateral wellbore. The system and method can include a unitary multibranch inflow control (MIC) junction assembly (a primary passageway through a primary leg and a lateral passageway through a lateral leg) installed at an intersection of main and lateral wellbores. An upper energy transfer mechanism (ETM) can be mounted along the primary passageway, and control lines **100** can provide communication between the upper ETM **214** and lower completion assembly equipment. A lower ETM can be mounted along the lateral passageway, with the upper ETM in communication with the lower ETM via the control lines. A tubing string can be extended through the primary passageway to access lower completion assembly equipment. The upper ETM can communicate with a tubing string ETM to receive/transmit control, data, and/or power signals from/to lower completion equipment in the lateral wellbores.

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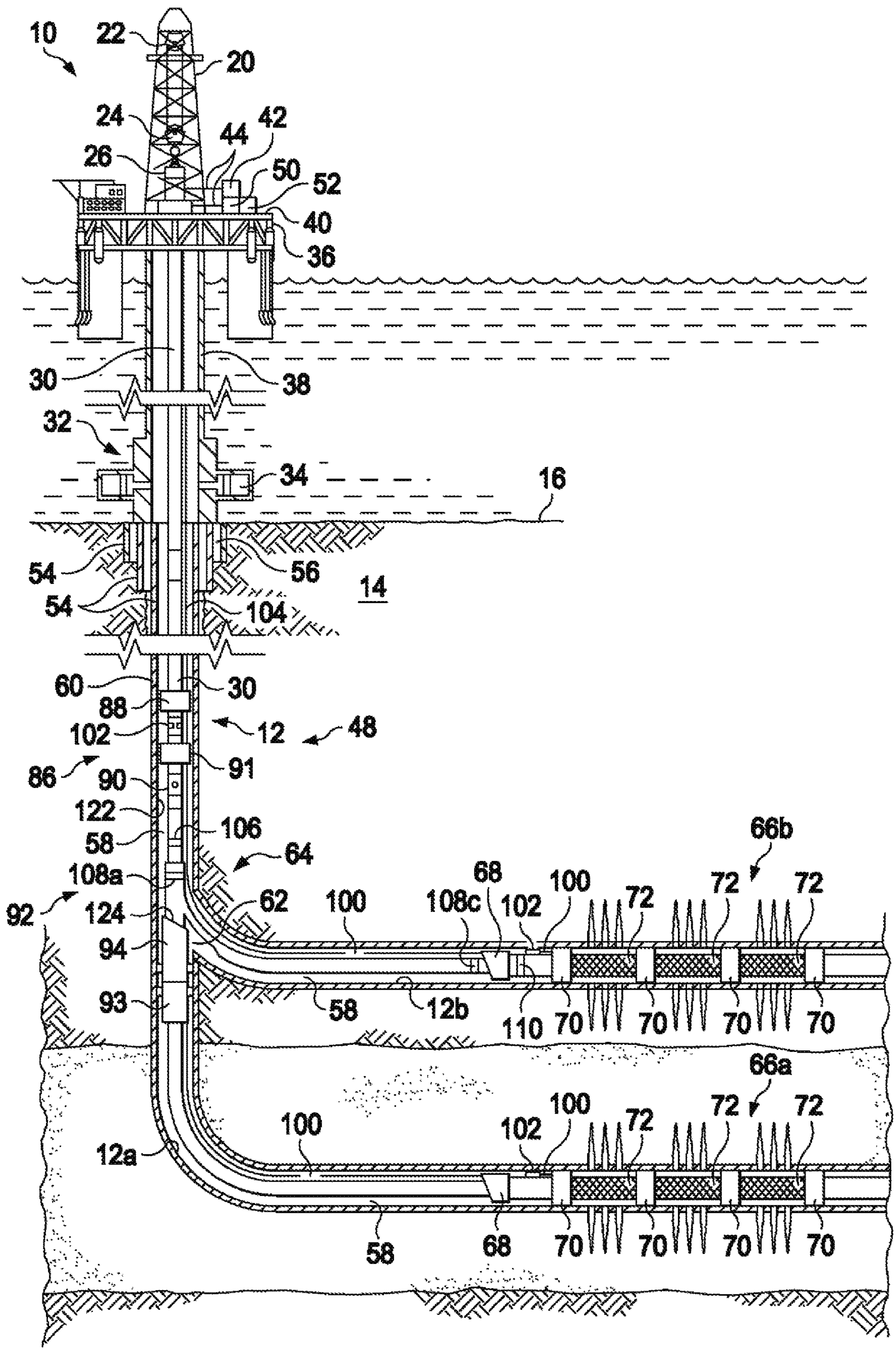
102
54
48
60
91
58
90
122
106
64
66b
68
100
108c
102
100
72
70
108
62
100
92
108
93
12a
12b
58
110
72
70
70
72
70
100
68
70
102
100
72
66a
70
72
70

FIG. 1a



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102
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64
108a
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100
66b
72
72
92
124
62
100
108c
102
72
94
93
58
12b
110
70
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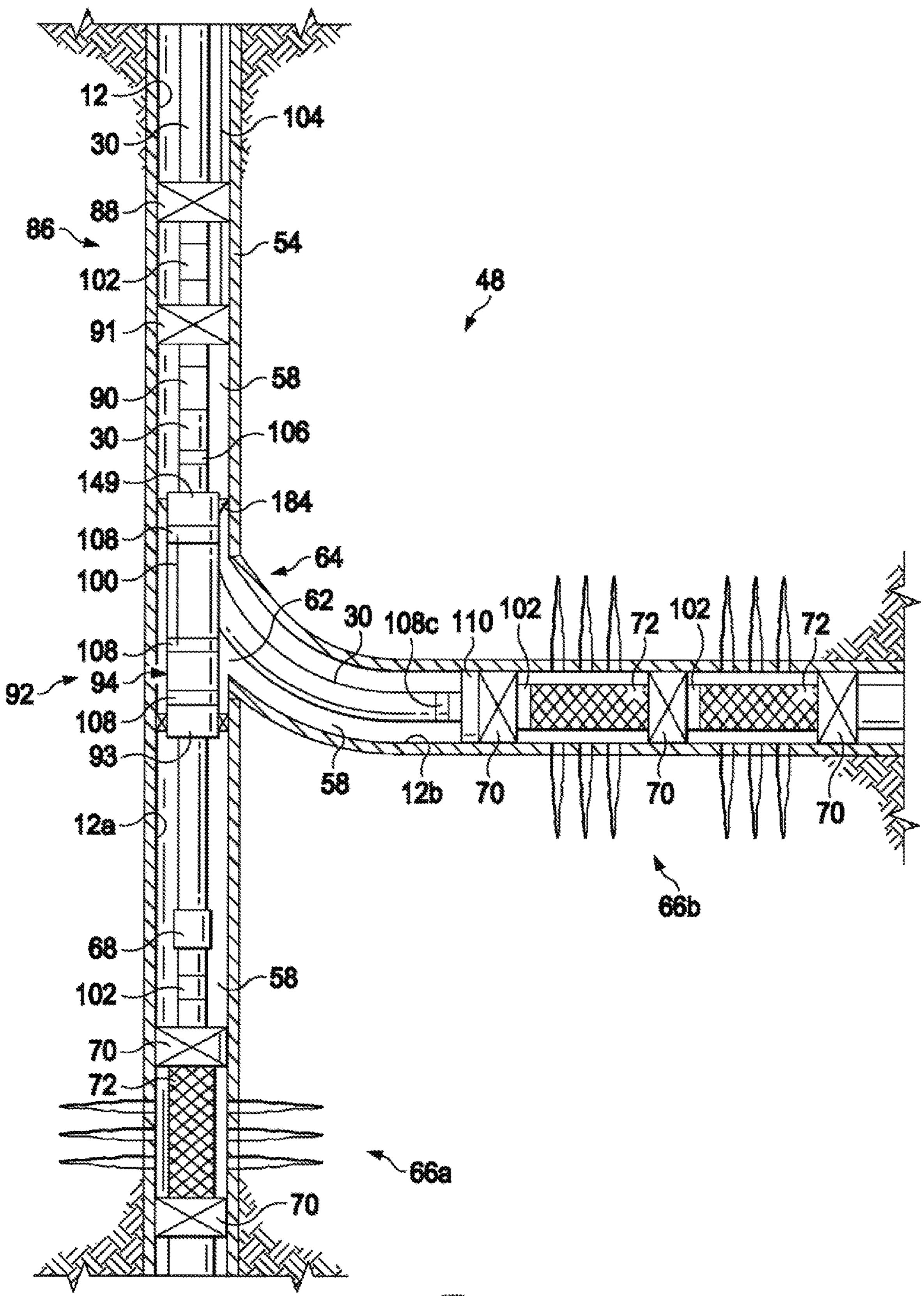
66a
100
72
72
72
102
100
12a
58
68
70
70
70
70

FIG. 1b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108c
110
102
72
102
72
108
92
94
108
93
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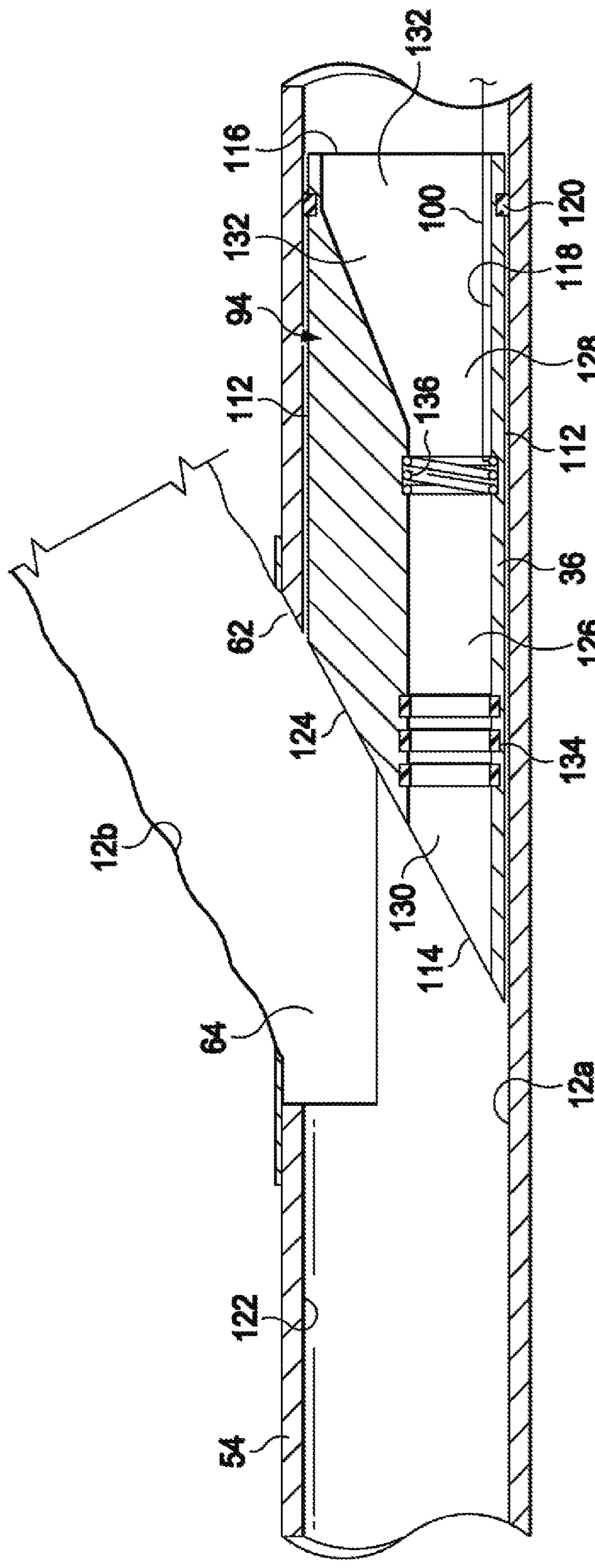
12b
70
70
70
12a
66b
68
102
58
70
72
66a
70

FIG. 1c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132
100
120
118
94
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136
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36
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124
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12b
130
114
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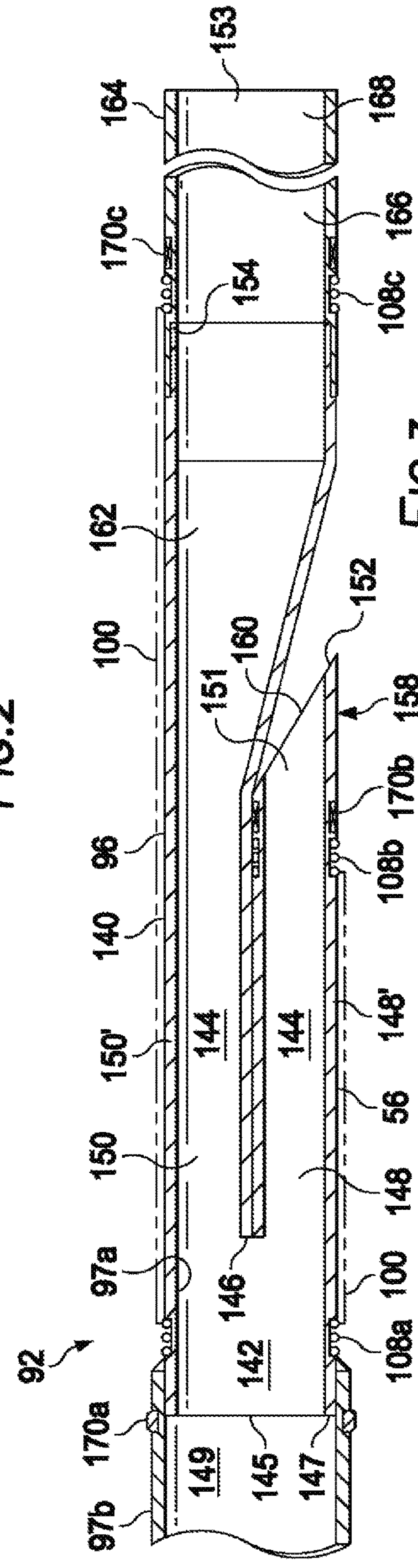
12a
122
54

FIG.2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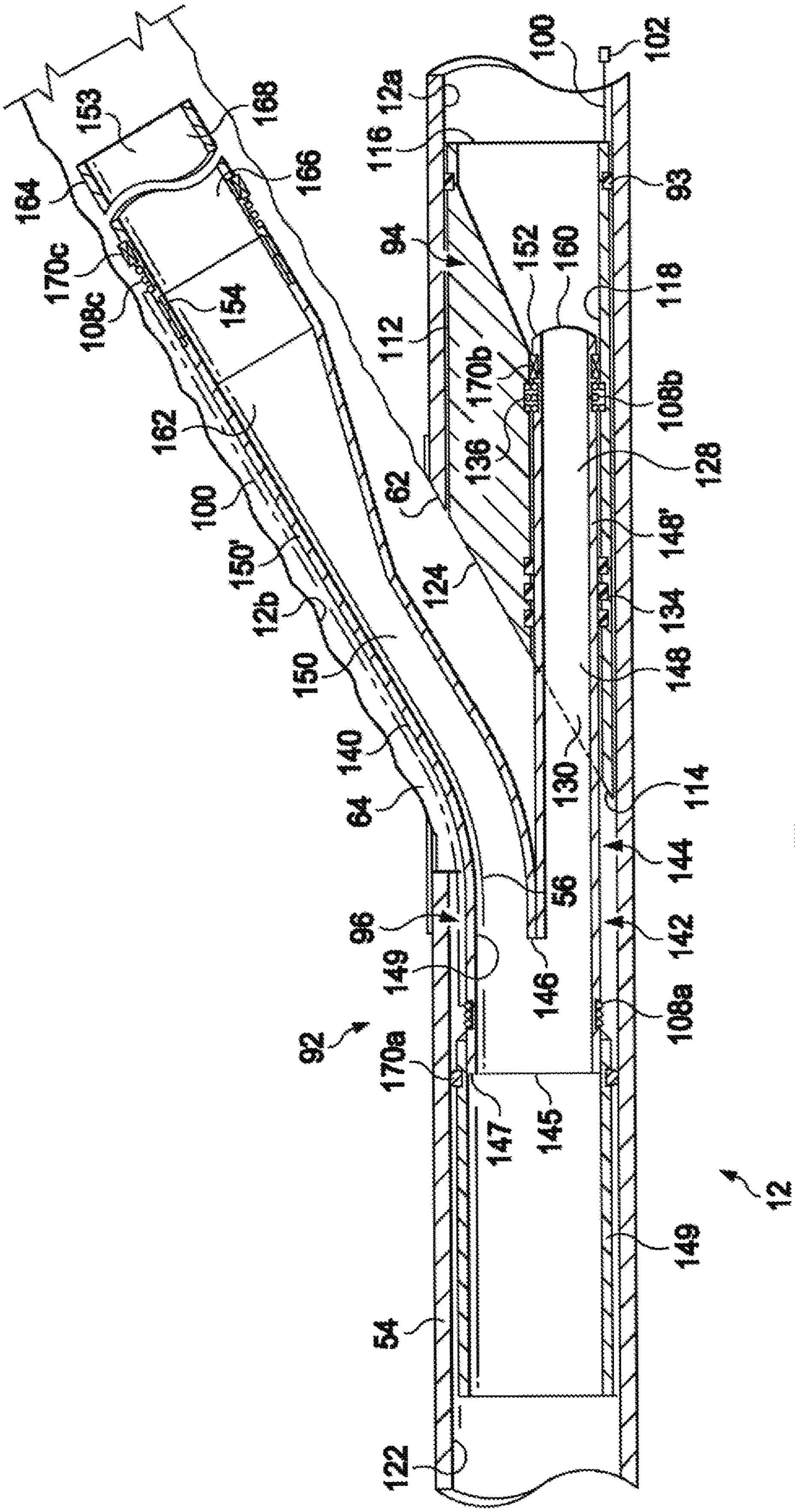
164
168
170c
166
154
108c
162
152
100
151
160
158
170b
96
108b
140
144
144
150'
148'
56
150
148
97a
146
100
92
142
108a
170a
149
145
147
97b

FIG.3



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102
12a
116
93
153
168
166
164
94
152
160
118
170c
154
108c
112
170b
108b
136
128
162
62
148'
100
150'
124
134
12b
148
150
140
130
114
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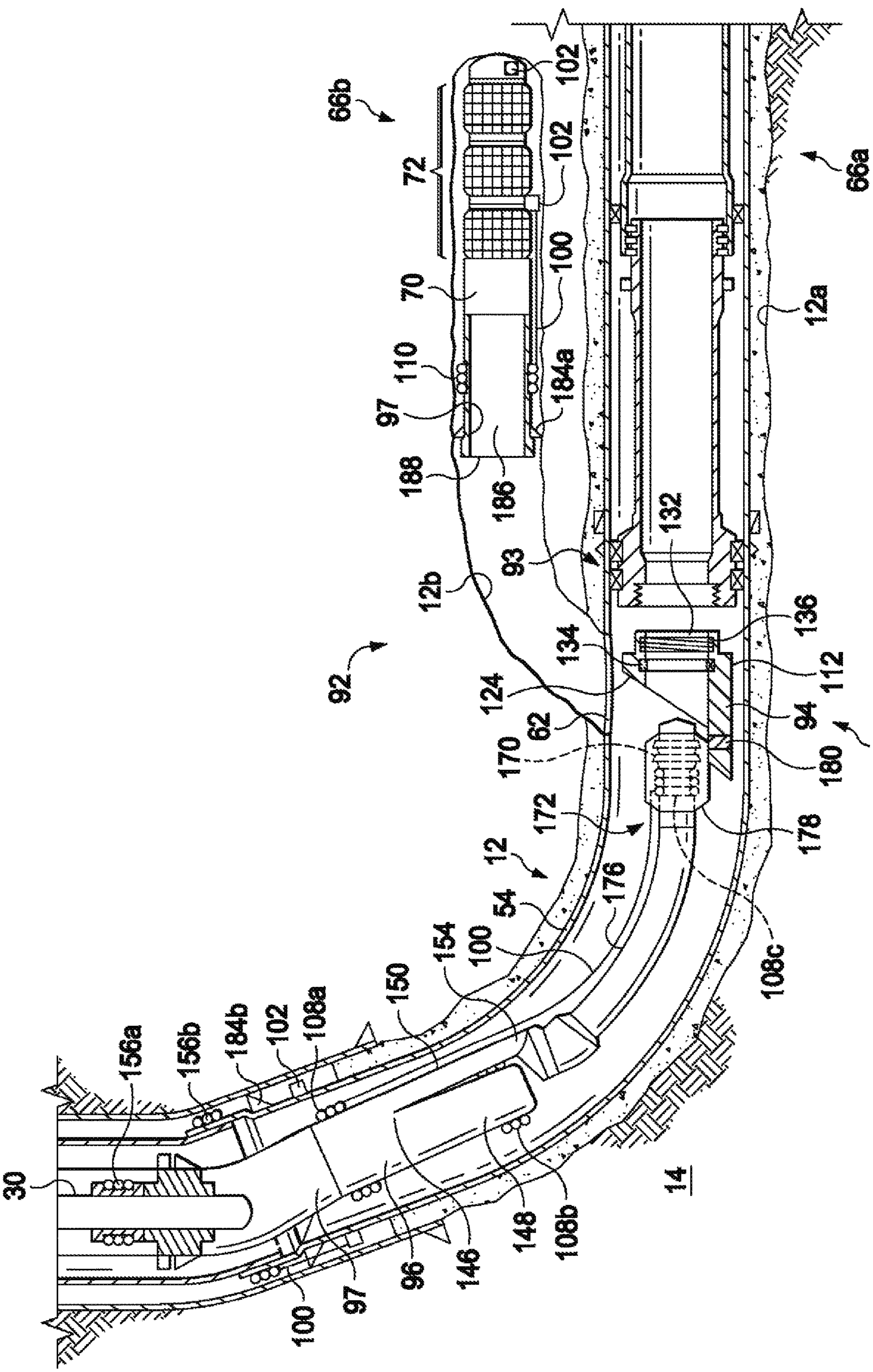
56
96
142
149
146
92
108a
170a
147
145
12
149
54
122

FIG. 4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100
100
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97
184a
188
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66a
12a
93
132
12b
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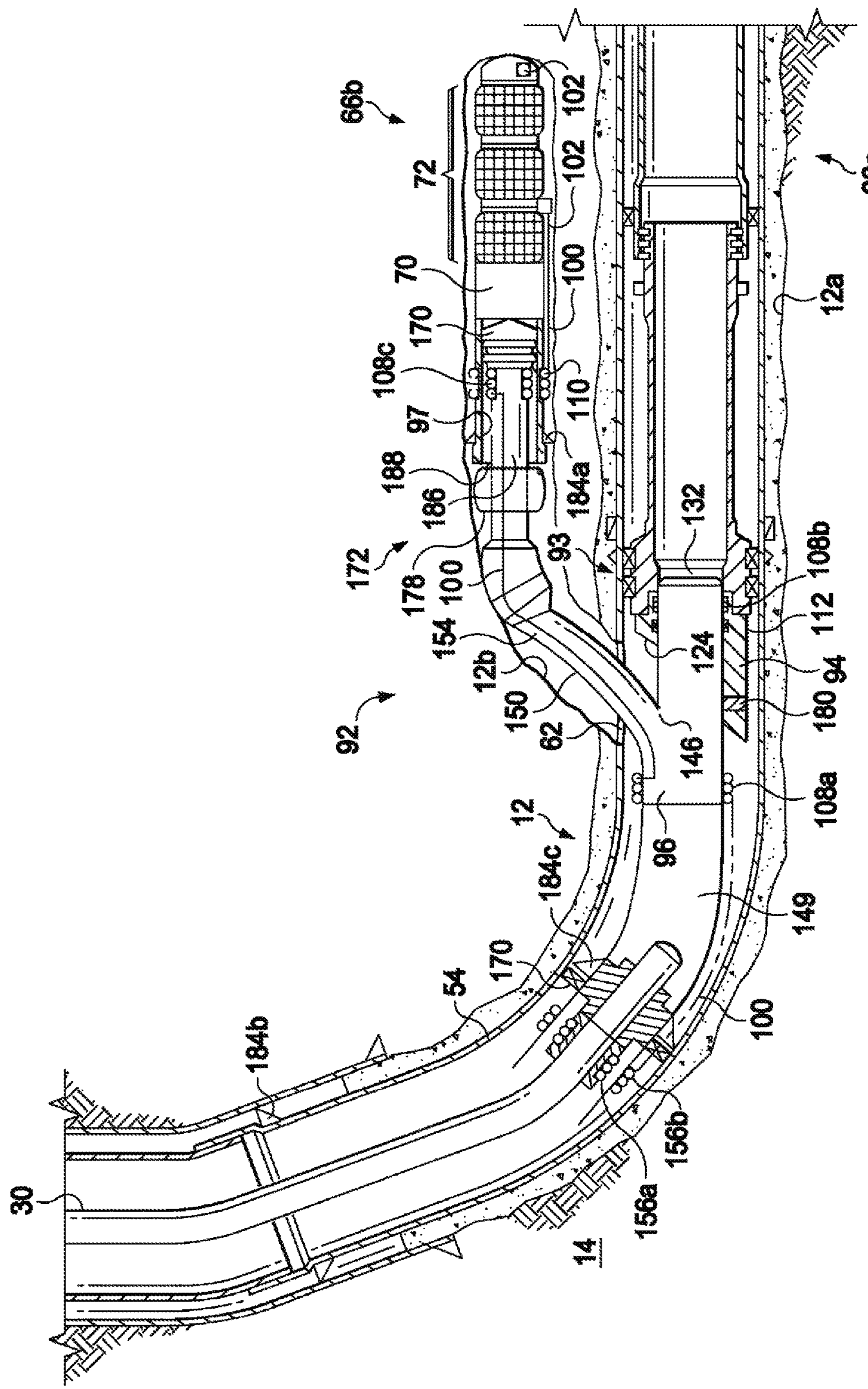
134
136
124
112
62
94
170
180
64
172
178
12
176
54
100
154
108c
150
156a
156b
184b
102
108a
30
14
100
97
96
146
148
108b

FIG.5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112
154
124
94
12b
180
92
150
62
146
108a
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184c
149
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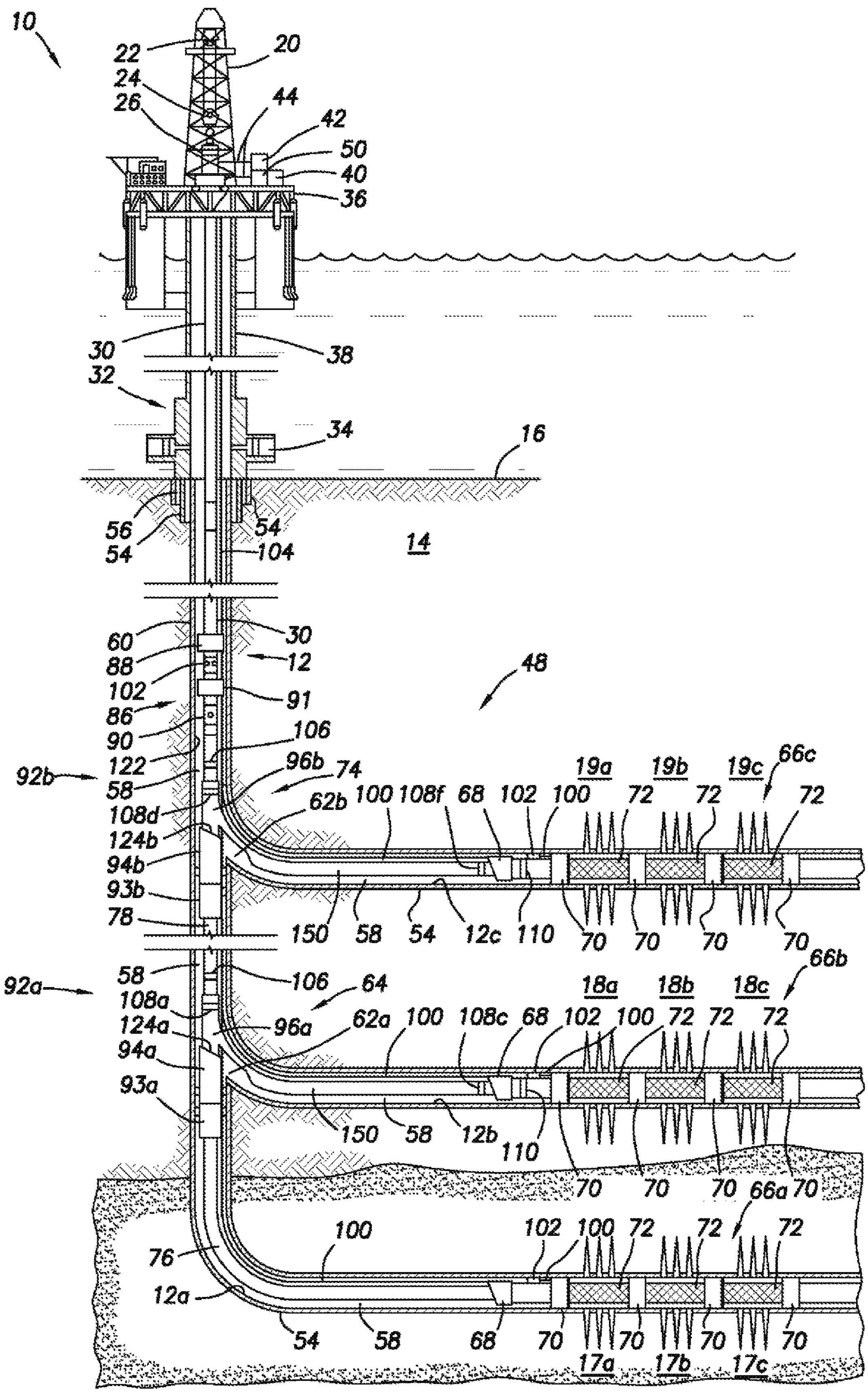
184b
156b
30
156a
14
66a
12a

FIG. 6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30
88
12
102
91
86
48
90
106
122
92b
58
96b
74
108d
62b
100
108f
68
102
100
19a
19b
19c
66c
72
72
72
124b
94b
93b
78
150
58
54
12c
110
70
70
70
70
58
106
64
92a
108a
124a
96a
62a
100
108c
68
102
100
72
72
72
18a
18b
18c
66b
94a
93a
150
58
12b
110
70
70
70
70
66a
100
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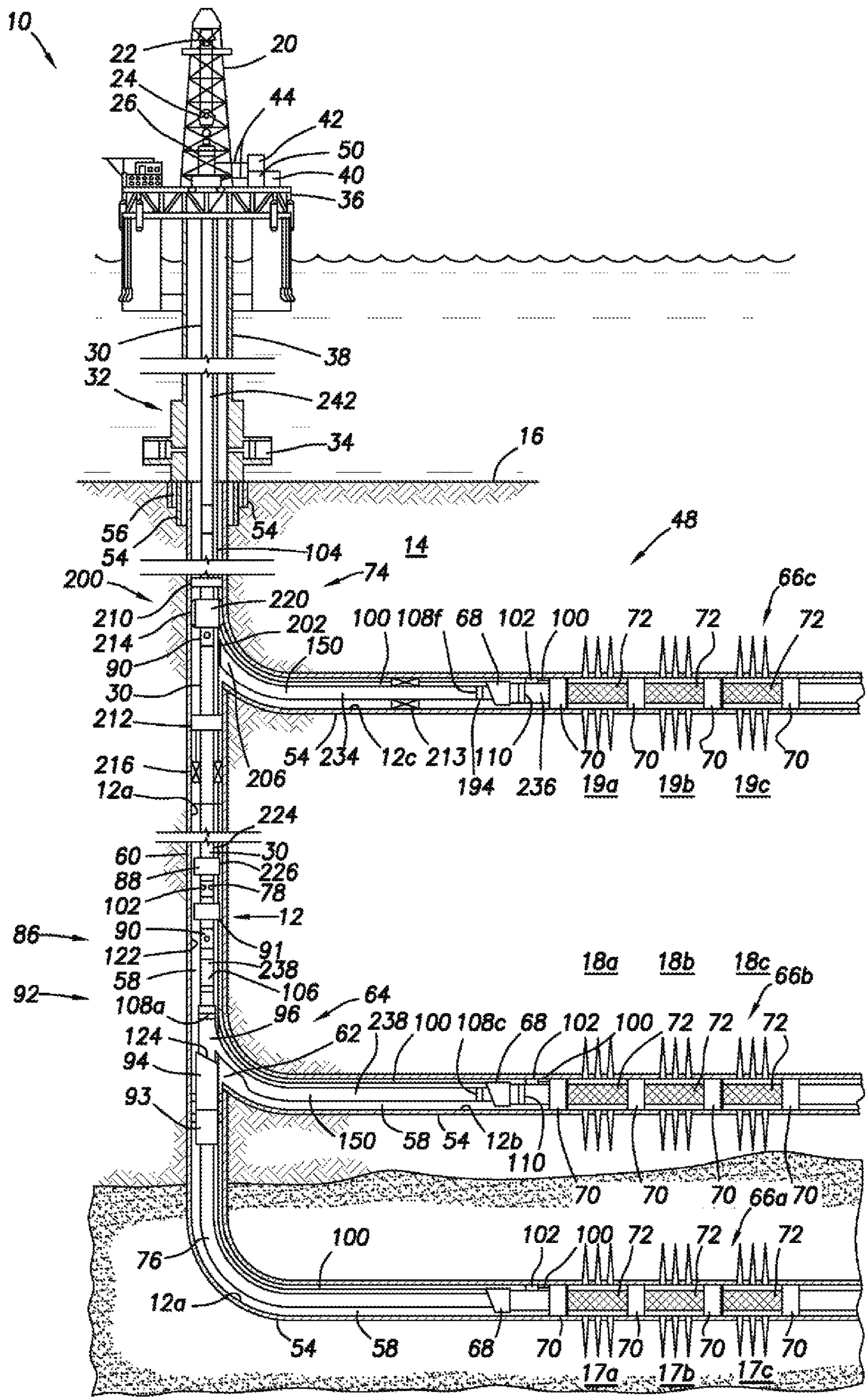
72
72
76
12a
54
58
68
70
70
70
70
17a
17b
17c

FIG. 7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38
32
242
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34
56
54
54
104
14
48
200
74
210
220
214
202
90
150
30
212
216
12a
206
100
108f
68
102
100
72
72
66c
72
54
234
12c
213
110
194
236
70
70
70
70
19a
19b
19c
224
60
30
88
226
102
78
12
86
90
91
122
238
58
106
92
108a
64
96
124
62
94
93
238
100
108c
68
102
100
72
72
72
66b
18a
18b
18c
150
58
54
12b
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70
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70
76
100
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54
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68
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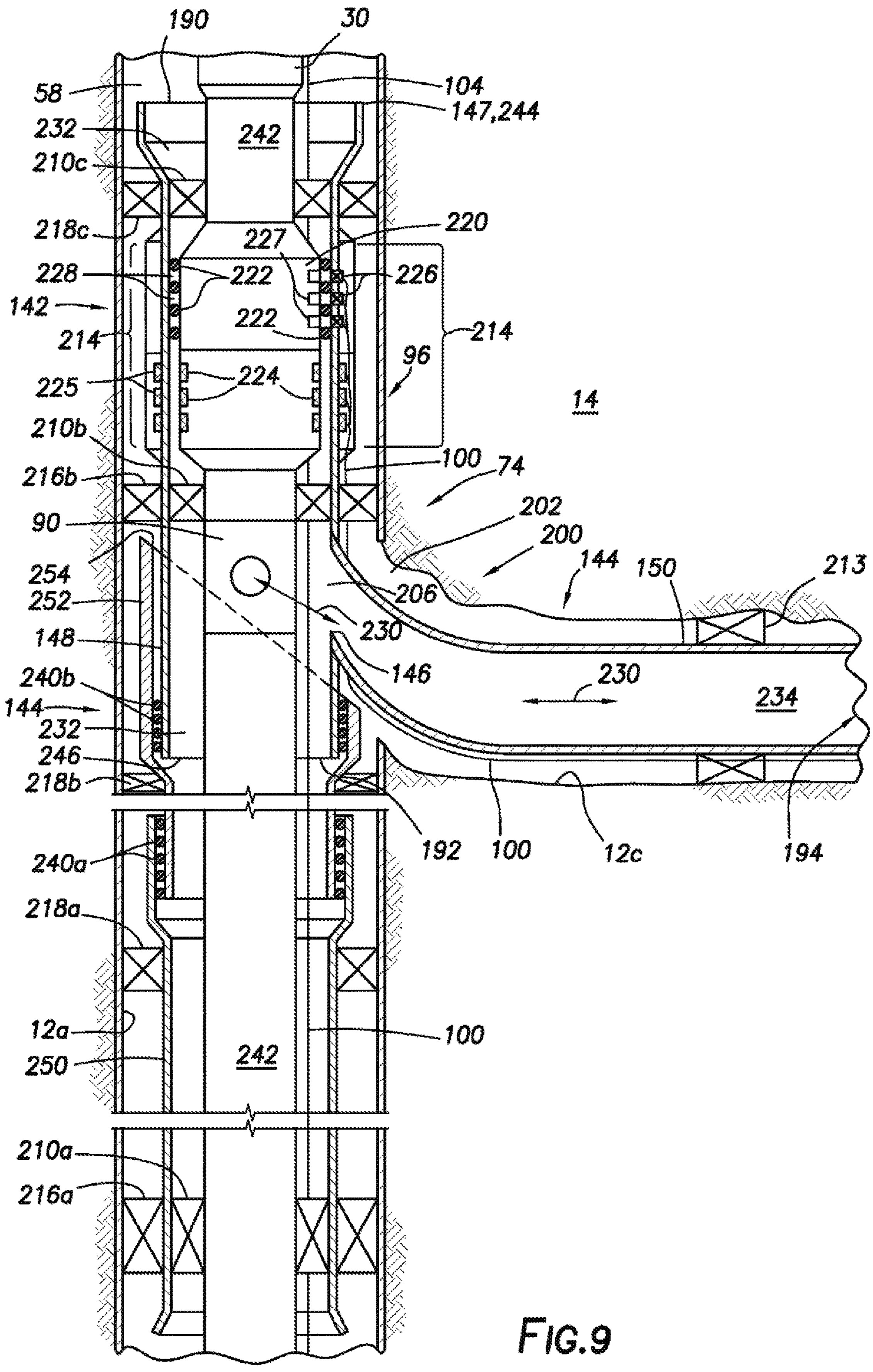
70
70
70
17a
17b
17c

FIG. 8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232
242
210c
218c
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222
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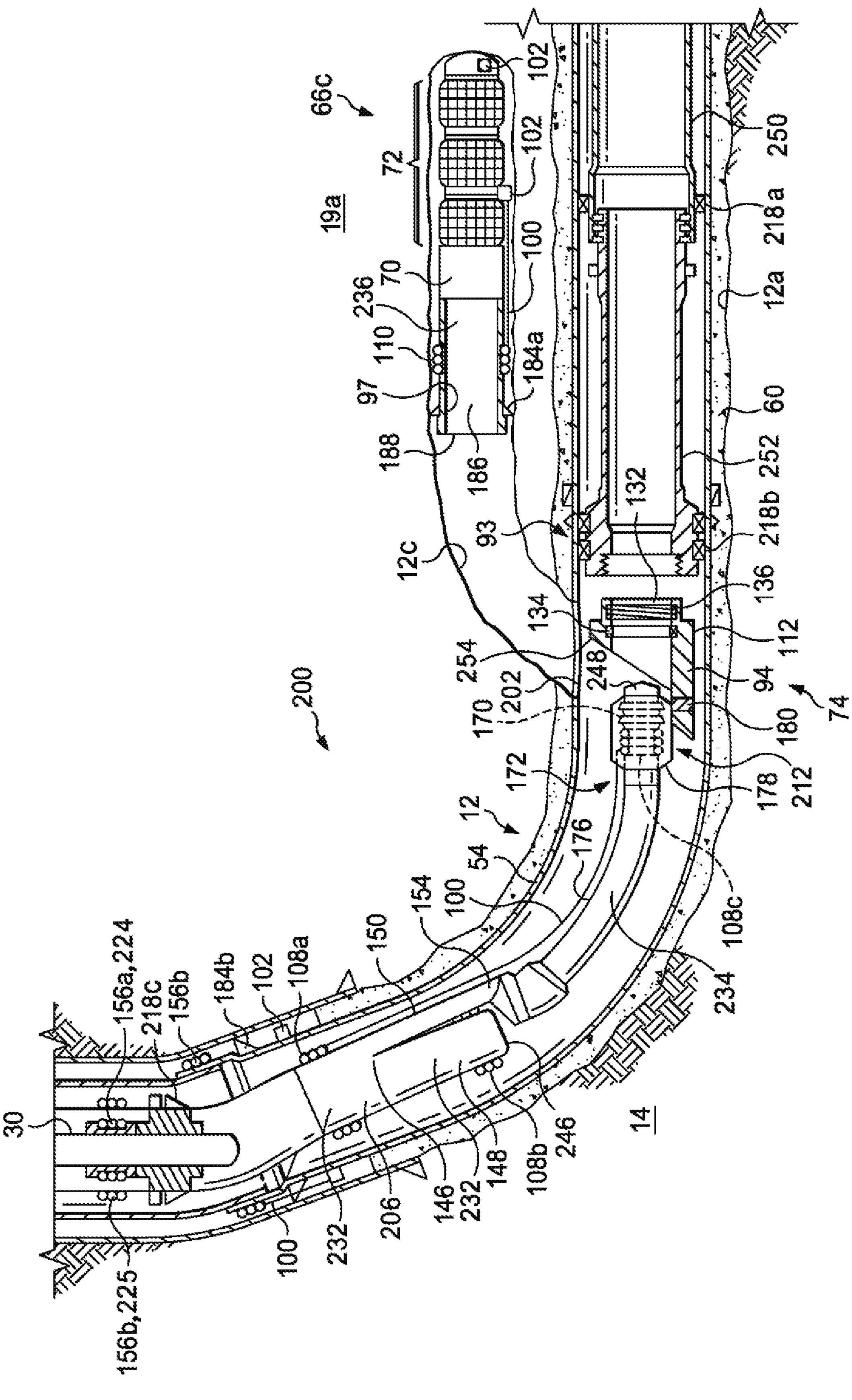
142
222
214
214
96
225
224
14
210b
100
74
216b
202
90
200
144
254
206
150
213
252
230
148
146
240b
230
144
234
232
246
218b
192
100
12c
194
240a
218a
12a
100
250
242
210a
216a

FIG.9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72
19a
102
102
100
70
236
110
184a
97
188
186
250
218a
12a
60
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218b
93
12c
136
134
254
202
248
112
94
170
180
74
172
178
212
200
12
54
176
108c
234
100
154
150
108a
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184b
156b
218c
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246
108b
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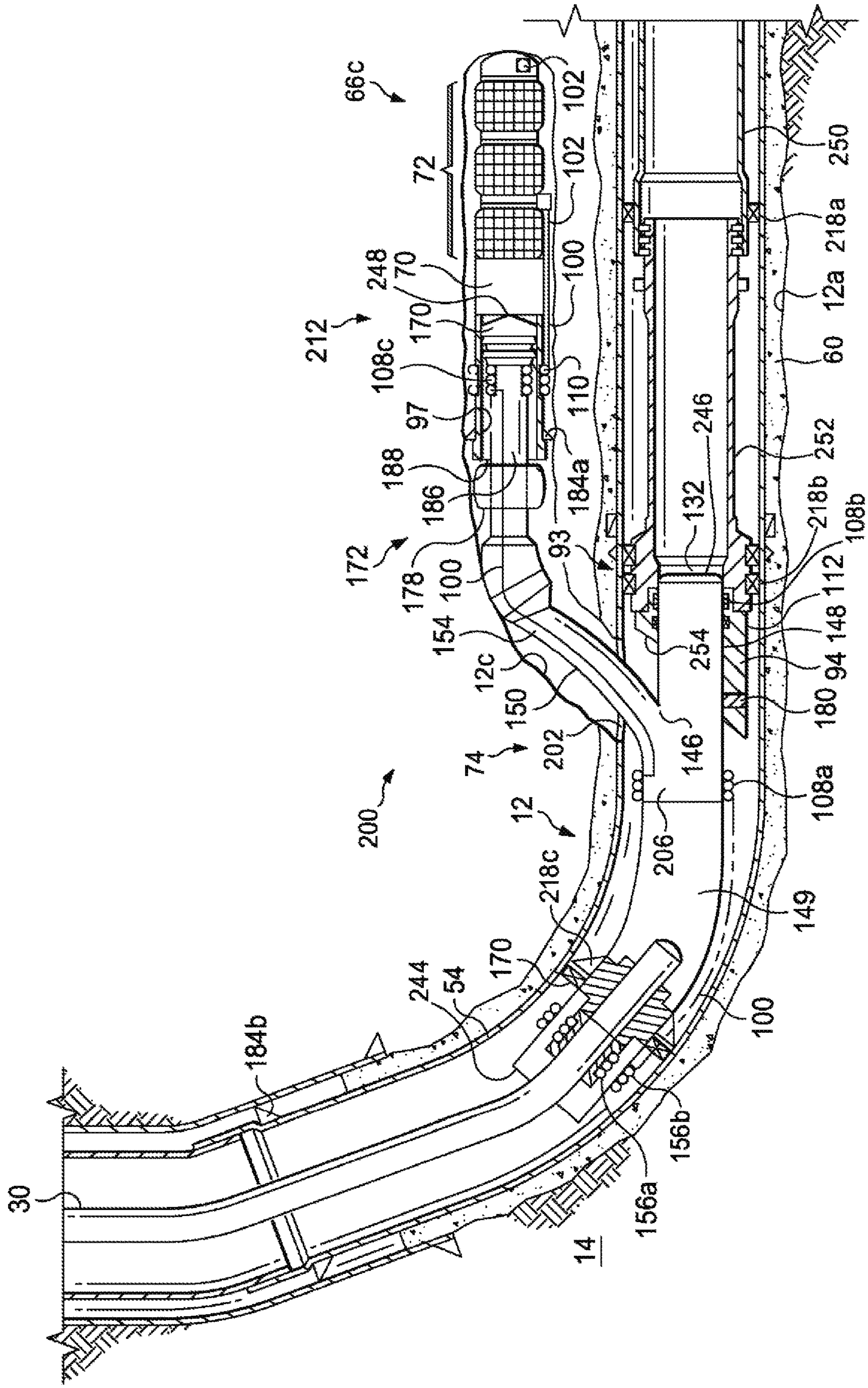
232
146
206
232
100
156b,225
14

FIG. 10


66c
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102
102
102
250
212
248
70
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100
218a
108c
110
12a
97
184a
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188
186
252
172
178
100
93
132
218b
108b
112
148
94
154
12c
254
150
180
74
202
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200
12
206
108a
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170
244
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100
184b
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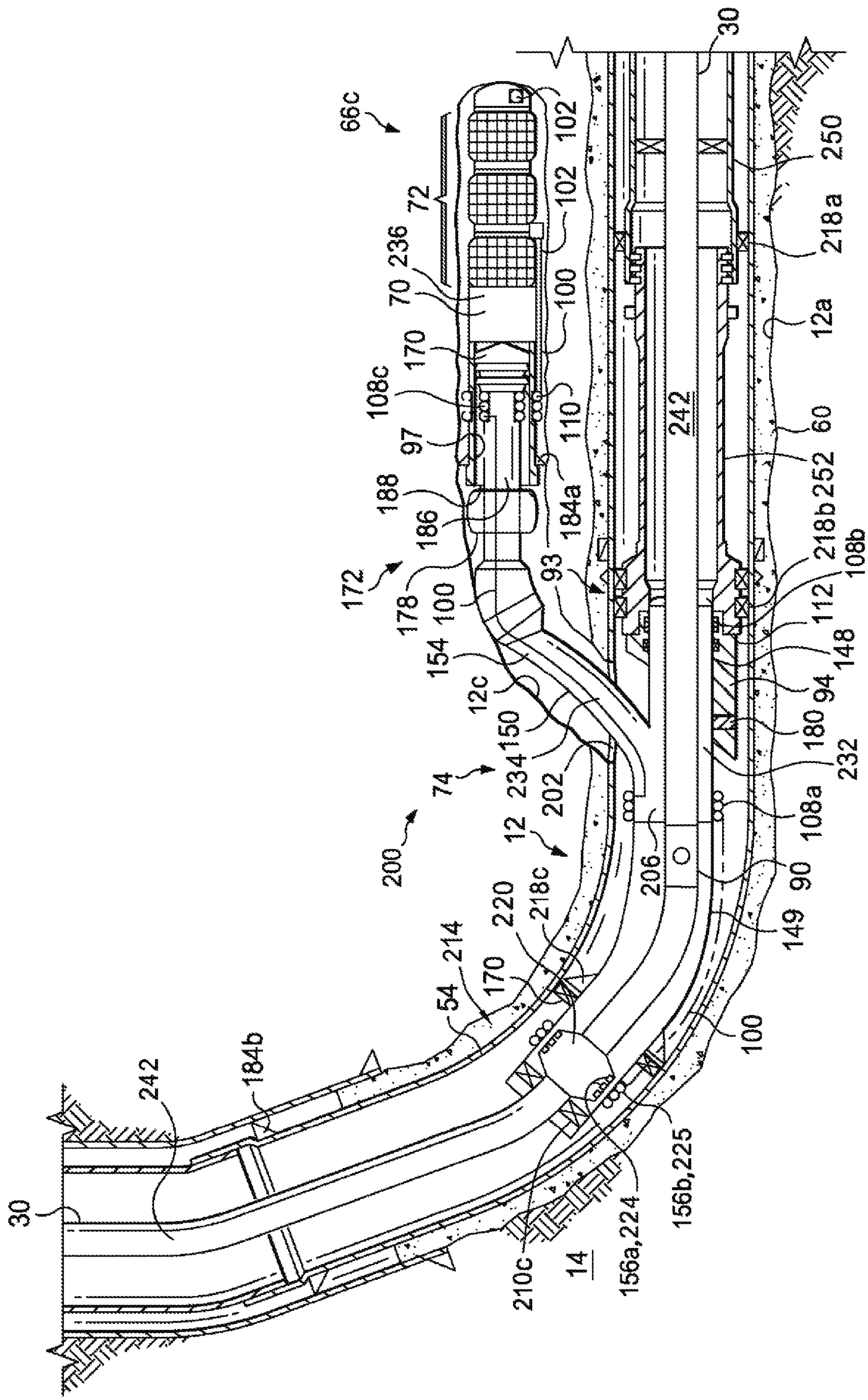
156b
30
14

FIG.11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102
102
72
236
70
100
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108c
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110
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186
184a
172
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178
100
154
12c
150
234
74
202
200
12
206
220
218c
214
170
54
184b
242
30
210c
14
156a,224
156b,225
100
149
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108a
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94
148
112
108b
218b
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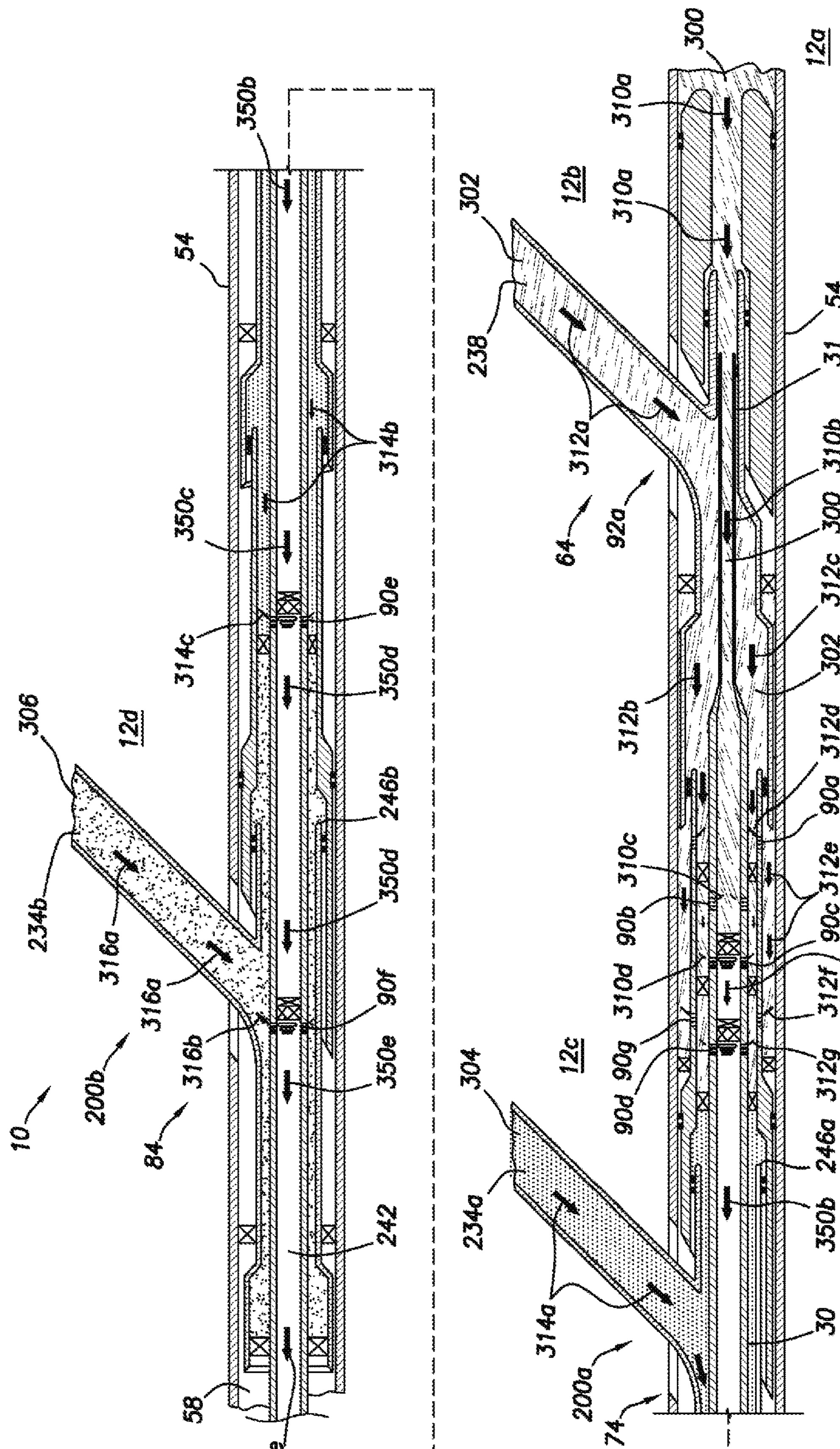
60
242
12a
218a
250
30

FIG.12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200b
84
306
234b
316a
316a
316b
12d
58
350e
242
350e
90f
350d
246b
350d
314c
90e
350c
314b
350b
54
74
200a
314a
234a
304
12c
90d
90g
310d
90b
310c
312b
64
92a
312a
238
302
12b
310a
310a
300
12a
30
350b
246a
312g
312f
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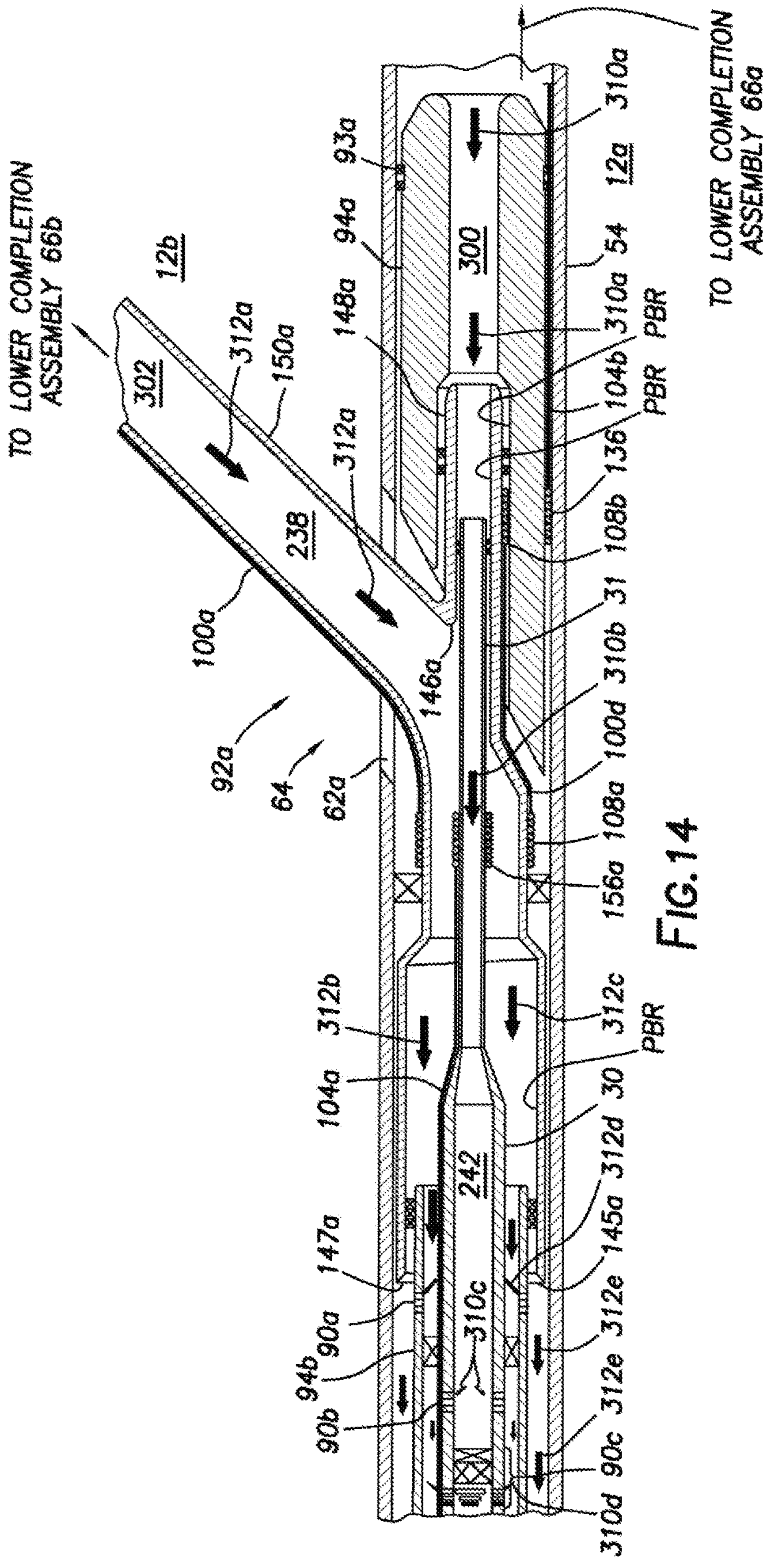
312e
90a
312d
302
312c
300
310b
31
54

FIG. 13


TO LOWER COMPLETION ASSEMBLY 66b
12b
302
312a
150a
148a
94a
93a
300
310a
12a
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TO LOWER COMPLETION ASSEMBLY 66a
310a
PBR
104b
PBR
136
108b
238
312a
100a
146a
31
310b
100d
92a
64
62a
108a
156a
312b
312c
PBR
104a
30
242
312d
147a
145a
90a
312e
94b
310c
90b
312e
90c
310d

FIG. 14

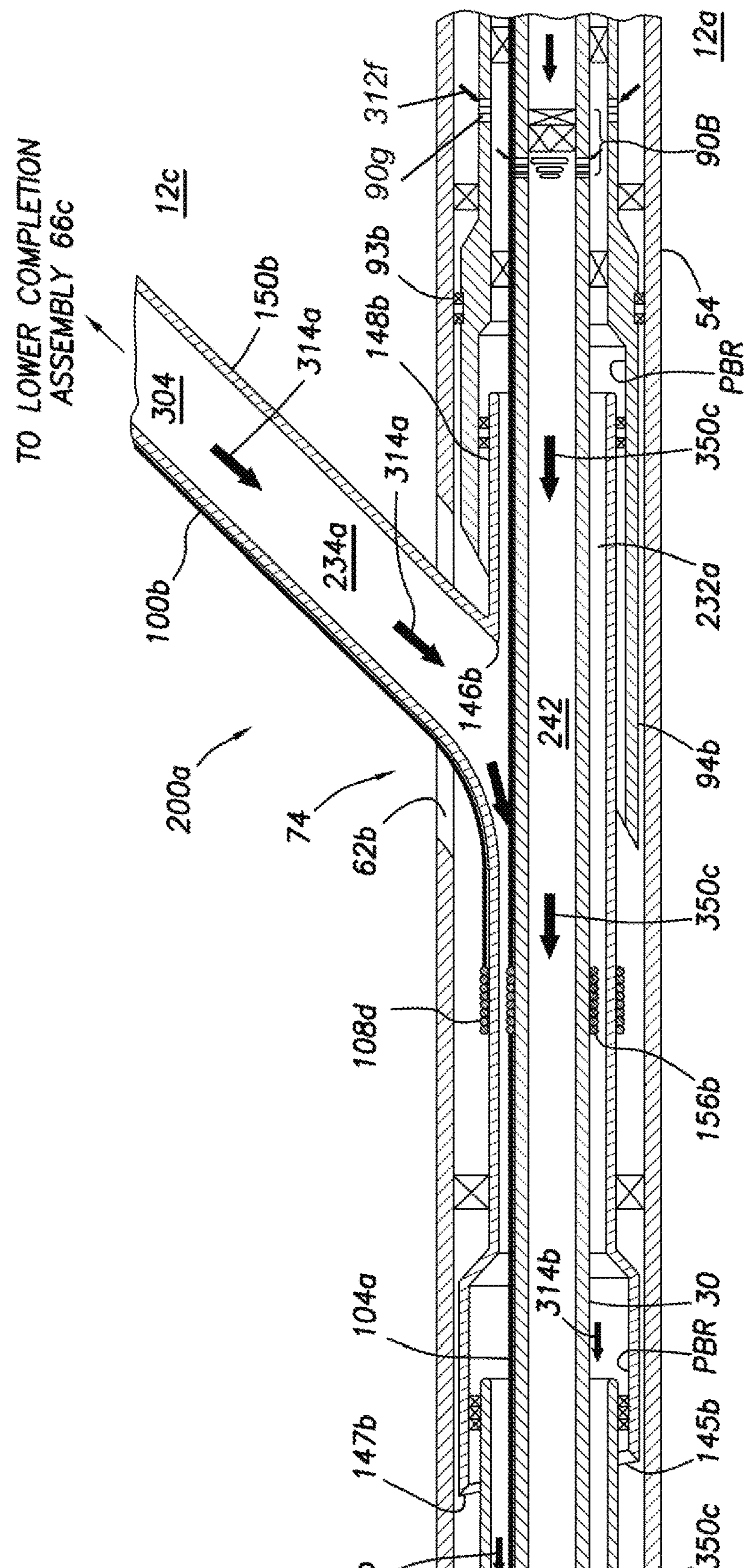
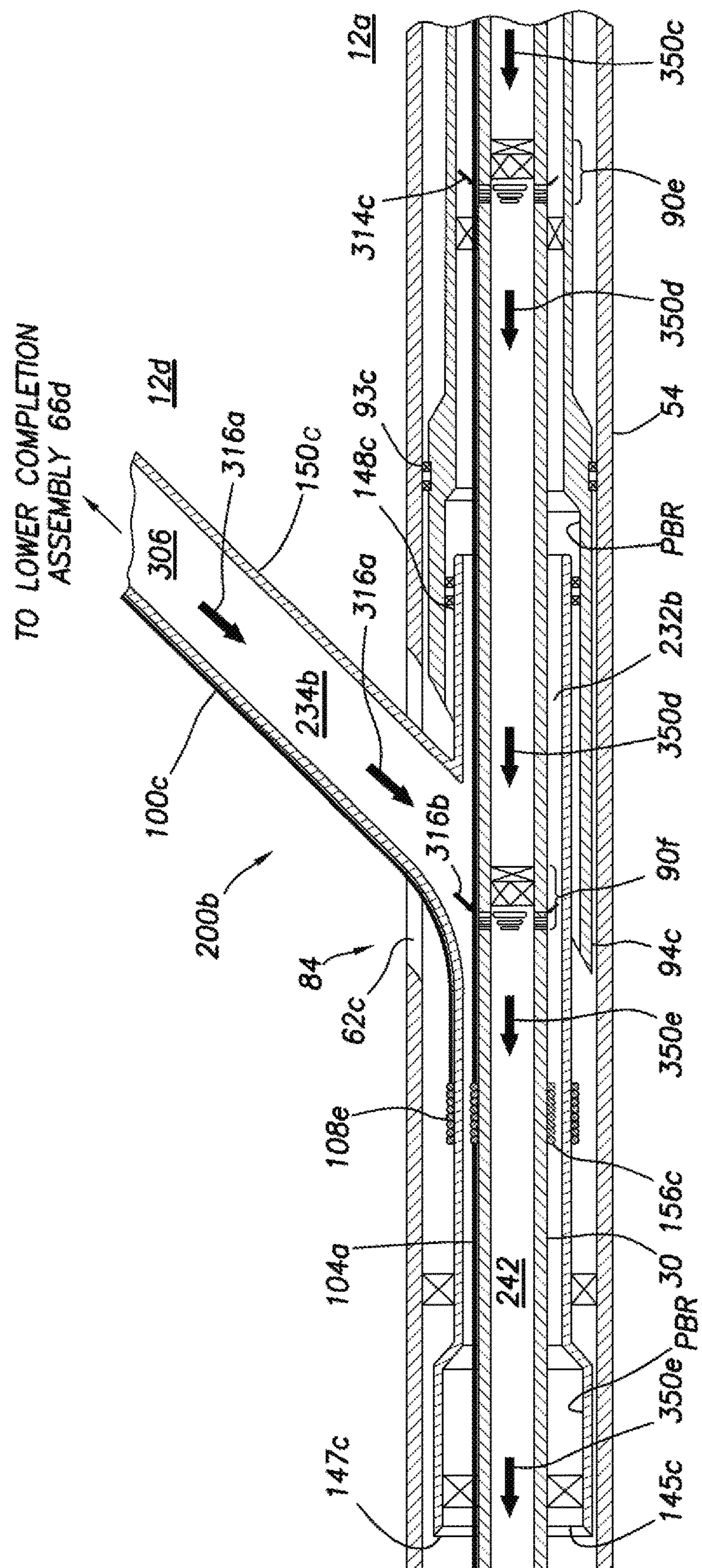

TO LOWER COMPLETION ASSEMBLY 66c
12c
12a
312f
90g
90B
93b
54
150b
148b
314a
304
PBR
350c
314a
234a
100b
232a
146b
242
200a
74
94b
62b
350c
108d
156b
104a
314b
PBR 30
147b
145b
314b
350c

FIG.15


12a
350c
314c
90e
350d
TO LOWER COMPLETION
ASSEMBLY 66d
12d
316a
150c
148c
93c
54
306
PBR
316a
234b
232b
350d
100c
316b
200b
90f
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62c
94c
350e
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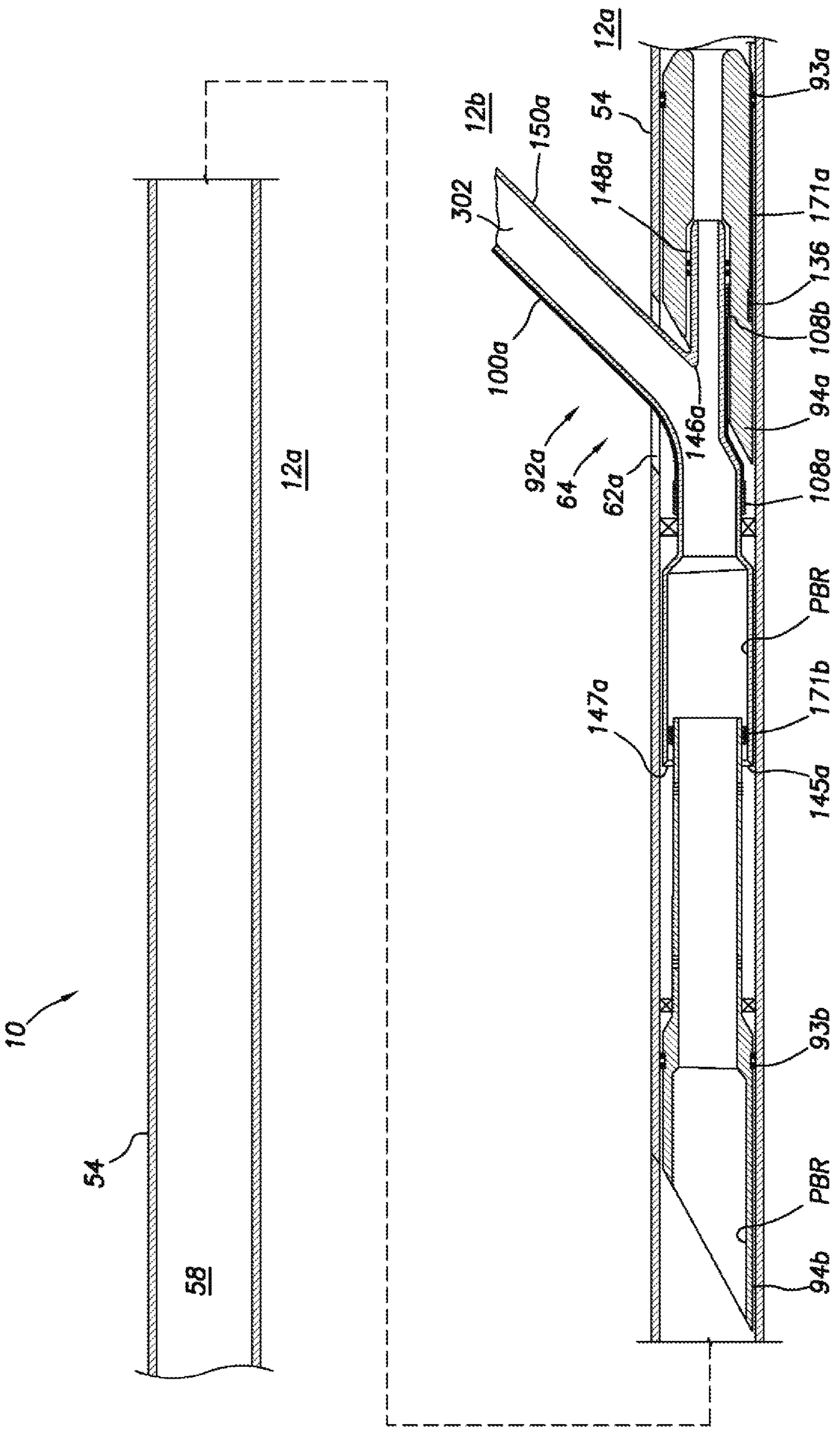
156c
104a
242
30
PBR
350e
147c
145c

FIG. 16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58
12a
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12b
150a
302
148a
54
93a
171a
136
108b
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94a
92a
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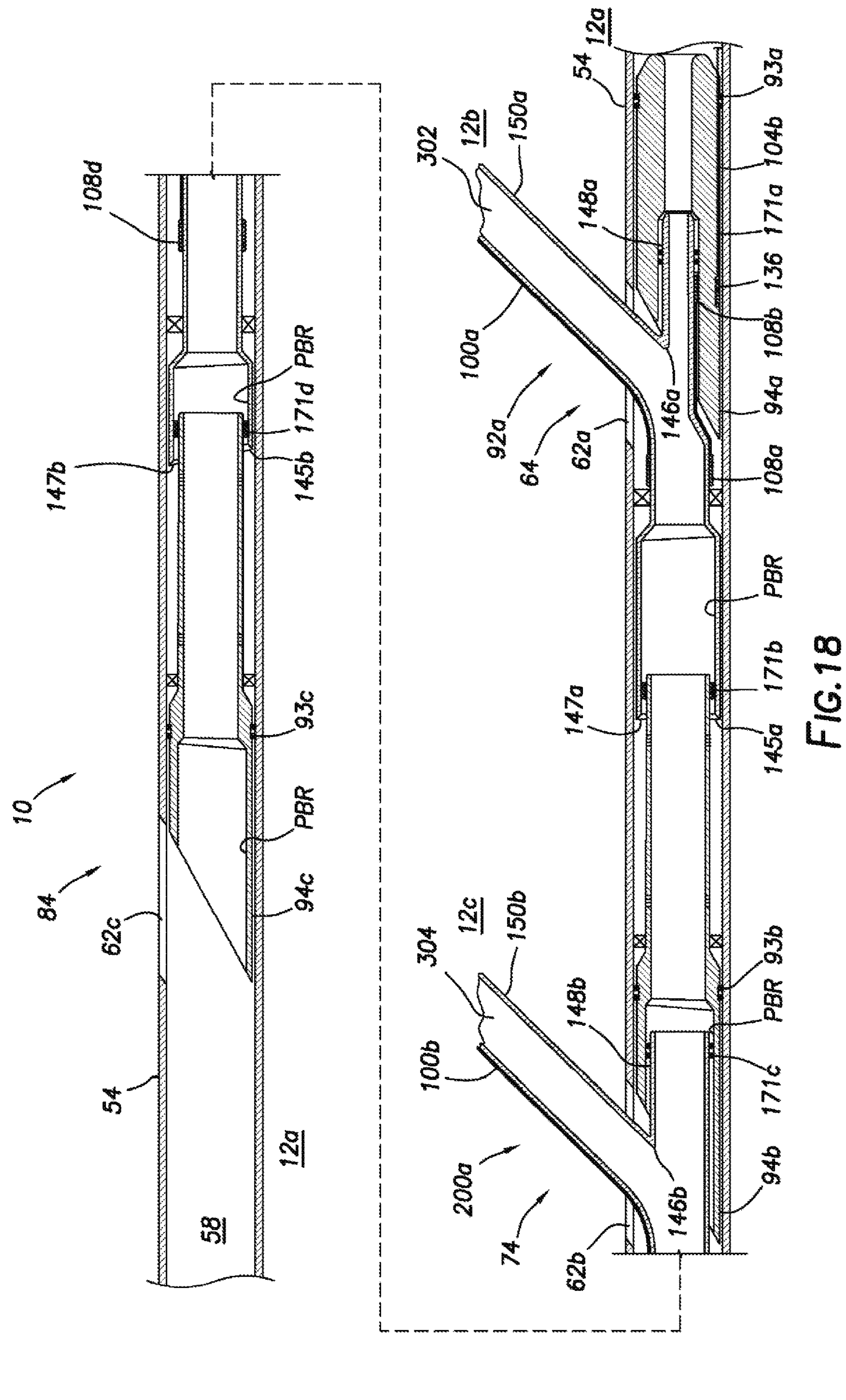
62a
108a
PBR
147a
171b
145a
93b
PBR
94b

FIG.17



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84
62c
54
58
12a
147b
108d
PBR
171d
145b
93c
PBR
94c
302
12b
150a
54
12a
93a
104b
171a
136
108b
148a
100a
92a
64
62a
146a
94a
108a
PBR
171b
147a
145a
12c
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148b
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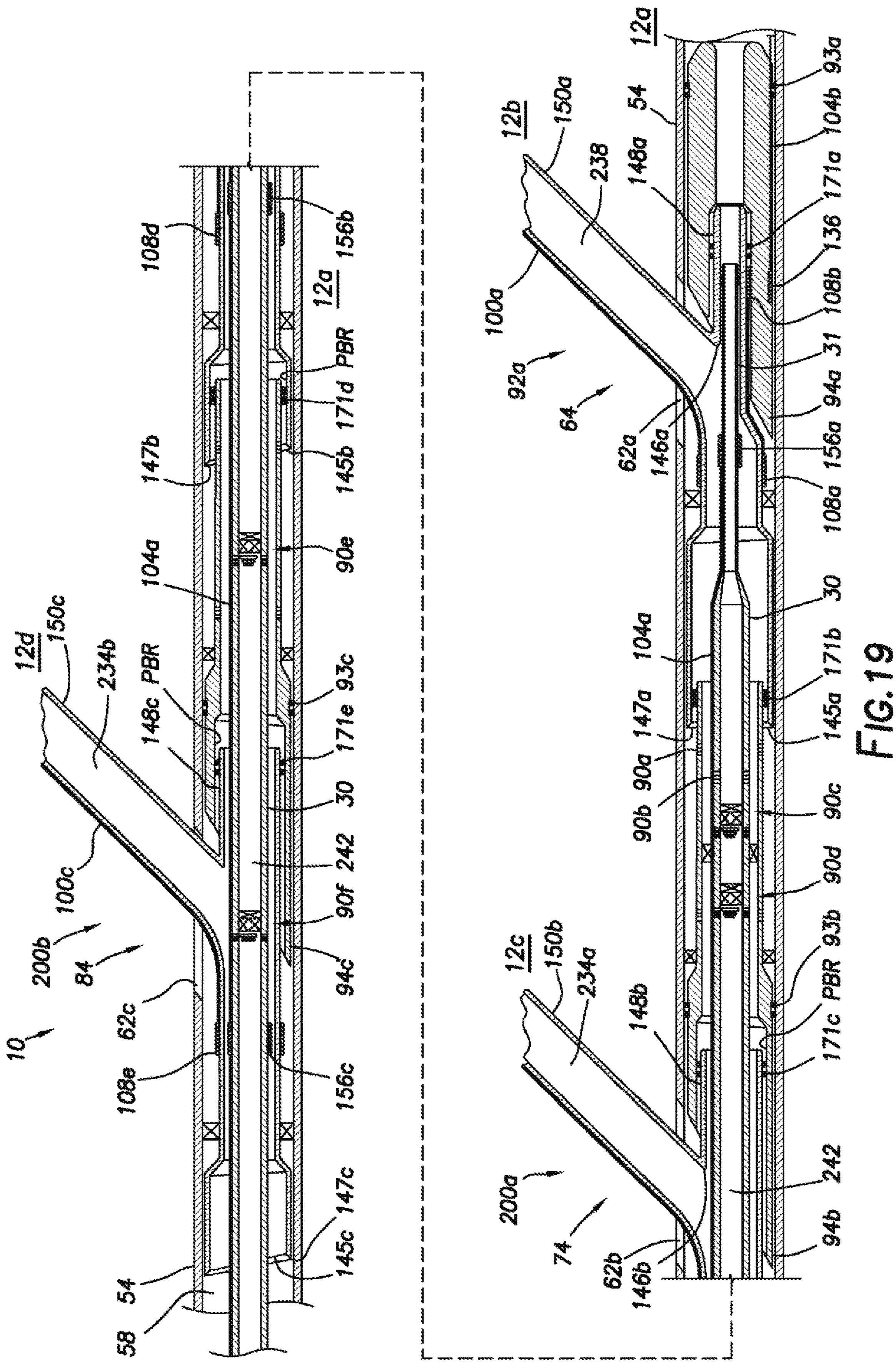
62b
146b
93b
PBR
171c
94b

FIG. 18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108e
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100c
12d
150c
234b
148c
PBR
104a
147b
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147c
156c
94c
90f
242
30
171e
93c
90e
145b
171d
PBR
12a
156b
200a
74
62b
146b
12c
150b
234a
148b
90b
90a
147a
104a
30
146a
62a
64
92a
100a
12b
150a
238
148a
54
12a
94b
242
171c
PBR
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90d
90c
145a
171b
108a
156a
94a
31
108b
136
171a
104b
93a

FIG.19

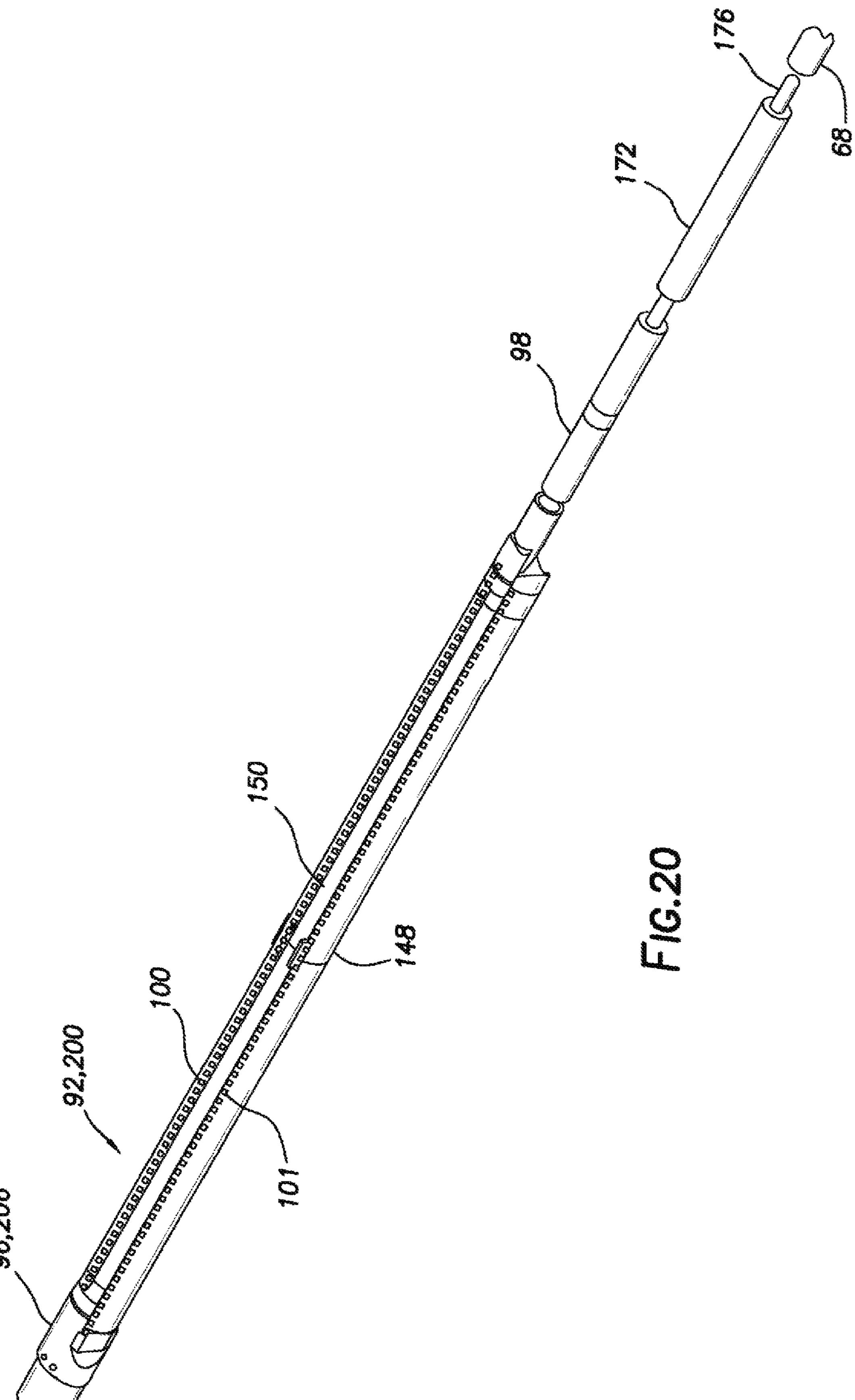

FIG.20

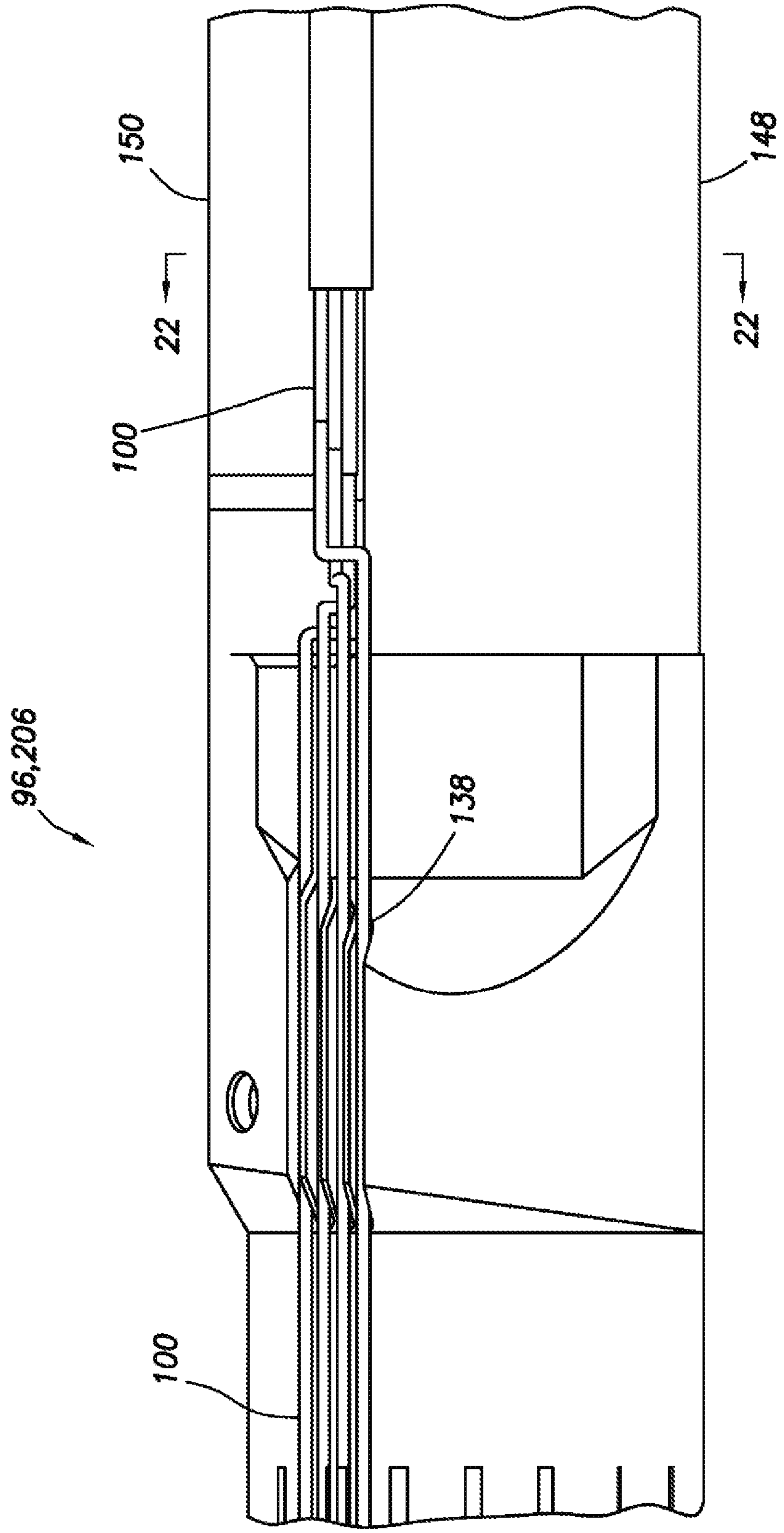

FIG.21

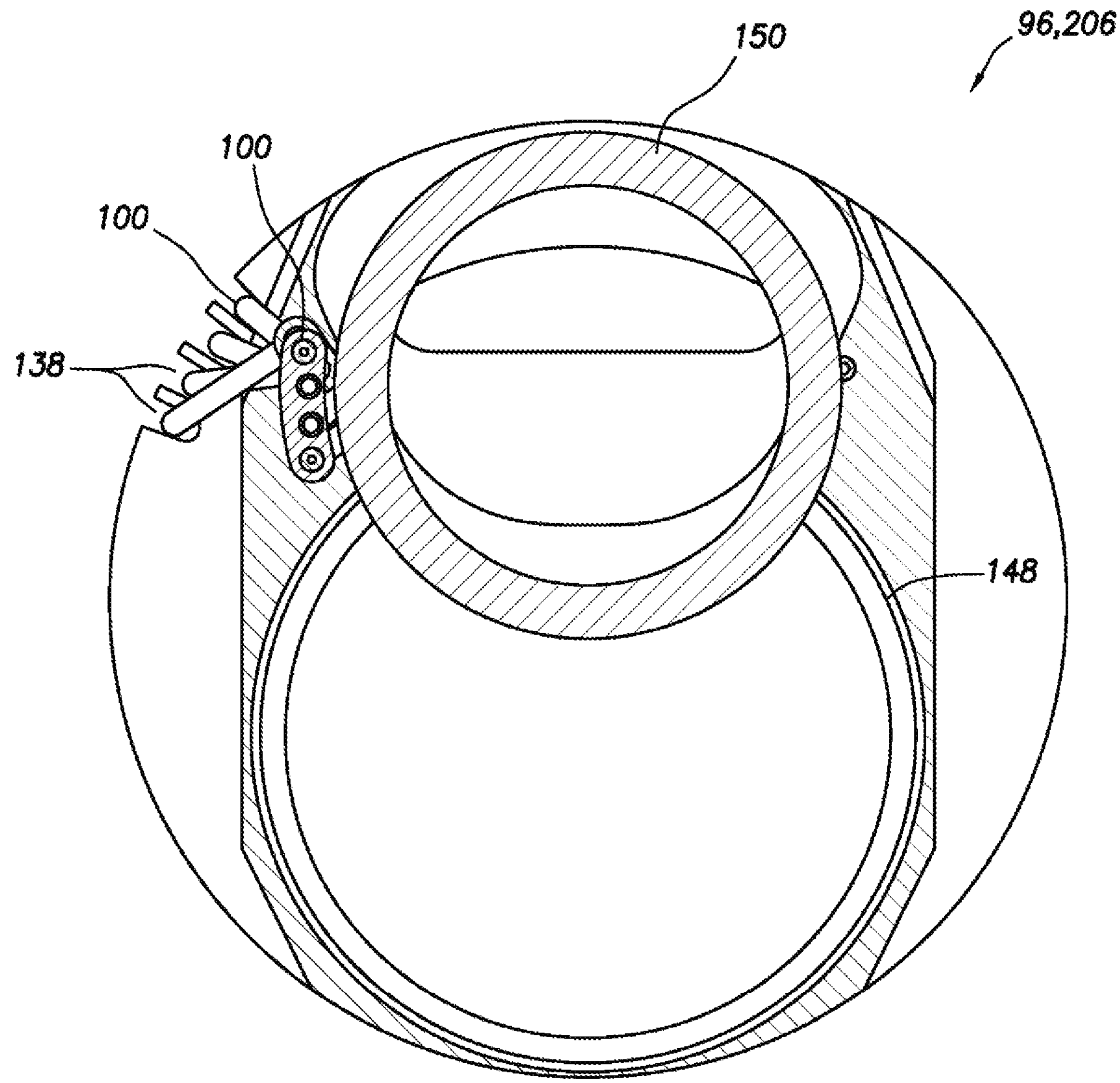

FIG.22

ENERGY TRANSFER MECHANISM FOR A JUNCTION ASSEMBLY TO COMMUNICATE WITH A LATERAL COMPLETION ASSEMBLY

TECHNICAL FIELD

[0001] The present disclosure relates generally to completing wellbores in the oil and gas industry and, more particularly, to a multilateral junction that permits electrical power and communications signals to be established in both a lateral wellbore and a main wellbore utilizing a unitary multilateral junction.

BACKGROUND

[0002] In the production of hydrocarbons, it is common to drill one or more secondary wellbores (alternately referred to as lateral or branch wellbores) from a primary wellbore (alternately referred to as parent or main wellbores). The primary and secondary wellbores, collectively referred to as a multilateral wellbore, may be drilled, and one or more of the primary and secondary wellbores may be cased and perforated using a drilling rig. Thereafter, once a multilateral wellbore is drilled and completed, production equipment such as production casing, packers and screens can be installed in the wellbore, then the drilling rig may be removed and the primary and secondary wellbores are allowed to produce hydrocarbons.

[0003] It is often desirable during the installation of the production equipment to include various operational devices such as permanent sensors, flow control valves, digital infrastructure, optical fiber solutions, Intelligent Inflow Control Devices (ICD's), seismic sensors, vibration inducers and sensors and the like that can be monitored and controlled remotely during the life of the producing reservoir. Such equipment is often referred to as intelligent well completion equipment and permits production to be optimized by collecting, transmitting, and analyzing completion, production, and reservoir data; allowing remote selective zonal control and ultimately maximizing reservoir efficiency. Typically, communication signals and electrical power between the surface and the intelligent well completion equipment are via cables extending from the surface. These cables may extend along the interior of a tubing string or the exterior of a tubing string or may be integrally formed within the tubing string walls. However, it will be appreciated that to maintain the integrity of the well, it is desirable for a cable not to breach or cross over pressure barriers formed by the various tubing, casing and components (such as packers, collars, hangers, subs and the like) within the well. For example, it is generally undesirable for a cable to pass between an interior and exterior of a tubing string since the aperture or passage through which the cable would pass could represent a breach of the pressure barrier formed between the interior and exterior of the tubing.

[0004] Moreover, because of the construction of the well, it may be difficult to deploy control cables from the surface to certain locations within the well. The presence of junctions between various tubing, casings, and components such as packers, collars, hangers, subs and the like, within the wellbore, particularly when separately installed, may limit the ability to extend cables to certain portions of the wellbore. This is particularly true in the case of lateral wellbores since completion equipment in lateral wellbores is installed separately from installation of completion equipment in the main wellbore. In this regard, it becomes difficult to extend cabling through a junction at the intersection of two wellbores, such as the main and lateral wellbores, because of the installation of equipment into more than one wellbore requires separate trips since the equipment cannot be installed at the same time unless the equipment is small enough to fit side-by-side in the main bore while tripping in the hole. Secondly, if there is more than one wellbore, the equipment would have to be spaced out precisely so that each segment of lateral equipment would be able to exit into its own lateral wellbore at the precise time the other equipment was exiting into their respective laterals, while at the same time maintaining connectivity with other locations in the wellbore.

[0005] Therefore, it will be readily appreciated that improvements in the arts of controlling intelligent well completion equipment in a multilateral wellbore are continually needed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Various embodiments of the present disclosure will be understood more fully from the detailed description given below and from the accompanying drawings of various embodiments of the disclosure. In the drawings, like reference numbers may indicate identical or functionally similar elements. Embodiments are described in detail hereinafter with reference to the accompanying figures, in which:

[0007] FIG. **1***a* is a representative partial cross-sectional view of an offshore well completion system having a unitary junction assembly installed at the intersection of a main wellbore and a lateral wellbore, according to one or more example embodiments;

[0008] FIG. **1***b* is another representative partial cross-sectional view of an offshore well completion system having a unitary flexible junction assembly installed at the intersection of a main wellbore and a lateral wellbore, according to one or more example embodiments;

[0009] FIG. **1***c* is another representative partial cross-sectional view of a unitary junction assembly installed in a wellbore completion system with wireless energy transfer mechanisms deployed to permit energy and data transfer across the junction, according to one or more example embodiments;

[0010] FIG. **2** is a representative partial cross-sectional view of the deflector installed in an offshore well completion system of FIG. **1***b*, according to one or more example embodiments;

[0011] FIG. **3** is a representative partial cross-sectional view of the unitary junction assembly that can be installed in an offshore well completion system of FIG. **1***b*, according to one or more example embodiments;

[0012] FIG. **4** is a representative partial cross-sectional view of the unitary junction assembly of FIG. **3** engaged with the deflector of FIG. **2**, according to one or more example embodiments;

[0013] FIG. **5** is a representative partial cross-sectional view of the unitary junction assembly of FIG. **3** during deployment in a multilateral well completion system, prior to engagement with the deflector of FIG. **2**, according to one or more example embodiments;

[0014] FIG. **6** is a representative partial cross-sectional view of the unitary junction assembly of FIG. **3** after deployment in a multilateral well completion system, engaged with the deflector of FIG. **2** and a lateral lower completion assembly, according to one or more example embodiments;

[0015] FIG. **7** is a representative partial cross-sectional view of an offshore well completion system having a unitary junction assembly installed at multiple intersections of lateral wellbores and a main wellbore, according to one or more example embodiments;

[0016] FIG. **8** is a representative partial cross-sectional view of an offshore well completion system having a unitary junction assembly installed at a lower intersection of a lateral wellbore and a main wellbore, and a multibranch inflow control unitary (MIC) junction assembly installed at an upper intersection of a lateral wellbore and the main wellbore, according to one or more example embodiments;

[0017] FIG. **9** is a representative partial cross-sectional view of a unitary multibranch inflow control (MIC) junction assembly installed at an intersection of a lateral wellbore and a main wellbore, according to one or more example embodiments;

[0018] FIG. **10** is a representative partial cross-sectional view of an intersection of a lateral wellbore and a main wellbore prior to installation of a unitary multibranch inflow control (MIC) junction assembly at the intersection, according to one or more example embodiments;

[0019] FIG. **11** is a representative partial cross-sectional view of an intersection of a lateral wellbore and a main wellbore after installation of a unitary MIC junction assembly at the intersection, according to one or more example embodiments;

[0020] FIG. **12** is a representative partial cross-sectional view of an intersection of a lateral wellbore and a main wellbore after installation of a unitary MIC junction assembly at the intersection and with a tubing string installed through the unitary MIC junction assembly, according to one or more example embodiments;

[0021] FIG. **13** is a representative partial cross-sectional view of a well completion system having a unitary junction assembly installed at a lower intersection of a lateral wellbore and a main wellbore, and a multibranch inflow control unitary (MIC) junction assembly installed at each of two upper intersections of a lateral wellbore and the main wellbore, according to one or more example embodiments, the view including example fluid flow paths from the laterals to the main wellbore, according to one or more example embodiments;

[0022] FIG. **14** is a representative partial cross-sectional view of multibranch inflow control unitary (MIC) junction assembly installed at a lowermost intersection of a lateral wellbore and the main wellbore of FIG. **13**, according to one or more example embodiments, the view including example fluid flow paths from the lateral to the main wellbore, according to one or more example embodiments;

[0023] FIG. **15** is a representative partial cross-sectional view of multibranch inflow control unitary (MIC) junction assembly installed at an intermediate intersection of a lateral wellbore and the main wellbore of FIG. **13**, according to one or more example embodiments, the view including example fluid flow paths from the lateral to the main wellbore, according to one or more example embodiments;

[0024] FIG. **16** is a representative partial cross-sectional view of a junction assembly installed at an uppermost intersection of a lateral wellbore and the main wellbore of FIG. **13**, according to one or more example embodiments, the view including example fluid flow paths from the lateral to the main wellbore, according to one or more example embodiments;

[0025] FIG. **17-19** are representative partial cross-sectional views of the offshore well completion system of FIG. **13** at various stages of installation of the junction assemblies at the intersections of the lateral wellbores and the main wellbore, according to one or more example embodiments;

[0026] FIG. **20** is a representative perspective view of a unitary MIC junction assembly shown separate for clarity prior to a lateral leg engaging a deflector at an intersection, with other components connected to the lateral leg of the unitary MIC junction assembly, according to one or more example embodiments;

[0027] FIG. **21** is a representative partial side view of a unitary MIC junction assembly with example control line routing, according to one or more example embodiments;

[0028] FIG. **22** is a representative cross-sectional view of the unitary MIC junction assembly of FIG. **21**, according to one or more example embodiments.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0029] The disclosure may repeat reference numerals and/or letters in the various examples or figures. This repetition is for the purpose of simplicity and clarity and does not in itself dictate a relationship between the various embodiments and/or configurations discussed. Further, spatially relative terms, such as beneath, below, lower, above, upper, uphole, downhole, upstream, downstream, and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated, the upward direction being toward the top of the corresponding figure and the downward direction being toward the bottom of the corresponding figure., the uphole direction being toward the surface of the wellbore, the downhole direction being toward the toe of the wellbore. Unless otherwise stated, the spatially relative terms are intended to encompass different orientations of the apparatus in use or operation in addition to the orientation depicted in the figures. For example, if an apparatus in the figures is turned over, elements described as being "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the exemplary term "below" can encompass both an orientation of above and below. The apparatus may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein may likewise be interpreted accordingly.

[0030] Moreover even though a figure may depict a horizontal wellbore or a vertical wellbore, unless indicated otherwise, it should be understood by those skilled in the art that the apparatus according to the present disclosure is equally well suited for use in wellbores having other orientations including vertical wellbores, slanted wellbores, multilateral wellbores or the like. Likewise, unless otherwise noted, even though a figure may depict an offshore operation, it should be understood by those skilled in the art that the method and/or system according to the present disclosure is equally well suited for use in onshore operations and vice-versa. Further, unless otherwise noted, even though a figure may depict a cased hole, it should be understood by those skilled in the art that the method and/or system according to the present disclosure is equally well suited for use in partially cased and/or open hole operations.

[0031] As used herein, the words "comprise," "have," "include," and all grammatical variations thereof are each intended to have an open, non-limiting meaning that does not exclude additional elements or steps. While compositions and methods are described in terms of "comprising," "containing," or "including" various components or steps, the compositions and methods also can "consist essentially of" or "consist of" the various components and steps. It should also be understood that, as used herein, "first," "second," and "third," are assigned arbitrarily and are merely intended to differentiate between two or more objects, etc., as the case may be, and does not indicate any sequence. Furthermore, it is to be understood that the mere use of the word "first" does not require that there be any "second," and the mere use of the word "second" does not require that there be any "first" or "third," etc.

[0032] The terms in the claims have their plain, ordinary meaning unless otherwise explicitly and clearly defined by the patentee. Moreover, the indefinite articles "a" or "an," as used in the claims, are defined herein to mean one or more than one of the element that it introduces. If there is any conflict in the usages of a word or term in this specification and one or more patent(s) or other documents that may be incorporated herein by reference, the definitions that are consistent with this specification should be adopted.

[0033] Generally, this disclosure provides a system and method that can include a unitary multibranch inflow control (MIC) junction assembly having a conduit with a first aperture at an upper end of the conduit, and second and third apertures at a lower end of the conduit; a primary passageway can be formed by the conduit and extending from the first aperture to the second aperture with a conduit junction defined along the conduit between the first and second apertures. The primary passageway can include an upper portion and a lower portion with the upper portion extending from the first aperture to the conduit junction, and the lower portion extending from the conduit junction to the second aperture; a lateral passageway can be formed by the conduit and extend from the conduit junction to the third aperture; an upper energy transfer mechanism (ETM) can be mounted along the upper portion of the primary passageway and proximate the first aperture; control lines **100** can provide communication between the upper ETM **214** and lower completion assembly equipment. A lower ETM can be mounted along the lateral passageway, with the upper ETM in communication with the lower ETM via the control lines; and the primary passageway can be configured to receive a first tubing string that extends therethrough.

[0034] Turning to FIGS. **1***a* and **1***b*, shown is an elevation view in partial cross-section of a multilateral wellbore completion system **10** utilized to complete wells intended to produce hydrocarbons from wellbore **12** extending through various earth strata in an oil and gas formation **14** located below the earth's surface **16**. Wellbore **12** is formed of multiple bores, extending into the formation **14**, and may be disposed in any orientation, such as lower main wellbore portion **12***a* and lateral wellbore **12***b* illustrated in FIGS. **1***a* and **1***b*.

[0035] Wellbore completion system **10** may include a rig or derrick **20**. Rig **20** may include a hoisting apparatus **22**, a travel block **24**, and a swivel **26** for raising and lowering casing, drill pipe, coiled tubing, production tubing, work strings or other types of pipe or tubing strings, generally referred to herein as string **30**. In FIGS. **1***a* and **1***b*, string **30** is substantially tubular, axially extending production tubing supporting a completion assembly as described below. String **30** may be a single string or multiple strings as discussed below.

[0036] Rig **20** may be located proximate to or spaced apart from wellhead **32**, such as in the case of an offshore arrangement as shown in FIGS. **1***a* and **1***b*. One or more pressure control devices **34**, such as blowout preventers (BOPs) and other equipment associated with drilling or producing a wellbore may also be provided at wellhead **32** or elsewhere in the system **10**.

[0037] For offshore operations, as shown in FIGS. **1***a* and **1***b*, rig **20** may be mounted on an oil or gas platform **36**, such as the offshore platform as illustrated, semi-submersibles, drill ships, and the like (not shown). Although system **10** of FIGS. **1***a* and **1***b* is illustrated as being a marine-based multilateral completion system, system **10** of FIGS. **1***a* and **1***b* may be deployed on land. In any event, for marine-based systems, one or more subsea conduits or risers **38** extend from deck **40** of platform **36** to a subsea wellhead **32**. Tubing string **30** extends down from rig **20**, through subsea conduit **38** and BOP **34** into wellbore **12**.

[0038] A working or service fluid source **42**, such as a storage tank or vessel, may supply, via flow lines **44**, a working fluid (not shown) pumped to the upper end of tubing string **30** and flow through string **30** to equipment disposed in wellbore **12**, such as subsurface equipment **48**. Working fluid source **42** may supply any fluid utilized in wellbore operations, including without limitation, drilling fluid, cement slurry, acidizing fluid, liquid water, steam or some other type of fluid. Production fluids, working fluids, cuttings and other debris returning to surface **16** from wellbore **12** may be directed by a flow line **44** to storage tanks **50** and/or processing systems **52**, such as shakers, centrifuges, other types of liquid/gas separators and the like.

[0039] With reference to FIG. **1***c* and ongoing reference to FIGS. **1***a* and **1***b*, all or a portion of the main wellbore **12***a* can be lined with liner or casing **54** that extends from the wellhead **32**, which casing **54** may include the surface, intermediate and production casings. Casing **54** may be comprised of multiple strings with lower strings extending from or otherwise hung off an upper string utilizing a liner hanger **184**. For purposes of the present disclosure, these multiple strings will be jointly referred to herein as the casing **54**. An annulus **56** can be formed between the walls of sets of adjacent tubular components, such as concentric casing strings **54**; or the wall of wellbore **12** and a casing string **54**. For outer casing **54**, all or a portion of the casing **54** may be secured within the main wellbore **12***a* by depositing cement **60** within the annulus **56** defined between the casing **54** and the wall of the main wellbore **12**. In some embodiments, the casing **54** includes a window **62** formed therein at the intersection **64** between the main wellbore **12***a* and a lateral wellbore **12***b*. An annulus **58** can be formed between an exterior of string **30** and the inside wall of a casing string **54**.

[0040] As shown in FIGS. **1***a*, **1***b* and **1***c*, subsurface equipment **48** is illustrated as completion equipment and the tubing string **30** shown in fluid communication with the completion equipment **48** is illustrated as production tubing string **30**. Although completion equipment **48** can be disposed in a wellbore **12** of any orientation, for purposes of illustration, completion equipment **48** is shown disposed in the main wellbore **12***a*, and a substantially horizontal portion of lateral wellbore **12***b*. Completion equipment **48** may include a lower completion assembly **66** having various tools, such as an orientation and alignment subassembly **68**, one or more packers **70** and one or more sand control screen assemblies **72**. Lower completion assembly **66***a* is shown disposed in main wellbore **12***a*, while lower completion assembly **66***b* is shown disposed in lateral wellbore **12***b*. It will be appreciated that the foregoing is simply illustrative and that lower completion assembly **66** is not limited to particular equipment or a particular configuration.

[0041] Disposed in wellbore **12** at the lower end of tubing string(s) **30** is an upper completion assembly **86** that may include various equipment such as packers **88**, flow control modules **90** and operational devices **102**, such as sensors or actuators, computers, (micro) processors, logic devices, other flow control valves, digital infrastructure, optical fiber, Intelligent Inflow Control Devices (ICDs), seismic sensors, vibration inducers and sensors and the like. The upper completion assembly **86** may also include an energy transfer mechanism (ETM) **91**, which may be wired or wireless, such as an inductive coupler segment. In the case of a wireless ETM, (or WETM), although the disclosure contemplates any WETM utilized to wirelessly transfer power and/or communication signals, in specific embodiments, the wireless ETMs discussed herein may be inductive coupler coils or other electric components, and for the purposes of illustration, will be referred to herein generally as an inductive coupler segments.

[0042] It will be appreciated that the ETMs generally, and WETMs specifically, may be used for a variety of purposes, including but not limited to transferring energy, transferring control and data signals, gathering data from sensors, communicating with sensors or other operational devices, controlling operational devices along the length of the lateral completion assembly, charging batteries, long-term storage capacitors or other energy storage devices deployed downhole, powering/controlling/regulating Inflow Control Devices ("ICDs"), etc. In one or more embodiments ETM **91** is in electrical communication with packer **88** and/or flow control modules **90** and/or operational devices **102** or may otherwise comprise operational devices **102**. ETM **91** may be integrally formed as part of packer **88** or flow control module **90**, or separate therefrom. ETM **91** may be an inductive coupler segment **91** or some other WETM. The ETM's can be used to enable communication between completion assembly equipment in a lateral (and/or twig or branch) wellbore and a controller at a remote location (such as at the surface, in the main wellbore, etc.) thereby allowing the controller to control the completion assembly equipment during production, injection, treatment, and other wellbore operations involving the lateral.

[0043] As used herein, "lateral" wellbore refers to a wellbore drilled through a wall of a primary wellbore and extending through the earth formation. This can include drilling a lateral wellbore from a main wellbore, as well as drilling a lateral wellbore from another lateral wellbore (which is sometimes referred to as a "twig" or "branch" wellbore). As used herein, "communication" or any grammatical variations refer to the transmission of signals (such as power, data, control, etc.) from a source to a destination. As used herein, "main wellbore" refers to a wellbore from which a lateral is drilled. This can include the initial wellbore of the wellbore system **10** from which a lateral wellbore is drilled, or a lateral wellbore from which another lateral wellbore is drilled (such as with a twig or branch wellbore).

[0044] At the intersection **64** of the main wellbore **12***a* and the lateral wellbore **12***b* is a junction assembly **92** engaging a location mechanism **93** secured within main wellbore **12***a*. The location mechanism **93** serves to support the junction assembly **92** at a desired vertical location within casing **54**, and may also maintain the junction assembly **92** in a predetermined rotational orientation with respect to the casing **54** and the window **62**. Location mechanism **93** may be any device utilized to vertically (relative to the primary axis of main wellbore **12***a*) secure equipment within wellbore **12***a*, such as a latch mechanism. In one or more embodiments, junction assembly **92** is a deformable junction that generally comprises a deformable, unitary conduit **96** (see FIG. **3**). In one or more embodiments, junction assembly **92** may be a rigid conduit **95**. In embodiments of junction assembly **92** where junction assembly **92** is a deformable junction that comprises a deformable conduit **96**, the junction assembly **92** may be deployed with a deflector **94** (see FIG. **2**) which may be disposed to engage the location mechanism **93**. In other embodiments, junction assembly **92** may comprise deflector **94**. Junction assembly **92** generally permits communication between the upper portion of wellbore **12** and both the lower portion of wellbore **12***a* and the lateral wellbore **12***b*. In this regard, junction assembly **92** may be in fluid communication with upper completion assembly **86**. In one or more embodiments, junction assembly **92** is a unitary assembly in that it is installed as a single, assembled component or otherwise, integrally assembled before installation at intersection **64**. Such a unitary assembly, as will be discussed in more detail below, permits inductive coupling communication to both the lower main wellbore **12***a* and the lateral wellbore **12***b* without the need for wet connections or physical couplings, while at the same time minimizing the sealing issues prevalent in the prior art as explained below.

[0045] Significantly, such a unitary assembly minimizes the likelihood that debris within the wellbore fluids will inhibit sealing at the junction **64**. Commonly, wellbore fluid has 3% or more suspended solids, which can settle out in areas such as junction **64** causing the seals in the area to be in-effective. Because of this, prior art junctions installed in multiple pieces or steps, cannot readily provide reliable high-pressure containment (>2,500-psi for example) and wireless power/communications simultaneously. Debris can become trapped between components of the prior art multi-part junctions as they are assembled downhole, jeopardizing proper mating and sealing between components. Further drawbacks can be experienced to the extent the multi-part junctions are non-circular, which is a common characteristic of many prior art junction assemblies. In this regard, a multi-part junction which requires the downhole assembly (or engagement) of non-circular components is prone to leakage due to 1) the environment and 2) inability to remove debris from the sealing areas.

[0046] The typical downhole environment where a multi-piece junction is assembled is contaminated with drilling solids suspended in the fluid. In addition, the multi-piece junction is assembled in a location where metal shavings are likely to exist from milling a window (hole) in the side of the casing. The metal shavings can fall out into the union of the main bore casing and the lateral wellbore. This area is large and non-circular which makes it very difficult to flush the shavings and drill cuttings out of the area. Furthermore, the sealing areas of a multi-part junction are not circular (non-circular) which prevents the sealing areas from being fully "wiped cleaned" to remove the metal shavings and drill cuttings prior to engagement of the seals and the sealing surfaces. In addition, the sealing surfaces may contain square shoulders, channels, and/or grooves which can further inhibit cleaning of all of the drilling debris from them. Notably, in many cases, because of the non-circular nature of the components between which a seal is to be established, traditional elastomeric seals may not be readily utilized, but rather, sealing must be accomplished with metallic sealing components such as labyrinth seals. As is known in the industry labyrinth seals typically do not provide the same degree of sealing as elastomeric seals. Moreover, being made of metal interleaved surfaces, the seal components will be difficult to clean prior to engagement with one another.

[0047] In contrast, a unitary junction assembly **92** (as well as the unitary multibranch inflow control (MIC) junction assembly **200**, see FIGS. **8-15**) as described herein is assembled on the surface in a clean environment so that all sealed connections can be inspected, cleaned prior to assembly and then pressure-tested before being run into the well. Moreover, the unitary junction assembly **92** (and the unitary MIC junction assembly **200**) eliminates the need for labyrinth seals as found in the prior art junction assemblies. Extending along each of lower completion assemblies **66***a,* **66***b* is one or more control lines or cables **100** mounted along either the interior or exterior of lower completion assembly **66**. Control lines **100** may pass through packers **70** and may be operably associated with one or more operational devices **102** of the lower completion assembly **66**. Operational devices **102** may include sensors or actuators, controllers, computers, (micro) processors, logic devices, other flow control valves, digital infrastructure, optical fiber, Intelligent Inflow Control Devices (ICDs), seismic sensors, ETMs, WETMs, vibration inducers and sensors and the like, as well as other inductive coupler segments.

[0048] Control lines **100** may operate as communication media, to transmit power, or data and the like between a lower completion assembly **66** and an upper completion assembly **86** via junction assembly **92**. Data and other information may be communicated via telemetry that can monitor and control the conditions of the environment and various tools in lower completion assembly **66** or other tool strings. The control lines **100**, ETMs, control lines **104**, and junction assembly **92** can work together to communicate telemetry data and power between lower completion assemblies **66***a,* **66***b* and an upper completion assembly **86**. Likewise, control lines **100**, control lines **104**, ETMs, the junction assembly **92**, and the unitary MIC Junction assembly **200** can work together to communicate telemetry data and power between the lower completion assemblies **66***a,* **66***b* (via upper completion assembly **86**), the lower completion assembly **66***c* and the surface equipment. Additional lower completion assemblies can be added to this communication network as needed when additional lateral wellbores (and/or twig or branch wellbores) are drilled and completed.

[0049] Extending uphole from upper completion assembly **86** are one or more control lines **104** which can extend to the surface **16**. Control lines **104** may be electrical, hydraulic, optical, or other lines. Control lines **104** may operate as communication media, to transfer power, signals, data and the like between a controller, commonly at or near the surface (not shown), and the upper and lower completion assemblies **86**, **66**, respectively.

[0050] Carried on production tubing **30** is an ETM **106** as will be described in more detail below, with a control line **104** extending from ETM **106** to surface **16**. In one or more embodiments, ETM is a WETM, and may be in the form of an inductive coupler segment **106**. However, the control line **104** is not required to extend to the surface. It could alternatively, or in addition to, extend to a remote location within the wellbore system **10**.

[0051] Likewise, deployed in association with junction assembly **92** are two or more ETMs **108**, at least of which, one is a WETM, with one or more control lines **100** extending from junction assembly **92**. More specifically, in one or more embodiments, junction assembly **92** can include an upper ETM **108***a,* which is preferably in the form of a WETM, and for the main wellbore **12***a* and the lateral wellbore **12***b,* junction assembly **92** can include a WETM **108***b,* **108***c,* respectively, preferably in the form of inductive coupler segments where the inductive coupler segments **108***b,* **108***c* communicate via control lines with an upper ETM **108***a* which are all carried on junction assembly **92**. In one or more embodiments, in the case of inductive coupler segments **108***b,* **108***c,* each WETM is downhole from the intersection **64** when junction assembly **92** is installed in wellbore **12**.

[0052] Finally, at least one ETM **110**, and preferably a WETM such as an inductive coupler segment, is deployed in lateral wellbore **12***b* in association with lower completion assembly **66***b*. It will be appreciated that when two WETMs are axially aligned (such as is shown in FIG. **4** by inductive coupler segments **108***b* and **136**), wireless coupling between the aligned coupler segments can permit wireless transfer between the segments of power and/or monitoring and control signals. This is particularly true where the WETMs are inductive coupler segments so as to facilitate inductive coupling between the WETMs. While in some embodiments, the two aligned inductive coupler segments are on opposite sides of a pressure barrier (such as within the interior of a pressure conduit and on the exterior of a pressure conduit), in other embodiments, the two inductive coupler segments may be on the same side of a pressure conduit, simply permitting a connector-less coupling for transmission of power and/or signals.

[0053] Turning to FIGS. **2**, **3** and **4**, embodiments of unitary junction assembly **92** having a deformable conduit **96** are illustrated and generally include (a) an upper section for attachment to a pipe string and a first upper aperture; (b) a lower section comprising a primary passageway ending in a first lower aperture for fluid communication with a deflector and a secondary passageway ending in a second lower aperture for fluid communication with the secondary wellbore; and (c) a deformable portion. One or more of the passageways may be formed along a leg whereby the conduit is separated into the primary leg and the secondary leg, thereby forming a unitary multilateral junction, the unitary nature of which permits junction assembly **92** to be installed as a single unit that can more readily be used to transfer power and/or communication signals to both the lower main wellbore **12***a* and the lateral wellbore **12***b*. The deformable portion may be a leg or conduit junction located between the upper section and the lower section of the conduit.

[0054] The embodiments of junction assembly **92** illustrated in FIGS. **2**, **3** and **4** may be deployed in conjunction with a deflector **94** which may be used to position junction assembly **92**. With specific reference to FIGS. **2** and **4**, deflector **94** is positioned along casing **54** adjacent the intersection **64** between the main wellbore **12***a* and lateral wellbore **12***b*. In particular, the deflector **94** is located distally to the intersection **64**, adjacent or in close proximity to it, such that when equipment is inserted through the main wellbore **12***a*, the equipment can be deflected into the lateral wellbore **12***b* at the intersection **64** as a result of contact with the deflector **94**. The deflector **94** may be anchored, installed or maintained in position within the main wellbore **12***a* using any suitable conventional apparatus, device or technique.

[0055] The deflector **94** has an external surface **112**, an upper end **114**, a lower end **116** and an internal surface **118**. The external surface **112** of the deflector **94** may have any shape or configuration so long as the deflector **94** may be inserted in the main wellbore **12***a* in the manner described herein. In one or more embodiments, the external surface **112** of the deflector **94** is preferably substantially tubular or cylindrical such that the deflector **94** is generally circular on cross-section.

[0056] In preferred embodiments, the deflector **94** may include an orientation tool **93** positioned along external surface **112** to provide a seal between the external surface **112** of the deflector **94** and the internal surface **122** of the casing **54** of main wellbore **12***a*. Thus, wellbore fluids are inhibited from passing between the deflector **94** and the casing **54**. As used herein, a seal assembly, such as the orientation tool **93**, may be any conventional seal or sealing structure. For instance, a seal assembly such as the orientation tool **93** may be comprised of one or a combination of elastomeric or metal seals, packers, slips, liners or cementing. Likewise, a seal assembly such as the orientation tool **93** may also be a sealable surface. The orientation tool **93** may be located at, adjacent or in proximity to the lower end **116** of the deflector **94**.

[0057] The deflector **94** further comprises a deflecting surface **124** located at the upper end **114** of the deflector **94** and a seat **126** for engagement with the junction assembly **92**. When positioned in the main wellbore **12***a*, as shown in FIG. **2**, the deflecting surface **124** is located adjacent the lateral wellbore **12***b* such that equipment inserted through the main wellbore **12***a* may be deflected into the lateral wellbore **12***b* to the extent the equipment cannot pass through deflector **94** as described below. The deflecting surface **124** may have any shape and dimensions suitable for performing this function, however, in preferred embodiments, the deflecting surface **124** provides a sloped surface which slopes from the upper end **114** of the deflector **94** downwards, towards the lower end **116** of the deflector **94**.

[0058] The seat **126** of the deflector **94** may also have any suitable structure or configuration capable of engaging the junction assembly **92** to position or land the junction assembly **92** in the main and lateral wellbores **12***a*, **12***b* in the manner described herein. In the preferred embodiment, when viewing the deflector **94** from its upper end **114**, the seat **126** is offset to one side opposite the deflecting surface **124**.

[0059] Further, in the preferred embodiment, the deflector **94** further comprises a deflector bore **128** associated with the seat **126**. The deflector bore **128** is associated with the seat **126**, which engages the junction assembly **92**, such that movement of fluids in the main wellbore **12***a* through the deflector **94** and through the junction assembly **92** is provided.

[0060] The deflector bore **128** extends through the deflector **94** from the upper end **114** to the lower end **116**. The deflector bore **128** preferably includes an upper section **130**, adjacent the upper end **114** of the conduit **94**, communicating with a lower section **132**, adjacent the lower end **116**. Preferably, the seat **126** is associated with the upper section **130**. Further, in the preferred embodiment, the seat **126** is comprised of all or a portion of the upper section **130** of the deflector bore **128**. In particular, the upper section **130** is shaped or configured to closely engage the junction assembly **92** in the manner described below. The bore of the lower section **132** of the deflector bore **128** preferably expands from the upper section **130** to the lower end **116** of the deflector **94**. In other words, the cross-sectional area of the lower section **132** increases towards the lower end **116**. Preferably, the increase in cross-sectional area is gradual and the cross-sectional area of the lower section **132** adjacent the lower end **116** is as close as practically possible to the cross-sectional area of the lower end **116** of the deflector **94**.

[0061] Disposed along bore **128** is a seal assembly **134** that can be any conventional seal assembly. For instance, the seal assembly **134** can be comprised of one or a combination of seals and sealing surfaces or friction fit surfaces. In one or more embodiments, seal assembly **134** is located along the inner surface **118** in upper section **130** of the deflector **94**.

[0062] Deflector **94** further includes an ETM **136**, and preferably, a WETM **136**, mounted thereon. In one or more embodiments, WETM **136** is inductive coupler segment, and for purposes of this discussion, without intending to limit the WETM **136**, will be discussed as an inductive coupler segment. While the inductive coupler segment **136** may be mounted internally or externally along deflector **94**, in one or more embodiments, inductive coupler segment **136** is deployed internally along bore **128**. In one or more preferred embodiments, inductor segment **136** is mounted upstream of seals **134** between the seals **134** and the upper end **114** with one or more cables **100** extending down from deflector **94** to lower completion assembly **66***a* and routed adjacent the seals **134**, such as through the thicker portion of the deflector **94** Likewise, in one or more preferred embodiments, inductor segment **136** is mounted downstream of seals **134** between seals **134** and lower end **116** so that a cable **100** extending down from deflector **94** to lower completion assembly **66***a* does not interfere with seal **134**. In this regard, inductive coupler segment **136** is preferably located below seat **126**.

[0063] Referring to FIGS. **3** and **4**, junction assembly **92** may be comprised of a conduit **96** having a deformable portion with an outside surface **140** as described below. In some embodiments, the conduit **96** is generally tubular or cylindrical in shape such that the conduit **96** is generally circular on cross-section and defines an outside diameter. In some embodiments, conduit **96** may have a D-shaped cross-section, while in other embodiments, conduit **96** may have other cross-sectional shapes. Conduit **96** includes an upper section **142**, a lower section **144** and a conduit junction **146**. In one or more embodiments, the conduit junction **146** is the deformable portion, while in other embodiments, the conduit junction is rigid and one or both of the conduit legs is deformable. The upper section **142** is comprised of a proximal end **147** opposing the conduit junction **146** with a first upper aperture **145** defined in the upper section **142**. Thus, the upper section **142** extends from the junction **146**, in a direction away from the lower section **144**, for a desired length to the proximal end **147**. In addition, the upper section **142** may further include a polished bore receptacle (PBR) **149** shown in FIG. **4**, either integrally formed or secured to proximal end **147**. The junction assembly **92** may include a liner hanger **184** in combination with the conduit **96** to support the conduit in the wellbore **12**.

[0064] In one or more embodiments, the conduit **96** is unitary. In this regard, conduit **96** may be integrally formed, in that the upper section **142**, the lower section **144** and the conduit junction **146** are comprised of a single piece or structure. Alternately, the conduit **96**, and each of the upper section **142**, the lower section **144** and the conduit junction **146**, may be formed by interconnecting or joining together two or more pieces or portions that are assembled into a unitary structure prior to deployment in wellbore **12**.

[0065] The lower section **144** is comprised of (i) a primary leg **148** having a wall **148'**, the primary leg **148** extending from the conduit junction **146** and (ii) a secondary or lateral leg **150** having a wall **150'**, the lateral leg **150** extending from the conduit junction **146**. The primary leg **148** is capable of engaging the seat **126** (see FIG. **2**) of the deflector **94**, while the lateral leg **150** is capable of being inserted into the lateral wellbore **12*b***. The conduit junction **146** is located between the upper section **142** and the lower section **144** of the conduit **96** comprising the junction assembly **92**, whereby the conduit **96**, and in particular the lower section **144**, is separated or divided into the primary and lateral legs **148**, **150**.

[0066] The primary leg **148** has a distal end **152** opposing the conduit junction **146** with a first lower aperture **151** defined at the distal end **152**. Thus, the primary leg **148** extends from the conduit junction **146**, in a direction away from the upper section **142** of the conduit **96**, for a desired length to the distal end **152** of the primary leg **148**. In the preferred embodiment, the primary leg **148** is tubular or hollow such that fluid may be conducted between the first upper aperture **145** of the upper section **142**, past the conduit junction **146** to the first lower aperture **151** of the distal end **152**. Thus, fluid may be conducted through the main wellbore **12*a*** by passing through the conduit **96** of the junction assembly **92** and the deflector bore **128** of the deflector **94**.

[0067] The secondary or lateral leg **150** also has a distal end **154** opposing the junction **146** with a second lower aperture **153** defined at the distal end **154**. Thus, the lateral leg **150** extends from the conduit junction **146**, in a direction away from the upper section **142** of the conduit **96**, for a desired length to the distal end **154** of the lateral leg **150**. The lateral leg **150** is tubular or hollow for conducting fluid between the first upper aperture **145** of the upper section **142**, past the conduit junction **146** to the second lower aperture **153** of the distal end **154**. In the illustrated embodiment, lateral leg **150** is deformable. In other embodiments, both legs **148**, **150** may be deformable. As used herein, "deformable" means any pliable, movable, flexible or malleable conduit that can be readily manipulated to a desired shape. The conduit may either retain the desired shape or return to its original shape when the deforming forces or conditions are removed from the conduit. For example, lateral leg **150** can be movable or can flex relative to primary leg **148** due to conduit junction **142**.

[0068] Junction assembly **92** further includes first, second and third inductive coupler segments **108*a*,** **108*b*** and **108*c***. First inductive coupler segment **108*a*** is preferably positioned along upper section **142** between proximal end **147** and conduit junction **146**. Second inductive coupler segment **108*b*** can be positioned along primary leg **148** between conduit junction **146** and distal end **152**, while a third optional inductive coupler segment **108*c*** can be positioned along lateral leg **150** between conduit junction **146** and distal end **154**. The third inductive coupler segment can be optional when the lower completion is connected to the junction **92** prior to being installed in the wellbore. In the case of second and third inductive coupler segments **108*b*** and **108*c*** (when used), the segments are preferably positioned adjacent the distal end **152**, **154**, respectively, of the primary leg **148** and lateral leg **150**. Likewise, in the case of the inductive coupler segments **108*a*,** **108*b*** and **108*c*,** they may be positioned either along the interior or exterior of junction assembly **92**. In FIGS. **3** and **4**, the inductive coupler segments **108*a*,** **108*b*** and **108*c*** are illustrated as being positioned along the exterior of junction assembly **92**. As illustrated, a cable **100** extends from the inductive coupler segment **108*a*** down to each of the inductive coupler segments **108*b*** and **108*c***. Because junction assembly **92** is unitary in nature, it allows the inductive coupler segment **108*a*** to be readily connected to the inductive coupler segments **108*b*** and **108*c*** since the interconnections need not bridge separately installed components as would commonly occur in the prior art with multi-piece junction assemblies assembled downhole.

[0069] In any event, primary leg **148** may be of any length permitting the primary leg **148** to engage the seat **126** of the deflector **94** and inductive coupler segment **108*b*** to be positioned in the vicinity of, and generally aligned with, inductive coupler segment **136** of deflector **94**. In this regard, inductive coupler segments **136** and **108*b*** may be on the same side of a pressure barrier, and thus, adjacent one another, or separated by a pressure barrier, and thus, simply aligned with one another. In any event, the lateral leg **150** may be of any length permitting the lateral leg **150** to be deflected into the lateral wellbore **12*b***. Further, the primary and lateral legs **148**, **150** may be of any lengths relative to each other. However, in the preferred embodiment, the lateral leg **150** is longer than the primary leg **148** such that the distal end **154** of the lateral leg **150** extends beyond the distal end **152** of the primary leg **148** when the conduit junction **146** is substantially undeformed. With respect to the alignment of coupler segments, it will be understood that two segments may require axial alignment, circumferential alignment or both. ETM coupler segments can be a series of stacked, extra-long, and/or multi-tap coupler segments, as well as incorporating components and/or methods to ensure maximum transfer of energy from one coupler segment to a coupled coupler segment. A controller can be used to "tap" a desired section of coupler segments that most closely aligns with the coupled coupler segment.

[0070] In one or more preferred embodiments, when the lateral leg **150** is in a substantially undeformed position as shown in FIG. **3**, the primary leg **148** and the lateral leg **150** are substantially parallel to each other. However, the primary and lateral legs **148**, **150** need not be substantially parallel to each other, and the longitudinal axes of the primary and lateral legs **148**, **150** need not be substantially parallel to the longitudinal axis of the conduit **96**, as long as the conduit **96** may be inserted and lowered into the main wellbore **12***a* when the lateral leg **150** is in a substantially undeformed position.

[0071] When the junction assembly **92** is connected to a pipe string **30** and lowered in the main wellbore **12***a*, the lateral leg **150** is capable of being deflected into the lateral wellbore **12***b* by the deflector **94** such that the deformable conduit junction **146** becomes deformed and the primary leg **148** then engages the seat **126** of the deflector **94**, as shown in FIG. **4**. The deformable conduit junction **146** separates the primary leg **148** and the lateral leg **150** and permits the placement of the junction assembly **92** in the main and lateral wellbores **12***a*, **12***b*. As stated, the primary leg **148** is capable of engagement with the seat **126** of the deflector **94**. Thus, the shape and configuration of the primary leg **148** is chosen or selected to be compatible with the seat **126**, being the upper section **130** of the deflector bore **128** in the preferred embodiment.

[0072] Further, the seat **126** engages the primary leg **148** such that the movement of fluid in the main wellbore **12***a*, through the deflector **94** and the conduit **96**, is provided. Preferably, the primary leg **148** engages the seat **126** to provide a sealed connection between the deflector **94** and the main wellbore **12***a*. Any conventional seal assembly **134** may be used to provide this sealed connection. For instance, the seal assembly **134** may be comprised of one or a combination of seals or a friction fit between the adjacent surfaces. In the preferred embodiment, the seal assembly **134** is located between the primary leg **148** and the upper section **130** of the deflector bore **128** when the primary leg **148** is seated or engages the seat **126**. The seal assembly **134** may be associated with either the primary leg **148** or the upper section **130** of the deflector bore **128**. However, preferably, the seal assembly **134** is associated with the upper section **130** of the deflector bore **128**.

[0073] Primary leg **148** may include a guide **158** for guiding the primary leg **148** into engagement with the seat **126**. The guide **158** may be positioned at any location along the length of the primary leg **148** which permits the guide **158** to perform its function. However, preferably, the guide **158** is located at, adjacent or in proximity to the distal end **152** of the primary leg **148**. The guide **158** may be of any shape or configuration capable of guiding the primary leg **148**. However, preferably the guide **158** has a rounded end **160** to facilitate transmission down the wellbore **12**, as shown in FIGS. **2** and **4**.

[0074] The lateral leg **150** may include an expansion section **162** located at, adjacent or in proximity to the distal end **154** of the lateral leg **150**. The expansion section **162** comprises a cross-sectional expansion of the lateral leg **150** in order to increase its cross-sectional area. As indicated above, the length of the lateral leg **150** is greater than the length of the primary leg **148** in the preferred embodiment. Preferably, the lateral leg **150** commences its cross-sectional expansion to form the expansion section **162** at a distance from the conduit junction **146** approximately equal to or greater than the distance of the distal end **152** of the primary leg **148** from the conduit junction **146**. Thus, when the conduit junction **146** is undeformed, the expansion section **162** is located beyond or distal to the distal end **152** of the primary leg **148** as shown in FIG. **3**.

[0075] A liner **164** for lining the lateral wellbore **12***b* may extend from the lateral leg **150** of the conduit **96**. The liner **164** may be any conventional liner, including a perforated liner, a slotted liner or a prepacked liner. In one or more embodiments, the liner **164** may form part of the lower completion assembly **66***b* in lateral wellbore **12***b*, while in other embodiments, liner **164** may be separate and generally in fluid communication with conduit **96**. In any event, liner **164** includes a proximal end **166** and a distal end **168**, where the proximal end **166** is attached to the distal end **154** of the lateral leg **150**. The distal end **168** extends into the lateral wellbore **12***b* such that all or a portion of the lateral wellbore **12***b* is lined by the liner **164**. Thus, junction assembly **92** may function to hang the liner **164** in the lateral wellbore **12***b*. Alternatively, as discussed below, a stinger **172** (see FIG. **5**), may be attached to the distal end **154** of lateral leg **150** and utilized to transport liner **164** and/or other components of a lower completion assembly **66** (see FIG. **5**) into lateral wellbore **12***b*.

[0076] The upper section **142** conducts fluid therethrough from the deformable conduit junction **146** to the proximal end **147**. In the preferred embodiment, the upper section **142** permits the mixing or co-mingling of any fluids passing from the primary and lateral (or secondary) legs **148**, **150** into the upper section **142**. However, alternately, the upper section **142** may continue the segregation of the fluids from the primary and lateral legs **148**, **150** through the upper section **142**. Thus, the fluids are not permitted to mix or co-mingle in the upper section **142**.

[0077] Junction assembly **92** may also include one or more seal assemblies **170** associated with it. Seal assemblies **170** may be carried on conduit **96** or may be carried on adjacent equipment, such as a liner hanger (see liner hanger **184***b* in FIG. **5**) supporting junction assembly **92**. As illustrated a seal assembly **170***a* is associated with the upper section **142** of the conduit **96**, or may form or comprise a portion thereof, such that the seal assembly **170***a* provides a seal between the conduit **96** and casing **54** within the main wellbore **12***a*. Seal assembly **170***a* may be carried on conduit **96** such as shown in FIGS. **3** and **4**, or some other adjacent equipment, such as shown in FIG. **5**, but is generally provided to seal the upper section **142** of junction assembly **92**. Preferably, the seal assembly **170***a* is located between the outside surface **140** of the upper section **142** of the conduit **96** (other liner hanger **84**, as the case may be) and the internal surface **122** of casing **54**. Thus, seal assembly **170***a* inhibits wellbore fluids from passing between the conduit **96** and the casing string **54**.

[0078] A seal assembly **170***b* is shown positioned along primary leg **64**, preferably adjacent distal end **152**, and a seal assembly **170***c* is shown positioned along lateral leg **150**, preferably adjacent distal end **154**. The seal assembly **170** may be comprised of any conventional seal or sealing structure. For instance, the seal assembly **170** may be comprised of one or a combination of seals, packers, slips, liners or cementing.

[0079] In one or more embodiments, where inductive coupler segments that are cabled to one another are positioned so that consecutive inductive coupler segments are on the same tubular, such as inductive coupler segments **108***a*, **108***b*, **108***c* illustrated on conduit **96**, and are within the same pressure barrier, it may be desirable to position the inductive coupler segments between sets of sealing elements, such as seal assemblies **170***a* and **170***b*. This prevents the need for a cable, such as cable **100**, from straddling or extending across a pressure barrier. As used herein, pressure barrier may refer to a wall between an interior and exterior of a tubular, such as a string or casing, or may refer to a zone defined by successive sets of seal assemblies along a tubular.

[0080] In one or more embodiments where cooperating inductive coupler segments, i.e., inductive coupler segments disposed to wirelessly transfer power and/or signals therebetween, are positioned adjacent one another within the same pressure barrier (as opposed to simply aligned on opposite sides of a tubing wall), it may be necessary for a cable **100** extending to one of the inductive coupler segments to pass through a pressure barrier, such as a seal assembly, in order to electrically connect via cable **100** respective electrical components. For example, in FIG. **4**, primary leg **148** of a junction assembly **92** is inserted into bore **128** of deflector **94**. As shown, the inductive coupler segment **136** carried by deflector **94** is adjacent inductive coupler segment **108***b* carried by junction assembly **92**. Because the inductive coupler segments **136**, **108***b* are within the same pressure barrier, the cable **100** extending from one of the inductive coupler segments **136**, **108***b* must extend through or around a seal assembly, such as is shown where cable **100** extends from inductive coupler segment **136** to a downhole operational device **102** passes through seal assembly **170***b* of deflector **94**. In another embodiment, cable **100** may pass from the internal surface **118** to the external surface **112** of deflector **94** and then extend downhole along the external surface **112** of deflector **94**.

[0081] Alternatively, it will be appreciated, that inductive coupler segment **136** may be located on the external surface **112** deflector **94** and simply aligned with inductive coupler segment **108***b* positioned on junction assembly **92** within the interior of deflector **94**. In such case, no such pressure barrier need be crossed, and cable **100** may extend downhole to an operational device **102**.

[0082] As best illustrated in FIG. **5**, in one or more embodiments, junction assembly **92** may include a stinger **172** attached to the distal end **154** of lateral leg **150**. In such case, the inductive coupler segment **108***c* of lateral leg **150** may be carried on stinger **172**. More generally in FIG. **5**, a lower completion assembly **66***a* is illustrated deployed in the lower portion of a main wellbore **12***a,* while a lower completion assembly **66***b* is illustrated deployed in a lateral wellbore **12***b.* Although lower completion assemblies **66** as described herein are not limited to a particular configuration, for purposes of illustration, lower completion assembly **66***b* is shown as having one or more sand control screen assemblies **72** and one or more packers **70** extending from a liner or hanger **184***a,* with a bore **186** extending therethrough. Lower completion assembly may also include at its proximal end **188** a polished bore receptacle, such as PBR **149** shown in FIG. **4**.

[0083] Moreover, each lower completion assembly **66***a,* **66***b* may include an inductive coupler segment associated with the respective lower completion assembly **66***a,* **66***b*. In particular, at least lower completion assembly **66***b* includes an ETM **110** with inductive coupler segments associated with it. In particular, the ETM **110** is deployed along lower completion assembly **66***b* adjacent proximal end **188** for alignment with inductive coupler segment **108***c* as described below.

[0084] In FIG. **5**, deflector **94** is illustrated being conveyed into the main wellbore **12***a* by junction assembly **92** and coupled to a latch mechanism **93**. The deflector **94** is operatively coupled to string **30** via a junction assembly **92** and the stinger **172** to facilitate installation of the deflector **94**. Once installed in the well **12**, the junction assembly **92** may be configured to provide access to lower portions **12***a* of the main wellbore **12** via primary leg **148** and to the lateral wellbore **12***b* via lateral leg **150**. The stinger **172** may include a stinger member **176** that is coupled to and extends from the lateral leg **150**, a shroud **178** is positioned at a distal end of the stinger member **176**, and one or more seal assemblies **170***c* (see also FIG. **3**) are arranged within the shroud **178** Likewise, the shroud **178** may be disposed around a third inductive coupler segment **108***c* (see also FIG. **3**) mounted adjacent seals **170***c*. In some embodiments, the shroud **178** may be coupled to the deflector **94** with one or more shear pins **180** or a similar mechanical fastener. In other embodiments, the shroud **178** may be coupled to the deflector **94** using other types of mechanical or hydraulic coupling mechanisms.

[0085] As previously described, junction assembly **92** includes the inductive coupler segments **108***a,* **108***b* and **108***c,* which can be either internally or externally along conduit **96**. Moreover, junction assembly **92** may include a PBR **149** at its proximal end **147** with the upper inductive coupler segment **108***a* (not shown in FIG. **5**) at the proximal end of junction assembly **92** being disposed along the PBR **149** of junction assembly **92**.

[0086] Deflector **94** is conveyed into the wellbore **12** until it engages latch mechanism **93**. Once the deflector **94** is properly connected to the latch mechanism **93**, the string **30** may be detached from the deflector **94** at the stinger **172** and, more particularly, at the shroud **178**. This may be accomplished by placing an axial load on the stinger **172** via the string **30** and shearing the shear pin(s) **180** that connect the stinger **172** to the deflector **94**. Once the shear pin(s) **180** sheared, the stinger **172** may then be free to move with respect to the deflector **94** as manipulated by axial movement of the string **30**. More particularly, with the deflector **94** connected to the latch mechanism **93** and the stinger **172** detached from the deflector **94**, the string **30** may be advanced downhole within the main wellbore **12** to position lateral leg **150** and the stinger **172** within the lateral wellbore **12***b*. The diameter of the deflector bore **128** may be smaller than a diameter of the shroud **178**, whereby the stinger **172** is prevented from entering the deflector bore **128** but the shroud **178** is instead forced to ride along deflecting surface **124** of deflector **94** and into the lateral wellbore **12***b*.

[0087] In one or more embodiments, any hanger **184** deployed within wellbore **12** may also include an inductive coupler segment **156***a* which can couple to the inductive coupler segment **156***b* of the junction assembly **92**. In FIG. **5**, a hanger **184***b* is illustrated as supporting production casing **54**. It should also be understood that the deflector **94** is not required to be conveyed into the main wellbore **12***a* by junction assembly **92**. The deflector **94** can be installed with the latch mechanism **93** prior to conveyance of the assembly **92**.

[0088] Referring to FIG. **6**, the stinger **172** and the lateral leg **150** of the junction assembly **92** are depicted as positioned in the lateral wellbore **12***b* and engaging the lower completion assembly **66***b* of the lateral wellbore **12***b*. During deployment, the shroud **178** of stinger **172** engages the lower completion assembly **66***b*. In one or more embodiments, the diameter of the shroud **178** may be greater than a diameter of the bore **186** and, as a result, the shroud **178** may be prevented from entering the lower completion assembly **66***b*. Upon engaging the lower completion assembly **66***b*, weight may then be applied to the stinger **172** via the string **30**, which may result in the shroud **178** detaching from the distal end of the stinger member **176**. In some embodiments, for instance, one or more shear pins or other shearable devices (not shown) may be used to couple the shroud **178** to the distal end of the stinger member **176**, and the applied axial load may surpass a shear limit of the shear pins, thereby releasing the shroud **178** from the stinger member **176**. It will be appreciated that while a shroud **178** is described herein as a mechanism for protecting seal assemblies **170** and inductive coupler segment **108***c* during deployment, the disclosure is not limited to configurations with a shroud **178**, and thus, in other embodiments, the shroud **178** may be eliminated.

[0089] With the shroud **178** released from the stinger member **176**, the string **30** may be advanced further such that the shroud **178** slides along the outer surface of the stinger member **176** as the stinger member **176** advances into the lower completion assembly **66***b* where the stinger seals **170** sealingly engage the inner wall of bore **186** and the inductive coupler segment **108***c* carried on stinger **176** is generally aligned with an inductive coupler segment **110** carried on the lower completion assembly **66***b*. With the stinger seals **170** sealed within bore **186**, fluid communication may be provided through the lateral wellbore **12***b*, including through the various components of lower completion assembly **66***b*.

[0090] Notably, advancing the string **30** downhole within the main wellbore **12** also advances the primary leg **148** until locating and being received within the deflector bore **128**. The seal assembly **134** in the deflector bore **128** sealingly engages the outer surface of the primary leg **148** and the inductive coupler segment **108***b* carried on primary leg **64** of junction assembly **92** is positioned adjacent an inductive coupler segment **136** of the deflector **94**.

[0091] When deployed as described herein, the unitary junction assembly **92** permits power and/or data signals to be transferred to locations in both the main wellbore **12***a* below the intersection **64** and the lateral wellbore **12***b*. Such an arrangement is particularly desirable because it eliminates the need to overcome multiple separate wellbore components traditionally installed at an intersection **64** between wellbores **12***a*, **12***b*. The arrangement also enables monitoring and flow control of individual segments in each lateral **17***a*, **17***b*, **17***c*, **18***a*, **18***b*, and **18***c*.

[0092] Turning to FIG. **7**, shown is an elevation view in partial cross-section is a multilateral wellbore completion system **10** with two lateral wellbores **12***b*, **12***c* and two intersections **64**, **74**. It should be understood that any number of intersections of lateral wellbores can be accommodated with the wellbore completion system **10**. The lower completion equipment **66***a*, **66***b* and a lower junction assembly **92***a* can be installed at the intersection **64** as described above. Once junction assembly **92***a* is installed, an intermediate completion assembly (or tubing string) **78** can be installed with its distal end coupled to the PBR **149** of the junction assembly **92***a*, with a deflector **94***b* and location mechanism **93***b* positioned at its proximal end.

[0093] The deflector **94***b* can be positioned along the casing **54** adjacent the intersection **74** between the main wellbore **12***a* and lateral wellbore **12***c*. In particular, the deflector **94***b* is located adjacent or in close proximity to it the intersection **74** such that when equipment is inserted through the main wellbore **12***a*, the equipment can be deflected into the lateral wellbore **12***c* at the intersection **74** as a result of contact with the deflector **94***b*. The deflector **94** may be anchored, installed or maintained in position within the main wellbore **12***a* using any suitable conventional apparatus, device or technique, such as the location mechanism **93***b*. The lower completion assembly **66***c* and the junction assembly **92***b* can be installed to provide fluid communication between the upper wellbore **12**, and the main wellbore **12***a* and lateral wellbores **12***b*, **12***c*. This process can continue when installing junction assemblies in additional intersections in the wellbore **12** as the multilateral wellbore completion system **10** is assembled and fluids are produced from and/or injected into the wellbore **12**.

[0094] FIGS. **7** and **8** each show intervals **17***a-c*, **18***a-c*, **19***a-c* of the respective wellbores **12***a*, **12***b*, **12***c*. The junction assemblies **92** in FIGS. **7** and **8**, as well as the multibranch inflow control (MIC) junction **200** in FIG. **8** provide for communication to the completion equipment in the lower completion assemblies (or tubing strings) **66***a*, **66***b*, **66***c*, via ETMs **91**, **156**, **108**, **110** as generally described above (as well as ETMs **212**, **214** described below). The communication to the lower completion assemblies **66***a*, **66***b*, **66***c* can individually control fluid flow between the tubing string and the earth formation in each of these intervals. The communication can also transmit sensor data from each interval **17***a-c*, **18***a-c*, **19***a-c* to the surface (or other location) for monitoring such things as interval pressures, fluid composition, fluid flow rates, equipment health, water coning, etc.

[0095] As used herein, "intervals" refer to formation intervals. The formation intervals may be considered layers within the formation. Additionally, the formation intervals can be identified by changes in characteristics of the formation such as a change in permeability, and/or elevation, and/or a change in what a particular formation interval may contain (e.g. oil, water, gas, etc.).

[0096] Turning to FIG. **8**, shown is an elevation view in partial cross-section of the example multilateral wellbore completion system **10** of FIG. **7** with two lateral wellbores **12***b*, **12***c* and two intersections **64**, **74**. A junction assembly **92** is installed at intersection **64** similarly as described above. A unitary multibranch inflow control (MIC) junction assembly **200** is installed at intersection **74**, which not only provides communication to the lower completion assembly **66***c*, but also allows a tubing string to extend through the MIC junction assembly and connect (or otherwise couple) to the upper completion equipment **86** (i.e. tubing string **78**), thereby providing communication to the lower completion assemblies **66***a*, **66***b*. The tubing string **30** can extend through the unitary MIC junction assembly **200** and land in a PBR above the packer **88**. The ETM **91** can establish communication between the tubing string **30** and the upper completion assembly **86**, as well as the lower completion assemblies **66***a*, **66***b*. It should be understood that this is merely an exemplary configuration of the unitary MIC junction assembly **200**, which can be used to allow extension of the tubing string **30** through the unitary MIC junction assembly to access the lower tubing strings **78**, **76** and the lower completion assemblies **66***a*, **66***b*.

[0097] Turning to FIG. **9**, shown is a partial cross-section view of a multibranch inflow control (MIC) junction **200** installed at the intersection **74** of the lateral wellbore **12***c* and the main wellbore **12***a*. In one or more embodiments, the conduit **206** is unitary. In this regard, conduit **206** may be integrally formed, in that the upper section **142**, the lower section **144** and the conduit junction **146** are comprised of a single piece or structure. Alternately, the conduit **206**, and each of the upper section **142**, the lower section **144** and the conduit junction **146**, may be formed by interconnecting or joining together two or more pieces or portions that are assembled into a unitary structure prior to deployment in wellbore **12**.

[0098] Embodiments of the unitary MIC junction assembly **200** having a deformable conduit **206** are illustrated and generally include (a) the upper section **142** for coupling to a tubing string **30** and an upper aperture **190**; (b) the lower section **144** comprising a primary passageway **232** beginning in the upper aperture **190** and ending in a lower aperture **192** for fluid communication and a secondary passageway **234** ending in another lower aperture **194** for fluid communication with the secondary wellbore **12***c;* and (c) a deformable portion. One or more of the passageways **232**, **234** may be formed along a leg whereby the conduit **206** is separated into the primary leg **148** and the lateral leg **150**, thereby forming a unitary MIC junction assembly **200**, the unitary nature of which permits the unitary MIC junction assembly **200** to be installed as a single unit that can more readily be used to transfer power and/or communication signals to both the lower completion assemblies **66***a,* **66***c* in respective wellbores **12***a,* **12***c*. The deformable portion may be a leg **148**, **150** or conduit junction **146** located between the upper section **142** and the lower section **144** of the conduit **206**, and/or a combination thereof.

[0099] The liner **250** can be installed below the intersection **74** in the main wellbore **12***a,* with liner hanger **218***a* and packer **216***a.* The liner **250** can extend along the wellbore **12***a* as desired. A deflector **252** can be installed proximate the intersection **74** and extend into the upper end of the liner **250** with seals **240***a* providing sealing engagement between the liner **250** and the deflector **252**. A liner hanger **218***b* can be used to secure the deflector **252** in a position proximate the intersection **74**. However, a latch coupling can be installed in the casing, or other anchoring/orienting devices may be used. The upper end of the deflector **252** can include an inclined surface **254** used to deflect equipment into the lateral wellbore **12***c*. It should be understood that multiple liners can be installed in the wellbore **12***a* between the intersections **74** and **64**. It should also be understood that no liners are required to be installed between the intersections **74** and **64**. For example, the deflector **252** can be installed with a packer at its lower end to seal off the annulus **58** without a liner **250** being installed.

[0100] With the deflector **252** installed, the MIC junction assembly **200** can be installed at the intersection **74**. The MIC junction assembly **200** can include a unitary deforming conduit **206** with a primary leg **148** and a lateral leg **150**. Similar to the junction assembly **92** described above, the lateral leg **150** can be deflected into the lateral wellbore **12***c* which can cause the lateral leg **150** to deform and separate from the primary leg **148**. The lateral leg can include the lower completion assembly **66***c* that can be located in the wellbore **12***c* as the MIC junction assembly **200** is being installed at the intersection **74**. However, the lower completion assembly **66***c* can also be installed in wellbore **12***c* prior to the installation of the MIC junction assembly **200**, with the MIC junction assembly **200** carrying a stinger **172** (see FIG. **13**) at the lower end of the lateral leg **150**, where the stinger can engage the lower completion assembly **66***c* to connect the lower completion assembly **66***c* to the MIC junction assembly **200**. The primary leg **148** can engage with a PBR in the deflector **252** and provide a sealing engagement via seals **240***b.* The upper portion of the MIC junction assembly **200** can include an upper end **244** (also referred to as end **147**) and an upper ETM **214**. The MIC junction assembly **200** can be secured in the wellbore **12***a* by a liner hanger **218***c* and packer **216***b,* as well as any other suitable means for securing tubing strings in a wellbore, such as swaging, cementing, etc.

[0101] As seen in FIG. **9**, a tubing string **30** has been installed in the wellbore **12***a* and extended through the primary leg **148** of the MIC junction assembly **200**. Packers **210***a-c* can be used to secure the tubing string **30** within the MIC junction assembly **200** and the liner **250**, as well as seal off an annulus formed between the MIC junction assembly **200** and the liner **250**. More or fewer seals (e.g. packers **210**) can be used, as long as one seal (e.g. packer **210***a*) is positioned below the widow **202**, and one seal (e.g. packer **210***b*) is positioned above the window **202**, such that fluid flow **230** between the main wellbore **12***a* and the lateral wellbore **12***c* can be controlled. The fluid flow **230** can represent fluids received from multiple wellbore intervals (e.g. intervals **19***a-c* of wellbore **12***c*) that can be co-mingled to form the fluid flow **230**. However, it is not a requirement that fluids from multiple intervals be co-mingled to form the fluid flow **230**. The multilateral wellbore completion system **10** can control and monitor the various intervals such that fluid from a single interval can form the fluid flow **230**. The fluid flow **230** between the tubing string **30** and the lateral wellbore **12***c* can be further controlled by the flow control device **90** that can selectively permit, prevent, and partially prevent fluid flow **230** exiting or entering the tubing string **30**.

[0102] The ETMs **220**, **214** can provide communication between the tubing string **30** and the MIC junction assembly **200**, whereas the junction **200** also provides communication with equipment in the lower completion assembly **66***c,* via ETMs **212**, **110** (see FIGS. **10-12**). Inductive couplers can be used to facilitate the communication between the tubing string **30** and the MIC junction assembly **200**, such as hydraulic, optical, and electromagnetic couplers. The ETM **220** can be interconnected in the tubing string **30**. When the tubing string **30** is installed in the wellbore **12**A and extended through the MIC junction assembly **200**, the ETM **220** can align with the ETM **214**, where the inductive coupler segments in the ETM **220** (such as the electromagnetic coupler segments **225** and the hydraulic coupler segments **226**) align with inductor coupler segments in the MIC junction assembly **200** (such as electromagnetic coupler segments **224** and the hydraulic coupler segments **227**, respectively). When these coupler segments are sufficiently aligned, communication can be provided through the ETMs **220**, **214** via inductive coupling of the respective segments (**224**, **225**, **226**, **227**). Regarding the hydraulic coupler segments **226**, **227**, pairs of adjacent seals **222** can form an annular space **228** between the ETM **220** and the MIC junction assembly **200** and between adjacent hydraulic coupler segments **226** and **227**. This allows the hydraulic coupler segments **226** and **227** to be in fluid communication with each other while preventing fluid communication with other annular spaces **228**. The hydraulic coupler segments **226** can include control valves which selectively enable and disable fluid communication between the ETMs **220**, **214** and the control lines **100** of the MIC junction assembly **200**.

[0103] Regarding the electromagnetic coupler segments **224**, **225**, when generally aligned in the MIC junction assembly **200**, each respective pair of the electromagnetic coupler segments **224**, **225** can communicate via electromagnetic signals with each other. The electromagnetic coupler segments **225** can be connected to control lines **100** for communicating telemetry data (e.g. control and data signals) to/from the lower completion assembly **66***c* equipment and control lines **104** of the tubing string **30**. These and other inductive coupling segments can provide communication between control lines **104** and the control lines **100** to facilitate individual communication with operational devices **102** in the lower completion assembly **66***c*, thereby individually controlling fluid flow between the tubing string **30** and the wellbore intervals **19***a-c* and monitoring fluid flow, temperature, pressure, pH, as well as other wellbore parameters.

[0104] The ETMs **220**, **214** allow the MIC junction assembly **200** to be installed in the wellbore **12***a* at one or more intersections (e.g. intersection **74**) before installing a tubing string **30** that extends through the one or more MIC junction assemblies **200** and enables individual control of wellbore intervals (e.g. intervals **19***a-c*) in the lateral wellbore **12***c*. As multiple junctions are utilized, the alignment of coupler segments of the ETMs **220** and **214** becomes more difficult. To alleviate this issue, expansion joints (possibly with intelligent control lines) can be used to allow for variations in the main and lateral wellbores. Also, as stated before, the ETM coupler segments may be "stacked" in series, and/or be extra-long, multi-tap, coupler segments to provide better alignment options. Other components/methods (no-go shoulders, ratch-latches, etc.) can be used to further ensure sufficient alignment of the coupler segments for maximum transfer of power/energy from one coupler segment to another coupler segment, as well as allow the hydraulic transfer units to seal properly for the transfer of pressurized fluid through an ETM.

[0105] The MIC junction assembly **200** shown in FIGS. **10** and **11** functions similarly to the junction assembly **92** shown in FIGS. **5** and **6** and described above. In general, FIGS. **5** and **6** show an installation of the junction assembly **92** at an intersection **64** in the wellbore **12***a*. FIGS. **10** and **11** show an installation of a MIC junction assembly **200** at an intersection **74**. As the MIC junction assembly **200** is carried through the wellbore **12***a* to the intersection **74**, the lateral leg **150** is deflected into the lateral wellbore **12***c* by an inclined surface **254** of the deflector **252**. The deflector **252** is shown possibly being carried to the intersection on the MIC junction assembly **200**, as similarly explained regarding FIGS. **5** and **6**. However it is preferred that the deflector **252** is installed prior to conveyance of the MIC junction assembly **200** in the wellbore **12***a*. The liner **250** can be installed in the wellbore **12***a* and secured with the liner hanger **218***a*. The deflector **252** can be inserted into a PBR at the upper end of the liner **250** and sealingly engage the PBR. The deflector **252** can be secured in the wellbore **12***a* by the liner hanger **218***b* (or other anchoring/orienting devices). It should also be understood, that the lower completion assembly **66***c* can be attached to the lateral leg **150** and run in with the MIC junction assembly **200**. The liner hanger **218***c* can be used to secure the MIC junction assembly **200** at the intersection **74**. The unitary conduit **206** can include the lateral leg **150** and a primary leg **148**. The lateral leg **150** is deflected into the lateral wellbore **12***c* through the window **202**.

[0106] Referring to FIG. **12**, at least one difference between the junction assembly **92** installation and the MIC junction assembly **200** installation is that a tubing string **30** can be extended through the MIC junction assembly **200**, whereas the junction assembly **92** does not allow a tubing string **30** to extend therethrough. The work string **30** used to convey the MIC junction assembly **200** to the intersection **74** has been removed and a tubing string **30** has been installed through the MIC junction assembly **200**. Packers **210***a*, **210***c* can be used to secure the tubing string **30** within the MIC junction assembly **200**, and flow control device **90** can be used to control fluid flow **230** (see FIG. **9**) between the tubing string **30** and the lower completion assembly **66***c*. The ETM **220** (with inductive coupler segments **156***a*, in this example) is shown aligned with the inductive coupler segments **156***b* (can also be referred to as ETM **214**). This can provide the inductive coupling for communicating with the lower completion assembly equipment **66***c* via the control lines **100**. As indicated in FIG. **8**, and in more detail in FIG. **12**, the tubing string **30** can extend through the primary passageway **232** of the MIC junction assembly **200**, and sealing couple with the lower junction assembly **92** at the intersection **64** or another MIC junction assembly **200** at another intersection. This can provide communication between equipment in the upper and lower completion assemblies **86**, **66***a-c* to individually control fluid flow between the wellbore intervals **17***a-c*, **18***a-c*, **19***a-c* and the tubing string **30**. Telescoping joints can be installed in the tubing string **30** to allow for additional flexibility in aligning the coupler segments in the ETMs.

[0107] Referring to FIGS. **13-16**, a partial cross-sectional view of another multilateral wellbore system **10** is shown, with FIG. **13** being an overview and FIGS. **14-16** being detailed views of separate portions of FIG. **13**. FIG. **13** shows completion equipment installed in the wellbore system **10** to support completion operations, such as treatment, injection, and production operations. FIG. **14** shows a detailed partial cross-sectional view of completion equipment installed at an intersection **64** of lateral wellbore **12***b* and main wellbore **12***a*. FIG. **15** shows a detailed partial cross-sectional view of completion equipment installed at an intersection **74** of lateral wellbore **12***c* and main wellbore **12***a*. FIG. **16** shows a detailed partial cross-sectional view of completion equipment installed at an intersection **84** of lateral wellbore **12***d* and main wellbore **12***a*.

[0108] A junction assembly **92***a* can be installed at an intersection **64** with its primary leg **148***a* extended into a deflector **94***a* in the main wellbore **12***a*, and it lateral leg **150***a* extended in to the lateral wellbore **12***b*. A unitary MIC junction assembly **200***a* can be installed at an intersection **74**, which is uphole from the intersection **64**. Its primary leg **148***b* can be extended into a deflector **94***b* in the main wellbore **12***a*, and its lateral leg **150***b* extended in to the lateral wellbore **12***c*. Another unitary MIC junction assembly **200***b* can be installed at an intersection **84**, which is uphole from the intersections **64**, **74**. Its primary leg **148***c* can be extended into a deflector **94***c* in the main wellbore **12***a*, and its lateral leg **150***c* extended into the lateral wellbore **12***d*. After assembly of the completion equipment in the wellbore system **10** as shown in FIG. **13**, a tubing string **30** can be extended from a remote location (such as the surface) through the unitary MIC junction assembly **200***b*, through the unitary MIC junction assembly **200***a*, with a distal end **31** of the tubing string **30** landing in the primary leg **148***a* of the junction assembly **92***a*.

[0109] The following discussion will describe fluid flow in the wellbore system **10** as it may relate to a production operation. However, if should be understood that the completion equipment in FIG. **13** can also be used to support other completion operations, such as treatment and injection operations. To support these other operations, the fluid flows can be reversed to flow fluid from the surface (or a remote location in the wellbore **12***a*) into the lower portions of the main wellbore **12***a* and into one or more of the lateral wellbores **12***b*, **12***c*, **12***d*. The flow of fluids in either direction in the wellbore system **10** can be controlled by flow control devices **90***a-f* (as well as additional flow control devices), which can be controlled by a processing device via communication to the completion equipment in the wellbores **12***a*, **12***b*, **12***c*, **12***d* through control lines **100**, **104** and ETMs as necessary, thereby controlling flow of fluids from/to any one or more of intervals **17***a-c*, **18***a-c*, **19***a-c* (as well as other intervals, when additional lateral wellbores are completed).

[0110] In a production operation, fluid **300** can flow (arrows **310***a*) from lower completion assembly equipment **66***a* in wellbore **12***a* into the distal end **31** of the tubing string **30** becoming fluid flow **310***b* in passageway **242**. Fluid **300** can flow through a flow control device **90***b* as fluid flow **310***c* into an annular space outside of the tubing string **30** and then back into the passageway **242** as fluid flow **310***d* through a flow control device **90***c*. The flow control device **90***c* (as well as other flow control devices) can be used to control the amount of fluid **300** that enters the passageway **242** from the lower completion equipment **66***a* and can at least contribute to the fluid flow **350***a-e* that can travel through the tubing string **30** to the surface. It should also be clear that operational devices **102** in the lower completion assembly **66***a* can control fluid flow from individual intervals **17***a-c*.

[0111] The fluid **302** can flow (arrows **312***a*) through passageway **238** from the lower completion assembly equipment **66***b* in wellbore **12***b* into an annular space outside the tubing string **30** becoming fluid flow **312***b* and **312***c*. The fluid **302** can flow (arrows **312***d*) radially outward through the flow control device **90***a* into another annular space, becoming fluid flow **312***e*. The fluid **302** can then flow (arrows **312***f*) through a flow control device **90***g*, into yet another annular space and then through a flow control device **90***d* (arrows **312***g*) into the passageway **242**. Therefore, any of the flow control devices **90***a*, **90***g*, and **90***d* can be used to control what amount (if any) of fluid **302** that is allowed to enter the passageway **242** from the lower completion equipment **66***b* in the lateral wellbore **12***b* and can at least contribute to the fluid flow **350***b-e* that can travel through the tubing string **30** to the surface.

[0112] The fluid **304** can flow (arrows **314***a*) through passageway **234***a* from the lower completion assembly equipment **66***c* in wellbore **12***c* into an annular space outside the tubing string **30** becoming fluid flow **314***b*. The fluid **304** can then flow from the annular space as fluid flow **314***c* into the passageway **242**. Therefore, the flow control device **90***e* can be used to control what amount (if any) of fluid **304** that is allowed to enter the passageway **242** from the lower completion equipment **66***c* in the lateral wellbore **12***c* and at least contribute to the fluid flow **350***d-e* that can travel through the tubing string **30** to the surface.

[0113] The fluid **306** can flow (arrows **316***a*) through passageway **234***b* from the lower completion assembly equipment **66***d* in wellbore **12***d* into an annular space outside the tubing string **30**. The fluid **306** can then flow from the annular space as fluid flow **316***b* through flow control device **90***f* into the passageway **242**, and at least contribute to the fluid flow **350***e* that can travel through the tubing string **30** to the surface. Therefore, the flow control device **90***f* can be used to control what amount (if any) of fluid **306** that is allowed to enter the passageway **242** from the lower completion equipment **66***d* in the lateral wellbore **12***d*.

[0114] Therefore, as illustrated in FIG. **13**, the fluid produced from (or injected into) the wellbores **12***a*, **12***b*, **12***c*, **12***d* can be controlled with the flow control devices **90***a-g* in this example configuration of completion equipment in the wellbore system **10**. The flow control devices **90***a-g* (as well as others, if needed) can be controlled via power, control, and data signals communicated to the control devices **90***a-g* via control lines and EMTs. The junction assembly **92***a* and the unitary MIC junction assemblies **200***a*, **200***b*, in this example, can provide paths to carry communication signals between the completion equipment, including the flow control devices **90***a-g*, thereby allowing control of fluid flow between surface equipment and each wellbore **12***a*, **12***b*, **12***c*, **12***d*, as well as individually controlling fluid flow from individual formation intervals along the wellbores **12***a*, **12***b*, **12***c*, **12***d*. It should also be clear, as mentioned previously, that these flow control devices **90***a-g* (as well as fewer or more flow control devices) can be used to control injection of fluids into individual intervals in the main wellbore and lateral wellbores when the wellbore system is used in injection or treatment operations.

[0115] FIG. **14** shows a more detailed partial cross-sectional view of the intersection **64** of FIG. **13**. A deflector **94***a*, with an orientation device **93***a*, can be installed proximate the window **62***a* in the casing **54**. The junction assembly **92***a* can be installed at the intersection **64**, where the primary leg **148***a* sealingly engages a polished bore receptacle (PBR) in the deflector **94***a*, and the lateral leg **150***a* sealingly couples to the lower completion assembly **66***b* (not shown). A distal end of another deflector **94***b* can extend into the aperture **145***a* and sealingly engage a PBR in the upper portion of the junction assembly **92***a*. The tubing string **30** can be installed through the deflector **94***b* with its distal end **31** sealingly engaging a PBR in the primary leg **148***a* of the junction assembly **92***a*.

[0116] Control lines **104***a* can extend along the tubing string **30** to connect the surface equipment (not shown) to the coupler segments **156***a-c* along the tubing string **30**. It should be understood that any number of coupler segments can be used along the tubing string **30**. In FIG. **14**, the control lines **104***a* connect to the coupler segments **156***a* which can be axially aligned with the coupler segments **108***a* disposed on an exterior of the junction assembly **92***a*. It should be understood that the positions of the coupler segments in FIGS. **13-16** are merely examples of locations for these items. They can be at many other positions, as long as the alignment of the coupler segments in an ETM provide for energy transfer between the coupler segments (such as **156***a* and **108***a*). The ETM preferably consists of source and destination coupler segments, with either coupler segment in the ETM capable of being a source or destination as well as switching between source and destination during operations.

[0117] Control lines **100***a* can be connected between the coupler segments **108***a* and the lower completion assembly **66***b* equipment in the lateral wellbore **12***b*. Therefore, communication through the coupler segments **156***a* and **108***a* can be used to control the lower completion assembly **66***b* equipment. Control lines **100***d* can be connected between the coupler segments **108***a* and **108***b* to enable communication between these coupler segments. The coupler segments **108***b* can be aligned with coupler segments **136** to enable energy transfers between the coupler segments **108***b* and **136**. The coupler segments **136** can be connected to the lower completion assembly **66***a* equipment in the main wellbore **12***a* via control lines **104***b*, thereby enabling control of the lower completion assembly **66***a* equipment. The communication paths provided by the control lines and the coupler segments enable control of the lower assembly equipment in the wellbores **12***a*, **12***b* as well as other operational devices (such as flow control devices **90***a-g*) to control fluid flow between the wellbores **12***a*, **12***b* and the passageway **242** of the tubing string **30**. Please refer to the discussion above regarding the fluid flow arrows **310***a-d* and **312***a-e*.

[0118] FIG. **15** shows a more detailed partial cross-sectional view of the intersection **74** of FIG. **13**. A deflector **94***b*, with orientation device **93***b*, can be installed proximate the window **62***b* in the casing **54**. The unitary MIC junction assembly **200***a* can be installed at the intersection **74**, where the primary leg **148***b* sealingly engages a PBR in the deflector **94***b*, and the lateral leg **150***b* sealingly couples with the lower completion assembly **66***c* (not shown). A distal end of another deflector **94***c* can extend into the aperture **145***b* and sealingly engage a PBR in the upper portion of the unitary MIC junction assembly **200***a*. The tubing string **30** can be installed through the deflector **94***c*, through primary passageway **232***a* of the unitary MIC junction assembly **200***a*, and through the deflector **94***b* to land the distal end **31** in the junction assembly **92***a*.

[0119] Control lines **104***a* can extend along the tubing string **30** to connect the surface equipment (not shown) to the coupler segments **156***a-c* along the tubing string **30**. In FIG. **15**, the control lines **104***a* connect to the coupler segments **156***b* which can be axially aligned with the coupler segments **108***d* disposed on an exterior of the unitary MIC junction assembly **200***a*. The control lines **100***b* can be connected between the coupler segments **108***d* and the lower completion assembly **66***c* equipment in the lateral wellbore **12***c*. Therefore, communication through the coupler segments **156***b* and **108***d* can be used to control the lower completion assembly **66***c* equipment. The communication paths provided by the control lines and the coupler segments enable control of the lower assembly equipment in the wellbores **12***a*, **12***b*, **12***c* as well as other operational devices (such as flow control devices **90***a-g*) to control fluid flow between the individual intervals in each of the wellbores **12***a*, **12***b*, **12***c* and the passageway **242** of the tubing string **30**. Please refer to the discussion above regarding the fluid flow arrows **314***a* and **350***c*.

[0120] FIG. **16** shows a more detailed partial cross-sectional view of the intersection **84** of FIG. **13**. A deflector **94***c*, with orientation device **93***c*, can be installed proximate the window **62***c* in the casing **54**. The unitary MIC junction assembly **200***b* can be installed at the intersection **84**, where the primary leg **148***c* sealingly engages a PBR in the deflector **94***c*, and the lateral leg **150***c* sealingly couples with the lower completion assembly **66***d* (not shown). The end **147***c* of the unitary MIC junction assembly **200***b* can be flared or otherwise configured to assist insertion of the tubing string **30** into the primary passageway **232***b*. The tubing string **30** can be installed through the aperture **145***c*, through primary passageway **232***b* of the unitary MIC junction assembly **200***b*, and through the deflector **94***c* and can be further extended through the unitary MIC junction assembly **200***a* to land the distal end **31** in a proximal end of the junction assembly **92***a*.

[0121] Control lines **104***a* can extend along the tubing string **30** to connect the surface equipment (not shown) to the coupler segments **156***a-c* along the tubing string **30**. In FIG. **16**, the control lines **104***a* connect to the coupler segments **156***c* which can be axially aligned with the coupler segments **108***e* disposed on an exterior of the unitary MIC junction assembly **200***b*. The control lines **100***c* can be connected between the coupler segments **108***e* and the lower completion assembly **66***d* equipment in the lateral wellbore **12***d*. Therefore, communication through the coupler segments **156***c* and **108***e* can be used to control the lower completion assembly **66***d* equipment. The communication paths provided by the control lines and the coupler segments enable control of the lower assembly equipment in the wellbores **12***a*, **12***b*, **12***c*, **12***d* as well as other operational devices (such as flow control devices **90***a-g*) to control fluid flow between the individual intervals in each of the wellbores **12***a*, **12***b*, **12***c*, **12***d* and the passageway **242** of the tubing string **30**. Please refer to the discussion above regarding the fluid flow arrows **316***a-b* and **350***d-e*.

[0122] FIGS. **17-19** show partial cross-sectional views of the wellbore system **10** in various stages of assembly of completion equipment within the multi-lateral wellbore system **10**. The earthen formation **14** surrounding the wellbores is not shown to more easily view the wellbore equipment.

[0123] FIG. **17** shows a casing **54** that has been secured in a main wellbore **12***a*. A first lateral wellbore **12***b* has been drilled through the wall of the casing **54** to form the window **62***a*. After the lateral wellbore **12***b* has been drilled, a deflector **94***a* can be secured in the wellbore **12***a* via the orientation device **93***a*. The junction assembly **92***a* can then be installed in the wellbore **12***a* at the intersection **64**, with the primary leg **148***a* extended into the deflector **94***a* and sealingly engaged with a PBR in the deflector **94***a* by seals **171***a*. The lateral leg **150***a* can be extended into the lateral wellbore **12***b*. Even though it is not shown, the lateral leg **150***a* can be coupled to the lower completion assembly **66***b* equipment in the lateral wellbore **12***b*, including coupling the control lines **100***a* to the lower completion assembly **66***b* equipment. One or more liner strings (not shown) can then be installed in the wellbore **12***a*, with the distal end of the lowermost liner string sealingly engaged via seals **171***b* with the PBR extending downhole from the end **147***a*. However, FIG. **17** shows the deflector **94***b* installed in the wellbore **12***a* and extending into sealing engagement with the PBR via seals **171***b*. In this example, the remaining two lateral wellbores **12***c*, **12***d* have not yet been drilled.

[0124] FIG. **18** shows a unitary MIC junction assembly **200***a* installed in the wellbore **12***a* at the intersection **74** after the lateral wellbore **12***c* has been drilled through the window **62***b*. The primary leg **148***b* can be sealingly engaged with the PBR of deflector **94***b* via seals **171***c*. The lateral leg **150***b* can be extended into the lateral wellbore **12***c*. Even though it is not shown, the lateral leg **150***b* can be coupled to the lower completion assembly **66***c* equipment in the lateral wellbore **12***c*, including coupling the control lines **100***b* to the lower completion assembly **66***c* equipment. One or more liner strings (not shown) can then be installed in the wellbore **12***a*, with the distal end of the lowermost liner string sealingly engaged via seals **171***d* with the PBR extending from the end **147***b*. However, FIG. **18** shows a deflector **94***c* installed in the wellbore **12***a* and extending into sealing engagement with the PBR via seals **171***d*.

[0125] FIG. **19** shows a unitary MIC junction assembly **200***b* installed in the wellbore **12***a* at the intersection **84** after the lateral wellbore **12***d* has been drilled through the window **62***c*. The primary leg **148***c* can be sealingly engaged with the PBR of deflector **94***c* via seals **171***e*. The lateral leg **150***c* can be extended into the lateral wellbore **12***d*. Even though it is not shown, the lateral leg **150***c* can be coupled to the lower completion assembly **66***d* equipment in the lateral wellbore **12***d*, with the control lines **100***b* being coupled to the lower completion assembly **66***d* equipment. A tubing string **30** (such as a production string, treatment string, injection string, etc.) has been installed in the wellbore **12***a* and is extended through the unitary MIC junction assembly **200***b*, and through the unitary MIC junction assembly **200***a*, with the distal end **31** engaged with the junction assembly **92***a*. This example illustrates at least one configuration of the unitary MIC junction assemblies that can support completion operations in multi-lateral wellbore systems like the system **10**.

[0126] Referring to FIG. **20**, another example is shown of the unitary conduits **96**, **206** of the junction assembly **92** and the MIC junction assembly **200**, respectively. The unitary conduits **96**, **206** can each include a primary leg **148**, lateral leg **150**, and control lines **100**, **101**. The control lines **100** are shown routed along the lateral leg **150** to communicate with a lower completion assembly **66***b*, **66***c*, **66***d* in a lateral wellbore **12***b*, **12***c*, **12***d*, respectively. However, they can be routed on the outside or inside of the lateral leg **150**, as well as partially or fully in the wall of the lateral leg **150**. For the junction assembly **92**, the control lines **101** can be routed along the primary leg **148** to provide communication to the completion assembly equipment positioned below the primary leg **148**. However, control lines **101** may not be necessary with the MIC junction assembly **200**, since the tubing string **30** can carry control lines for communicating to the lowest lower completion assemblies **66***a*, **66***b*.

[0127] The lateral leg **150** can be disposed in a somewhat circular indention in the primary leg **148** to be run in to the wellbore **12***a*. When the lower end of the lateral leg **150** engages a deflector, then the lateral leg **150** can be directed away from the primary leg **148** and into the lateral wellbore **12***b*, **12***c*, **12***d*. A stinger **172** can be assembled to the lower end of the lateral leg **150** for engaging an alignment subassembly **68** in the lower completion assembly **66** in a lateral wellbore. A stinger member **176** can be used to assist with proper engagement of the alignment subassembly **68** when the lateral leg **150** is extended into the lateral wellbore. Some configurations may utilize a telescoping joint **98** between the lateral leg **150** and the stinger **172** to allow for variations in the insertion distances between the primary leg **148** and the lateral leg **150**.

[0128] Referring to FIG. **21**, the control lines **100** may be routed through channels **138** in an exterior surface of a body of the unitary conduit **96**, **206**. The control lines **100** can be routed from the inductive coupling segments **156**, **108**, through the channels **138** and along the lateral leg **150** to the lower completion assembly (e.g. assembly **66***c*). The control lines **100** can be individually routed lines, and/or line assemblies that contain two or more control lines **100**.

[0129] Referring to FIG. **22**, a cross sectional view along **22-22** is shown, with the control lines **100** positioned within the channels **138**, four channels **100** grouped together in a 4-channel assembly, and the lateral leg **150** positioned in a somewhat circular recess of the primary leg **148**. For this configuration to be compatible with the unitary conduit **206** of the MIC junction assembly **200**, the primary leg **148** must be large enough to accommodate the somewhat circular (or semi-circular) recess and maintain an inner diameter that allows a tubing string to pass through the primary leg **148** when it's installed.

[0130] Thus, a multilateral wellbore system **10** system with a multibranch inflow control (MIC) junction assembly is provided. Embodiments of the system may generally include a unitary MIC junction assembly **200** having a conduit **206** with a first aperture **190** at an upper end **244** of the conduit **206**, and second and third apertures **192**, **194** at a lower end **246**, **248** of the conduit **206**; a primary passageway **232** formed by the conduit **206** and extending from the first aperture **190** to the second aperture **192** with a conduit junction **146** defined along the conduit **206** between the first and second apertures **190**, **192**, the primary passageway **232** comprising an upper portion and a lower portion with the upper portion extending from the first aperture **190** to the conduit junction **146**, and the lower portion extending from the conduit junction **146** to the second aperture **192**; a lateral passageway **234** formed by the conduit **206** and extending from the conduit junction **146** to the third aperture **194**; an upper energy transfer mechanism (ETM) **214** mounted along the upper portion of the primary passageway **232** and proximate the first aperture **190**; control lines **100** that provide communication between the upper ETM **214** and lower completion assembly **66***c*, **66***d* equipment (**48**, **102**, **99***a-g*, etc.); and the primary passageway **232** is configured to receive a first tubing string **30** that extends therethrough.

[0131] For any of the foregoing embodiments, the system may include any one of the following elements, alone or in combination with each other:

[0132] A lower energy transfer mechanism (ETM) **212** mounted along the lateral passageway **234** between the third aperture **194** and the upper ETM **214**, wherein the upper ETM **214** is in communication with the lower ETM **212** via control lines **100**. One or more of the upper and lower ETMs **214**, **212** can be an inductive coupler segment **156**, **108**. One or more of the upper and lower ETMs **214**, **212** is a wireless ETM (WETM) and the WETM is powered from an energy source selected from the group consisting of electricity, electromagnetism, magnetism, sound, motion, vibration, Piezoelectric crystals, motion of conductor/coil, ultrasound, incoherent light, coherent light, temperature, radiation, electromagnetic transmissions, and fluid pressure. A first tubing ETM **220** can be disposed along the first tubing string **30**, and wherein the first tubing ETM **220** can be adjacent the upper ETM **214** of the unitary MIC junction assembly **200** when the first tubing string **30** is installed through the primary passageway **232** of the unitary MIC junction assembly **200**.

[0133] The first tubing string **30** can be a tubing string **30** and the tubing string **30** extends through the primary passageway **232** of the unitary MIC junction assembly **200** and couples to a lower tubing string **78** that can be further downhole from the unitary MIC junction assembly **200**. The lower portion of the primary passageway **232** can comprise a primary leg **148** of the unitary MIC junction assembly **200** and the lateral passageway **234** can comprise a lateral leg **150** of the unitary MIC junction assembly **200**, and wherein one or more of the primary and lateral legs **148**, **150** can be deformable. Laterals are typically drilled at an angle between about 2 degrees to about 5 degrees. Therefore, the deformable leg can be made to deform to a suitable angle to extend into the lateral (or twig, or branch) wellbore, with the suitable angle being between about 2 degrees to about 5 degrees. The suitable angle can also be between 0 degrees and 10 degrees.

[0134] A second tubing string **66***c* can include an end portion with a second tubing ETM **110** disposed on the end portion, where the second tubing string **66***c* can couple to the lateral leg **150** of the unitary MIC junction assembly **200** so that the second tubing ETM is adjacent to the lower ETM **212** of the unitary MIC junction assembly **200**. The second tubing string **66***c* can be a lower completion assembly **66***c* and the second tubing ETM **110** can be a WETM. The lower completion assembly **66***c* comprises an operational device **102**, wherein the operational device **102** is in communication with the second tubing ETM **110** via control lines **100**, and wherein the operational device **102** is selected from the group consisting of sensors, flow control valves, controllers, WETMs, ETMs, contact electrical connectors, actuators, electrical power storage device, computer memory, and logic devices.

[0135] The operational device **102** can comprise first and second flow control valves **102**, wherein the first flow control valve **102** can control fluid flow between a first wellbore interval **19***a-c* and a passageway **236** in the lower completion assembly **66***c*, and the second flow control valve **102** can control fluid flow between a second wellbore interval **19***a-c* and the passageway **236** in the lower completion assembly **66***c*. Signals from a remote location can be transmitted through the upper ETM **214** of the unitary MIC junction assembly **200**, through the lower ETM **212** of the unitary MIC junction assembly **200**, through the second tubing ETM **110**, and to the first and second flow control valves **102**, and wherein the signals can provide individual control, via the first and second flow control valves **102**, of fluid flow between the respective first and second wellbore intervals **19***a-c* and the passageway **236** of the lower completion assembly **66***c*.

[0136] A lower completion assembly **66***c* with a passageway **236** that is in fluid communication with the lateral passageway **234** of the unitary MIC junction assembly **200**. A flow control device **90** can be interconnected in the first tubing string **30**, wherein the flow control device **90** is positioned within the primary passageway **232** of the unitary MIC junction assembly **200** when the first tubing string **30** in installed through the primary passageway **232**. The flow control device **90** can control fluid flow between the lateral passageway **234** and a passageway **242** in the first tubing string **30**.

[0137] A method for controlling fluid flow to/from multiple intervals **19***a-c* in a lateral wellbore **12***c* is provided, which can include operations installing a unitary multi-branch inflow control (MIC) junction assembly **200** in a main wellbore **12***a* at an intersection **74** of a first lateral wellbore **12***c*.

[0138] The unitary MIC junction assembly **200** can comprise a conduit **206** with a first aperture **190** at an upper end **244** of the conduit **206**, and second and third apertures **192**, **194** at a lower end **246**, **248** of the conduit **206**; a primary passageway **232** formed by the conduit **206** and extending from the first aperture **190** to the second aperture **192** with a conduit junction **146** defined along the conduit **206** between the first and second apertures **190**, **192**, the primary passageway **232** comprising an upper portion and a lower portion with the upper portion extending from the first aperture **190** to the conduit junction **146**, and the lower portion extending from the conduit junction **146** to the second aperture **192**, with the lower portion comprising a primary leg **148**; a lateral passageway **234** formed by the conduit **206** and extending from the conduit junction **146** to the third aperture **194**, the lateral passageway **234** comprising a lateral leg **150**; an upper energy transfer mechanism (ETM) **214** mounted along the upper portion of the primary passageway **232** and proximate the first aperture **190**; and control lines **100** that provide communication between the upper ETM **214** and lower completion assembly **66***c*, **66***d* equipment (**48**, **102**, **99***a-g*, etc.).

[0139] The operations can also include coupling the lateral leg **150** with a lower completion assembly **66***c;* installing a first tubing string **30** in the main wellbore **12***a;* and extending the first tubing string **30** through the primary passageway **232** of the unitary MIC junction assembly **200** or multiple primary passageways **232** of multiple unitary MIC junction assemblies **200**.

[0140] For any of the foregoing embodiments, the method may include any one of the following elements, alone or in combination with each other:

[0141] The operations can also include coupling the lateral leg **150** with the lower completion assembly **66***c* prior to the installing of the unitary MIC junction assembly **200**, wherein the installing of the unitary MIC junction assembly **200** further comprises installing the lower completion assembly **66***c* in the lateral wellbore **12***c* as the unitary MIC junction assembly **200** is being installed. In this configuration, the lower ETM **212** may not be required, since the control line connections can be made at the surface during assembly of the lower completion assembly **66***c* to the lateral leg **150** of the unitary MIC junction assembly **200**. However, the lower ETM **212** can be utilized with it mounted along the lateral passageway **234** between the third aperture **194** and the upper ETM **214**, wherein the upper ETM **214** is in communication with the lower ETM **212** via control lines **100**

[0142] The operations can also include coupling the lateral leg **150** with the lower completion assembly **66***c* while the unitary MIC junction assembly **200** is being installed at the intersection **74**.

[0143] The operations can also include aligning a first tubing ETM **220** with the upper ETM **214** in the unitary MIC junction assembly **200**, and controlling multiple operational devices **102** in the lower completion assembly **66***c* via control and data signals transmitted between the first tubing ETM **220** and the upper ETM **214**. The operational devices **102** can be selected from the group consisting of sensors, flow control valves, controllers, WETMs, ETMs, contact electrical connectors, actuators, electrical power storage device, computer memory, and logic devices. The lateral wellbore intersects multiple formation intervals **19***a-c* in the earthen formation **14**, and the controlling can include controlling fluid flow between each of the formation intervals and a passageway in the lower completion assembly **66***c*.

[0144] The operations can also include installing a second tubing string **78** in the main wellbore **12***a* below the unitary MIC junction assembly **200** prior to the installing of the unitary MIC junction assembly **200**, wherein the extending the first tubing string **30** further comprises coupling a distal end of the first tubing string **30** to a proximal end of the second tubing string **78**, where another ETM, similar to ETM **220**, can be used to provide communication between the first tubing string **30** and the second tubing string **78**.

[0145] A method for controlling fluid flow to/from multiple intervals (at least **19***a-c*) in lateral wellbores **12***c*, **12***d* is provided, which can include operations of installing first and second unitary multibranch inflow control (MIC) junction assemblies **200***b*, **200***a* in a main wellbore **12***a*. The first unitary MIC junction assembly **200***a* can be installed at a first intersection **74** of a first lateral wellbore **12***c* prior to installing the second unitary MIC junction assembly **200***b* at a second intersection **84** of a second lateral wellbore **12***d*. Each of the first and second unitary MIC junction assemblies **200***b*, **200***a* can include: a conduit **206** with a first aperture **190** at an upper end **244** of the conduit **206**, and second and third apertures **192**, **194** at a lower end **246**, **248** of the conduit **206**; a primary passageway **232** formed by the conduit **206** and extending from the first aperture **190** to the second aperture **192** with a conduit junction **146** defined along the conduit **206** between the first and second apertures **190**, **192**, the primary passageway **232** can include an upper portion and a lower portion with the upper portion extending from the first aperture **190** to the conduit junction **146**, and the lower portion extending from the conduit junction **146** to the second aperture **192**, with the lower portion comprising a primary leg **148**; a lateral passageway **234** formed by the conduit **206** and extending from the conduit junction **146** to the third aperture **194**, where the lateral passageway **234** can include a lateral leg **150**; an upper energy transfer mechanism (ETM) **214** mounted along the upper portion of the primary passageway **232** and proximate the first aperture **190**; and control lines **100** that can provide communication between the upper ETM and first lower completion assembly equipment.

[0146] The method can further include operations of coupling the lateral leg of the first unitary MIC junction assembly with a first lower completion assembly, coupling the lateral leg of the second unitary MIC junction assembly with a second lower completion assembly, installing a first tubing string in the main wellbore, and extending the first tubing string through the primary passageways of the first and second unitary MIC junction assemblies.

[0147] Furthermore, the illustrative methods described herein may be implemented by a system comprising processing circuitry that can include a non-transitory computer readable medium comprising instructions which, when executed by at least one processor of the processing circuitry, causes the processor to perform any of the methods described herein.

[0148] Although various embodiments have been shown and described, the disclosure is not limited to such embodiments and will be understood to include all modifications and variations as would be apparent to one skilled in the art. Therefore, it should be understood that the disclosure is not intended to be limited to the particular forms disclosed; rather, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the disclosure as defined by the appended claims.

1. A multilateral wellbore system comprising:

a unitary multibranch inflow control (MIC) junction assembly having a conduit with a first aperture at an upper end of the conduit, and second and third apertures at a lower end of the conduit;

a primary passageway formed by the conduit and extending from the first aperture to the second aperture with a conduit junction defined along the conduit between the first and second apertures,

the primary passageway comprising an upper portion and a lower portion with the upper portion extending from the first aperture to the conduit junction, and the lower portion extending from the conduit junction to the second aperture;

a lateral passageway formed by the conduit and extending from the conduit junction to the third aperture;

an upper energy transfer mechanism (ETM) mounted along the upper portion of the primary passageway and proximate the first aperture;

control lines that provide communication between the upper ETM and lower completion assembly equipment; and

the primary passageway is configured to receive a first tubing string that extends therethrough.

2. The system of claim **1**, further comprising a lower energy transfer mechanism (ETM) mounted along the lateral passageway between the third aperture and the upper ETM, wherein the upper ETM is in communication with the lower ETM via the control lines.

3. The system of claim **2**, wherein at least one of the upper and lower ETMs is a wireless ETM (WETM) and the WETM is powered from an energy source selected from the group consisting of electricity, electromagnetism, magnetism, sound, motion, vibration, Piezoelectric crystals, motion of conductor/coil, ultrasound, incoherent light, coherent light, temperature, radiation, electromagnetic transmissions, and fluid pressure.

4. The system of claim **1**, wherein a first tubing ETM is disposed along the first tubing string, and

wherein the first tubing ETM is adjacent the upper ETM of the unitary MIC junction assembly when the first tubing string is installed through the primary passageway of the unitary MIC junction assembly.

5. The system of claim **4**, wherein the first tubing string extends through the primary passageway of the unitary MIC junction assembly and couples to a lower tubing string that is further downhole from the unitary MIC junction assembly.

6. The system of claim **1**, wherein the lower portion of the primary passageway comprises a primary leg of the unitary MIC junction assembly and the lateral passageway comprises a lateral leg of the unitary MIC junction assembly, and

wherein at least one of the primary and lateral legs is deformable.

7. The system of claim **6**, further comprising a second tubing string having an end portion with a second tubing ETM disposed on the end portion, wherein the second tubing string couples to the lateral leg of the unitary MIC junction assembly so that the second tubing ETM is adjacent to the lower ETM of the unitary MIC junction assembly.

8. The system of claim **7**, wherein the second tubing string is a lower completion assembly and the second tubing ETM is a WETM.

9. The system of claim **8**, wherein the lower completion assembly comprises an operational device,

wherein the operational device is in communication with the second tubing ETM via control lines, and

wherein the operational device is selected from the group consisting of electrical, optical, hydraulic, and fluidic versions of a sensor, a flow control valve, a controller, a WETMs, an ETMs, a connector, an actuator, a power storage device, a computer memory, and a logic device.

10. The system of claim **9**, wherein the operational device comprises first and second flow control valves,

wherein the first flow control valve controls fluid flow between a first wellbore interval and a passageway in the lower completion assembly, and

the second flow control valve controls fluid flow between a second wellbore interval and the passageway in the lower completion assembly.

11. The system of claim **10**, wherein communication signals from a remote location are transmitted through the upper ETM of the unitary MIC junction assembly, through the lower ETM of the unitary MIC junction assembly, through the second tubing ETM, and to the first and second flow control valves, and

wherein the communication signals provide individual control, via the first and second flow control valves, of fluid flow between the respective first and second wellbore intervals and the passageway of the lower completion assembly.

12. The system of claim **10**, wherein communication signals from a sensor in the lower completion assembly are transmitted through the second tubing ETM, through the lower ETM of the unitary MIC junction assembly, through the upper ETM of the unitary MIC junction assembly, and to a remote location, and

wherein the communication signals provide indications of conditions and/or configurations in the lower completion assembly, and the first and second flow control valves are controlled in response to the communication signals being received at the remote location.

13. The system of claim **1**, further comprising a lower completion assembly with a passageway that is in fluid communication with the lateral passageway of the unitary MIC junction assembly.

14. The system of claim **13**, further comprising a flow control device interconnected in the first tubing string,

wherein the flow control device is positioned within the primary passageway of the unitary MIC junction assembly when the first tubing string is installed through the primary passageway, and wherein the flow control device controls fluid flow between the lateral passageway and a passageway in the first tubing string.

15. A method of controlling fluid flow to/from multiple intervals in a lateral wellbore, the method comprising:

installing a unitary multibranch inflow control (MIC) junction assembly in a main wellbore at an intersection of a first lateral wellbore, the unitary MIC junction assembly comprising:

a conduit with a first aperture at an upper end of the conduit, and second and third apertures at a lower end of the conduit;

a primary passageway formed by the conduit and extending from the first aperture to the second aperture with a conduit junction defined along the conduit between the first and second apertures,

the primary passageway comprising an upper portion and a lower portion with the upper portion extending from the first aperture to the conduit junction, and the lower portion extending from the conduit junction to the second aperture, with the lower portion comprising a primary leg;

a lateral passageway formed by the conduit and extending from the conduit junction to the third aperture, the lateral passageway comprising a lateral leg;

an upper energy transfer mechanism (ETM) mounted along the upper portion of the primary passageway and proximate the first aperture; and

control lines that provide communication between the upper ETM and lower completion assembly equipment;

coupling the lateral leg with a lower completion assembly;

installing a first tubing string in the main wellbore; and

extending the first tubing string through the primary passageway of the unitary MIC junction assembly.

16. The method of claim **15**, wherein the coupling further comprises coupling the lateral leg with the lower completion assembly prior to the installing of the unitary MIC junction assembly, wherein the installing of the unitary MIC junction assembly further comprises installing the lower completion assembly in the lateral wellbore as the unitary MIC junction assembly is being installed.

17. The method of claim **15**, wherein the coupling further comprises coupling the lateral leg with the lower completion assembly while the unitary MIC junction assembly is being installed at the intersection.

18. The method of claim **15**, wherein the installing the first tubing string further comprises aligning a first tubing ETM with the upper ETM in the unitary MIC junction assembly.

19. The method of claim **18**, further comprising controlling and/or monitoring multiple operational devices in the lower completion assembly via communication signals transmitted between the first tubing ETM and the upper ETM.

20. The method of claim **19**, wherein the operational devices are selected from the group consisting of electrical, optical, hydraulic, and fluidic versions of a sensor, a flow control valve, a controller, a WETM, an ETM, a connector, an actuator, a power storage device, a computer memory, and a logic device.

21. The method of claim **19**, wherein the lateral wellbore intersects a plurality of formation intervals in an earthen formation, and wherein the controlling further comprises controlling fluid flow between each of the formation intervals and a passageway in the lower completion assembly.

22. The method of claim **15**, further comprising installing a second tubing string in the main wellbore below the unitary MIC junction assembly prior to the installing of the unitary MIC junction assembly, wherein the extending the first tubing string further comprises coupling a distal end of the first tubing string to a proximal end of the second tubing string.

23. A method of controlling fluid flow to/from multiple intervals in multiple lateral wellbores, the method comprising:

installing first and second unitary multibranch inflow control (MIC) junction assemblies in a main wellbore, wherein the first unitary MIC junction assembly is installed at a first intersection of a first lateral wellbore prior to installing the second unitary MIC junction assembly at a second intersection of a second lateral wellbore, and wherein the first and second unitary MIC junction assemblies each comprise:

a conduit with a first aperture at an upper end of the conduit, and second and third apertures at a lower end of the conduit;

a primary passageway formed by the conduit and extending from the first aperture to the second aperture with a conduit junction defined along the conduit between the first and second apertures,

the primary passageway comprising an upper portion and a lower portion with the upper portion extending from the first aperture to the conduit junction, and the lower portion extending from the conduit junction to the second aperture, with the lower portion comprising a primary leg;

a lateral passageway formed by the conduit and extending from the conduit junction to the third aperture, the lateral passageway comprising a lateral leg;

an upper energy transfer mechanism (ETM) mounted along the upper portion of the primary passageway and proximate the first aperture; and

control lines that provide communication between the upper ETM and first lower completion assembly equipment;

coupling the lateral leg of the first unitary MIC junction assembly with a first lower completion assembly;

coupling the lateral leg of the second unitary MIC junction assembly with a second lower completion assembly;

installing a first tubing string in the main wellbore; and

extending the first tubing string through the primary passageways of the first and second unitary MIC junction assemblies.

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