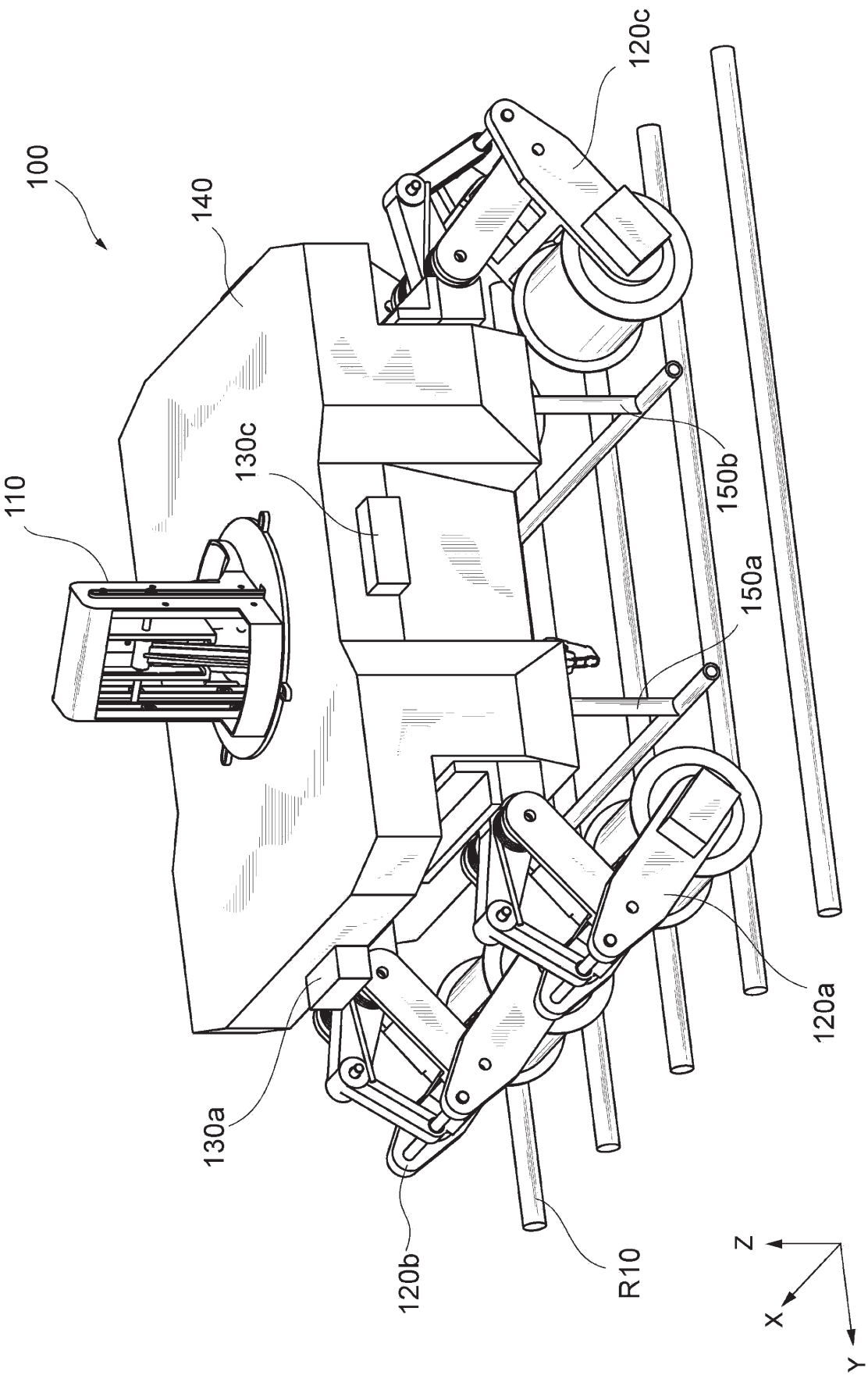


FIG. 1

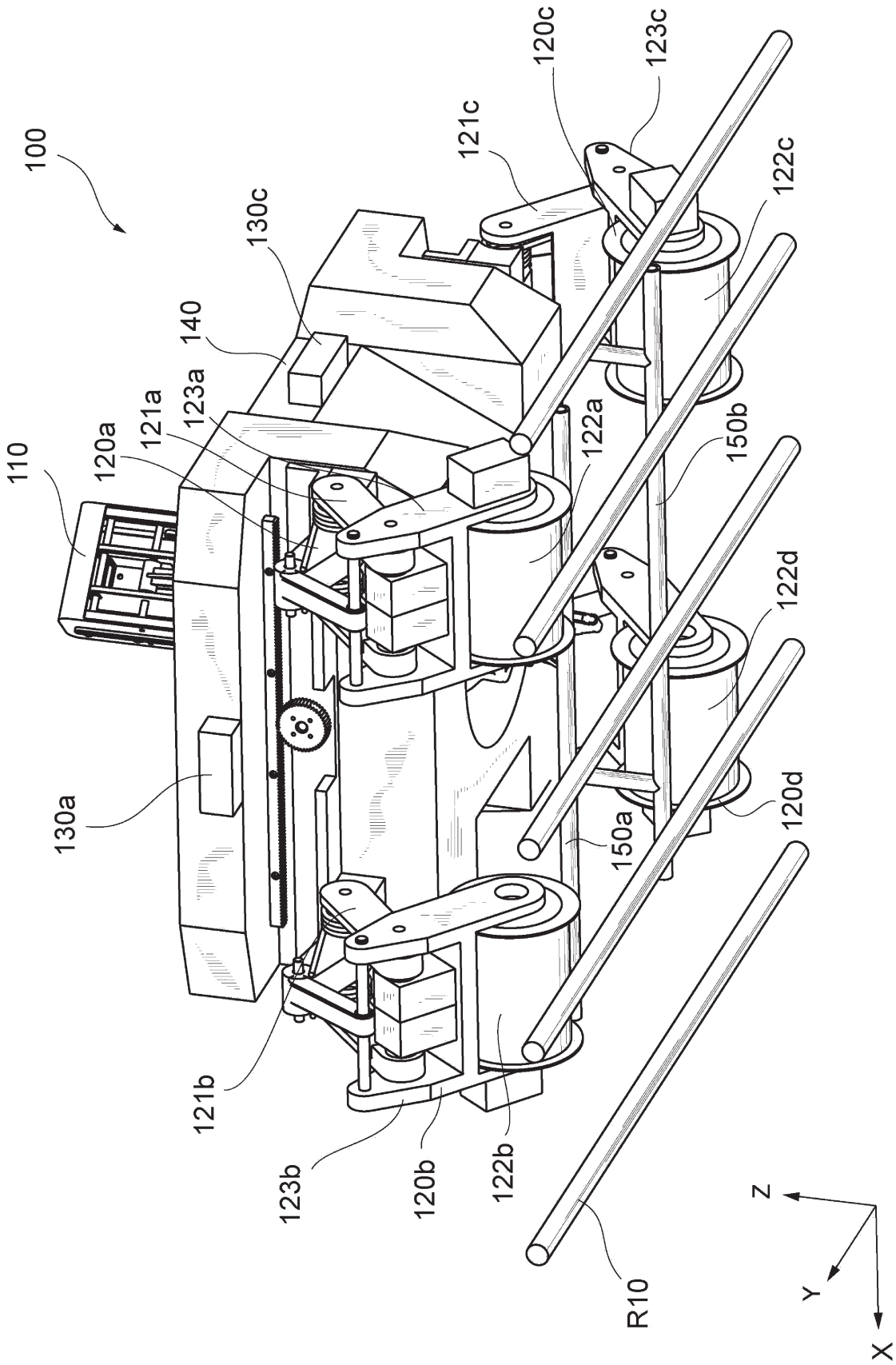

100
110
120a
121a
123a
140
130c
121c
120c
123c
122c
150b
122a
122d
120d
150a
130a
121b
123b
120b
122b
R10
Z
Y
X

FIG. 2

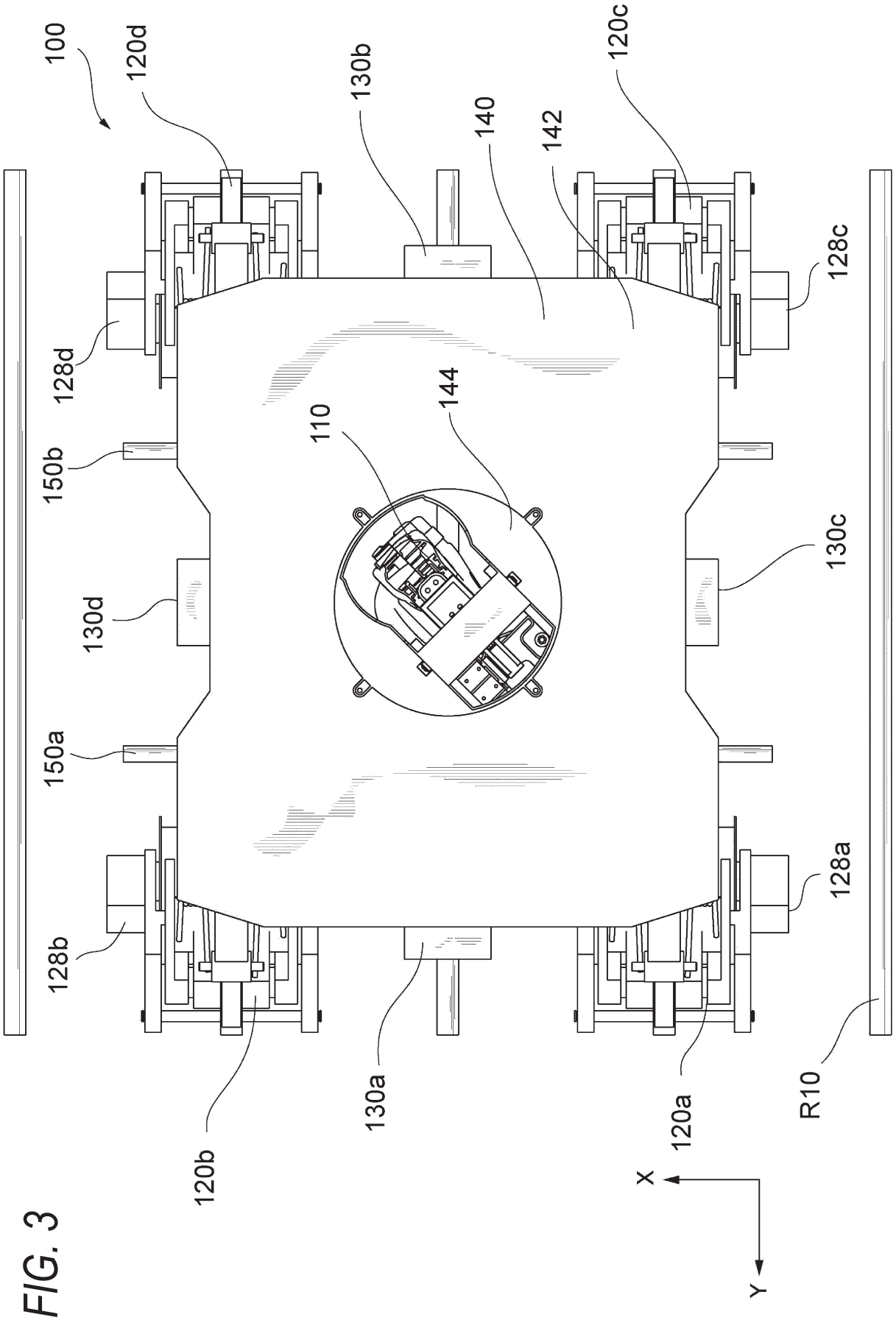

100
120d
130b
140
142
120c
128c
128d
144
110
150b
130c
130d
150a
128a
128b
120b
130a
120a
R10
X
Y

FIG. 3

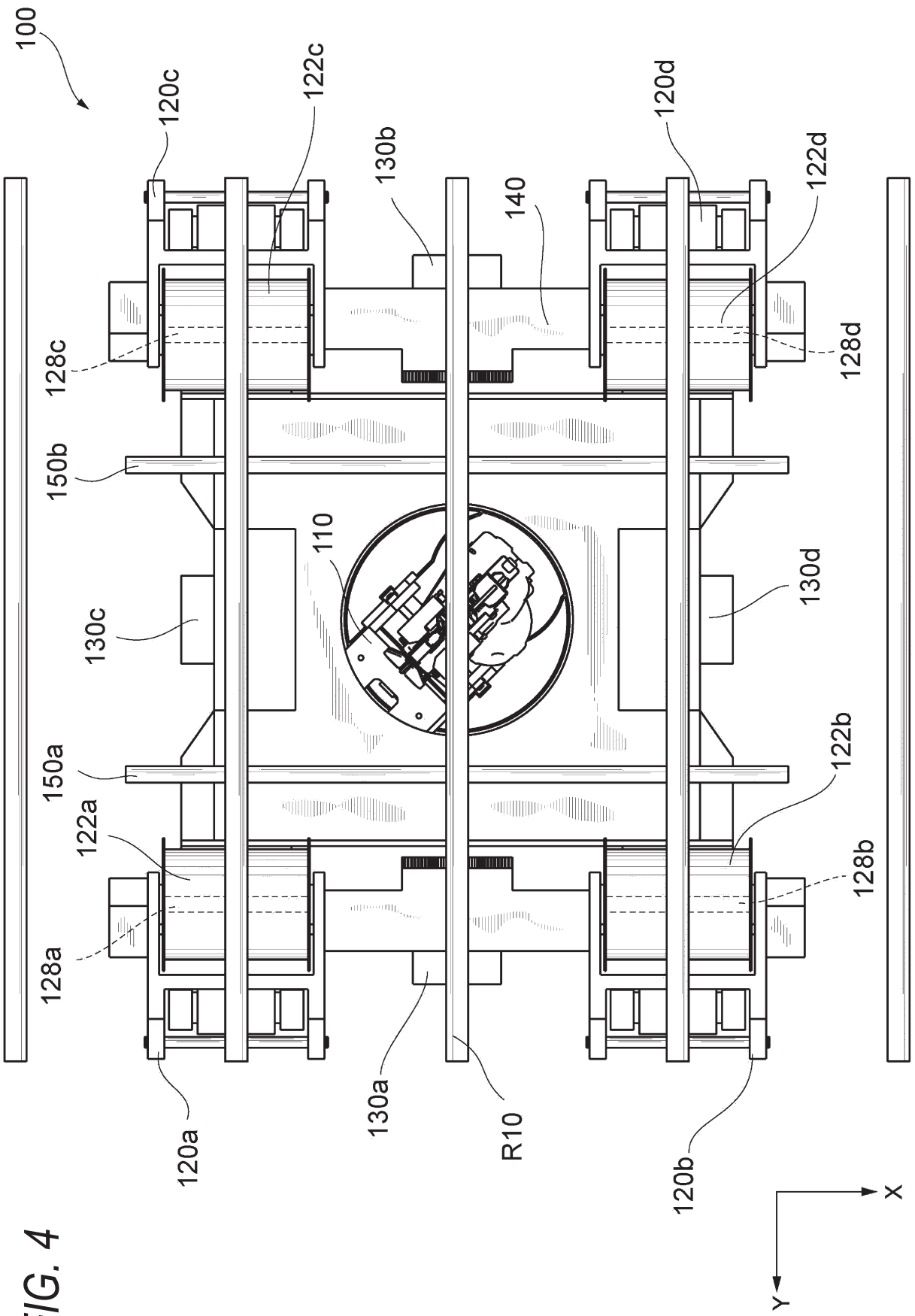

100
120c
122c
130b
140
120d
122d
128c
128d
150b
110
130c
130d
150a
122a
122b
128a
128b
120a
130a
R10
120b
X
Y

FIG. 4

FIG. 5

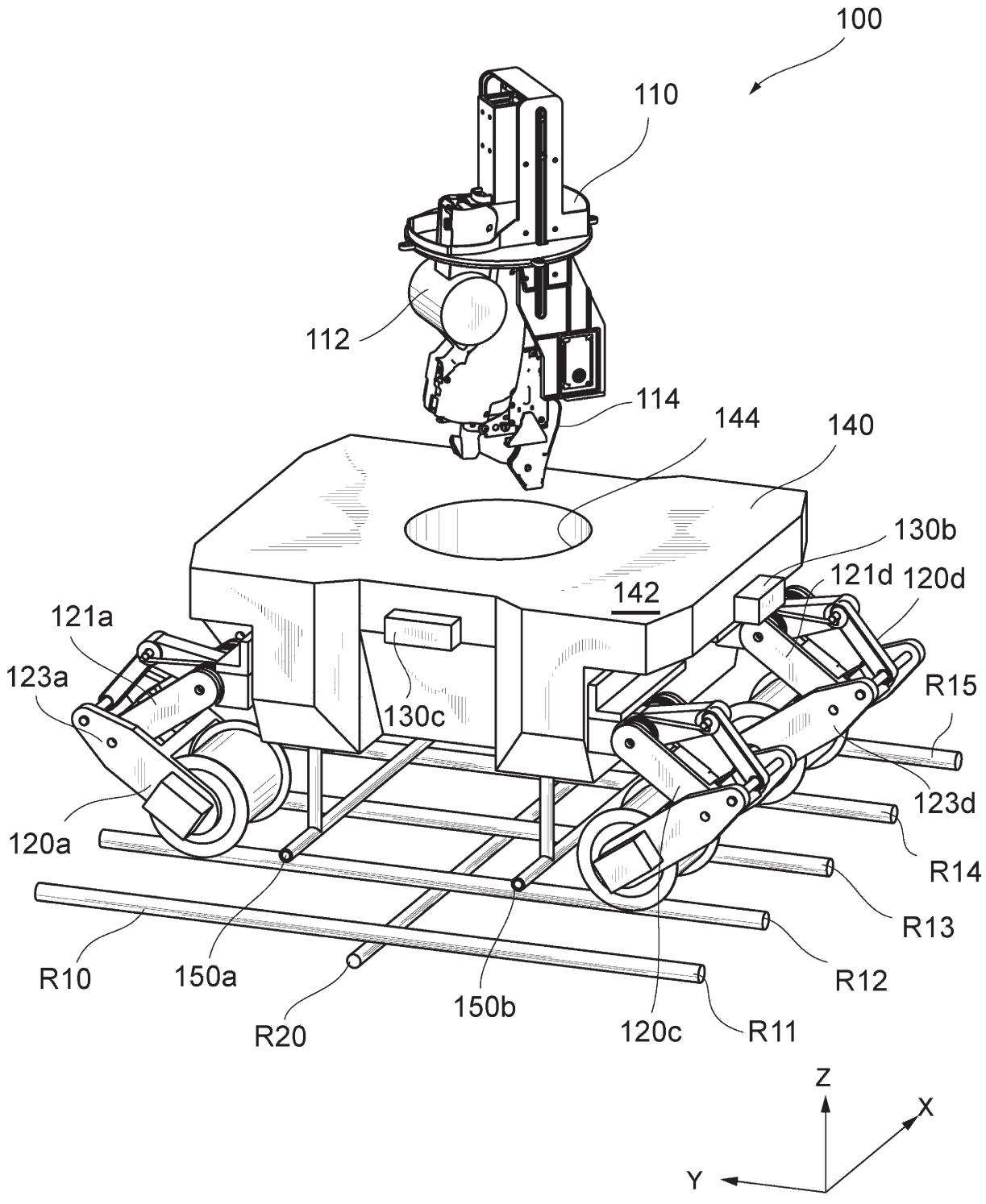

100
110
112
114
144
140
130b
121d
120d
142
121a
123a
130c
R15
123d
120a
R14
R13
R10
150a
R12
150b
R20
120c
R11
Z
X
Y

FIG. 6

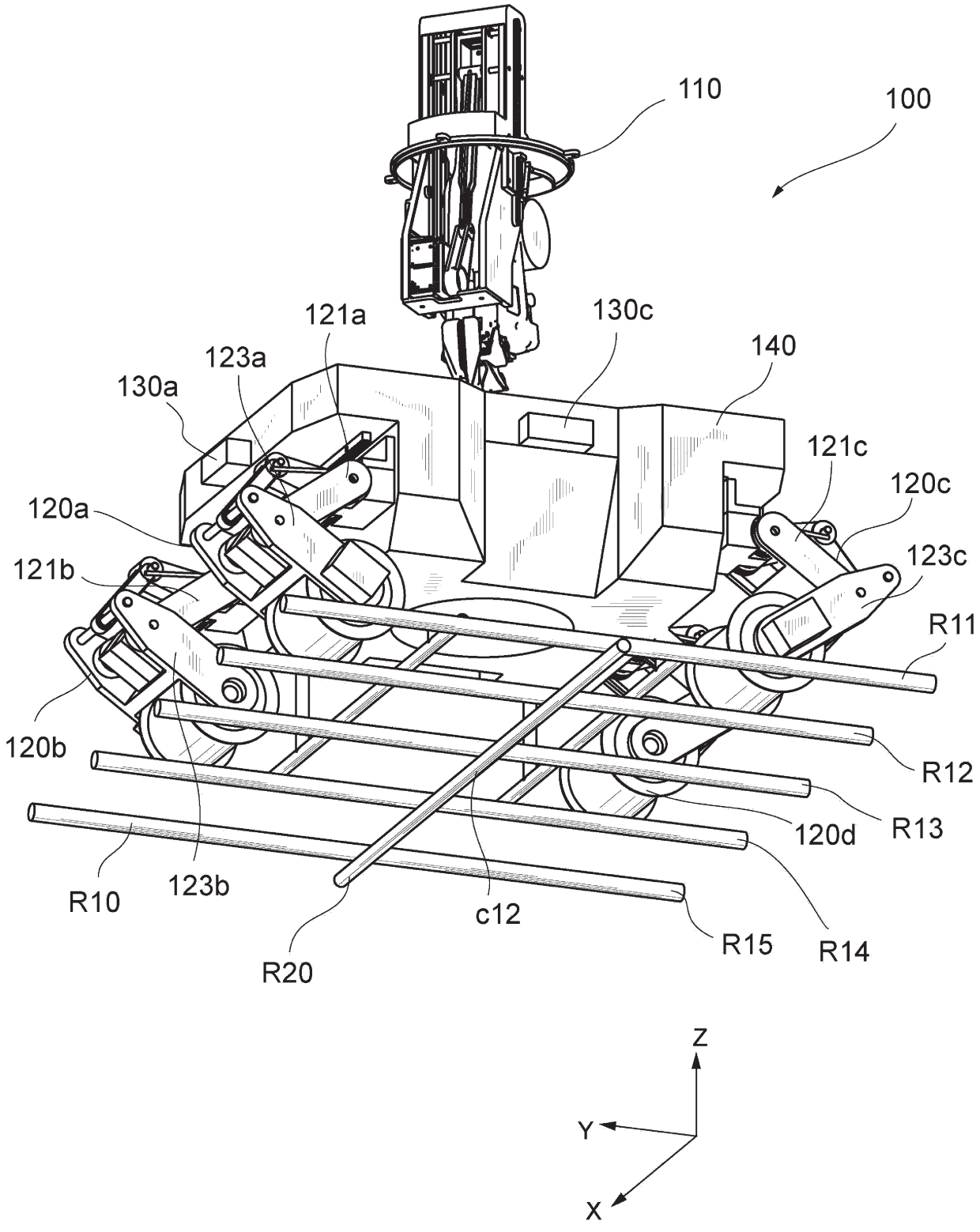

110
100
121a
130c
123a
140
130a
121c
120c
120a
123c
121b
R11
120b
R12
R13
120d
R10
123b
c12
R15
R14
R20
Z
Y
X

FIG. 7A

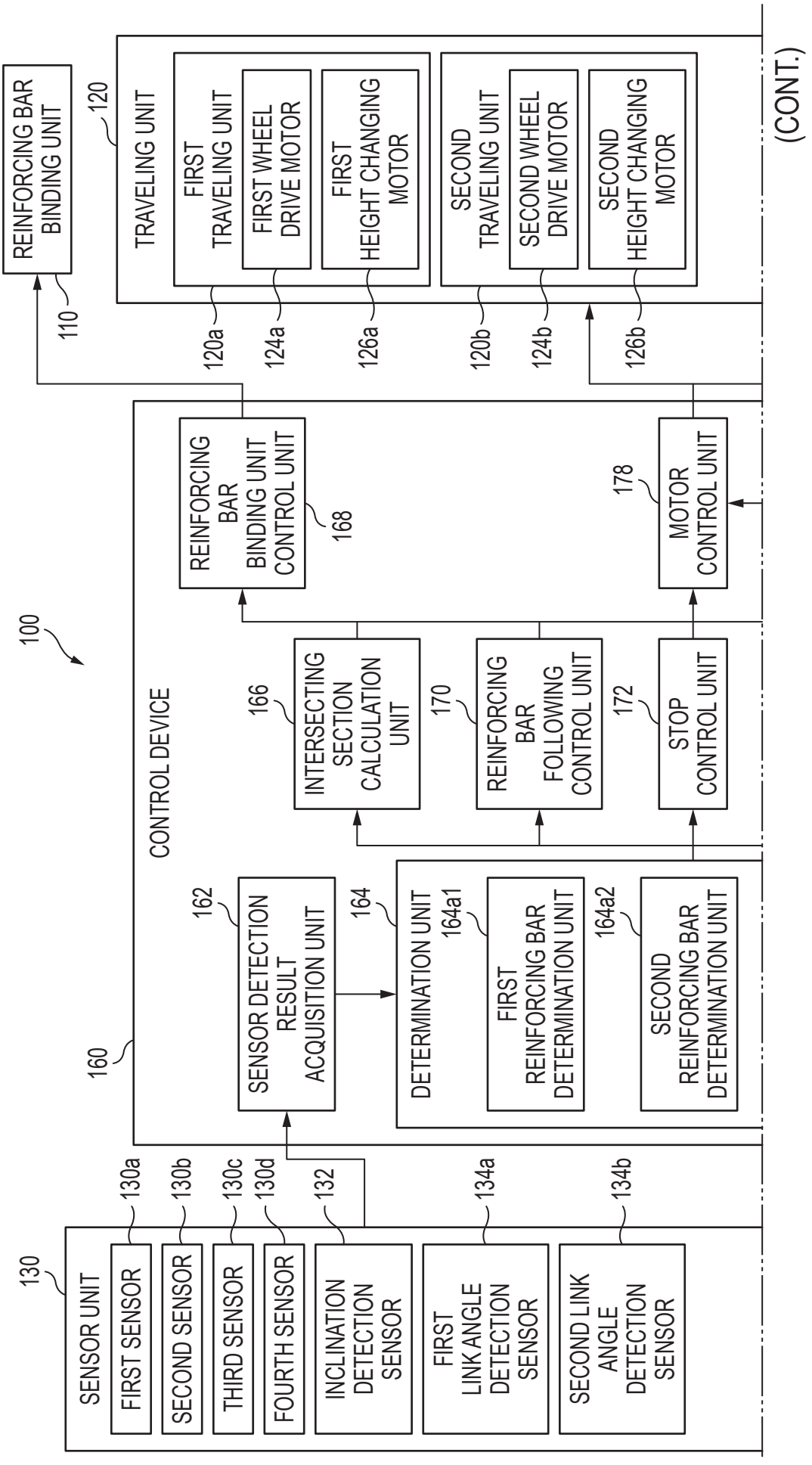

130
SENSOR UNIT
FIRST SENSOR
SECOND SENSOR
THIRD SENSOR
FOURTH SENSOR
INCLINATION DETECTION SENSOR
FIRST LINK ANGLE DETECTION SENSOR
SECOND LINK ANGLE DETECTION SENSOR
130a
130b
130c
130d
132
134a
134b
100
160
CONTROL DEVICE
162
SENSOR DETECTION RESULT ACQUISITION UNIT
164
DETERMINATION UNIT
164a1
FIRST REINFORCING BAR DETERMINATION UNIT
164a2
SECOND REINFORCING BAR DETERMINATION UNIT
166
INTERSECTING SECTION CALCULATION UNIT
170
REINFORCING BAR FOLLOWING CONTROL UNIT
172
STOP CONTROL UNIT
168
REINFORCING BAR BINDING UNIT CONTROL UNIT
178
MOTOR CONTROL UNIT
110
REINFORCING BAR BINDING UNIT
120
TRAVELING UNIT
FIRST TRAVELING UNIT
FIRST WHEEL DRIVE MOTOR
FIRST HEIGHT CHANGING MOTOR
SECOND TRAVELING UNIT
SECOND WHEEL DRIVE MOTOR
SECOND HEIGHT CHANGING MOTOR
120a
124a
126a
120b
124b
126b
(CONT.)

FIG. 7B

(CONTINUED FROM FIG. 7A)

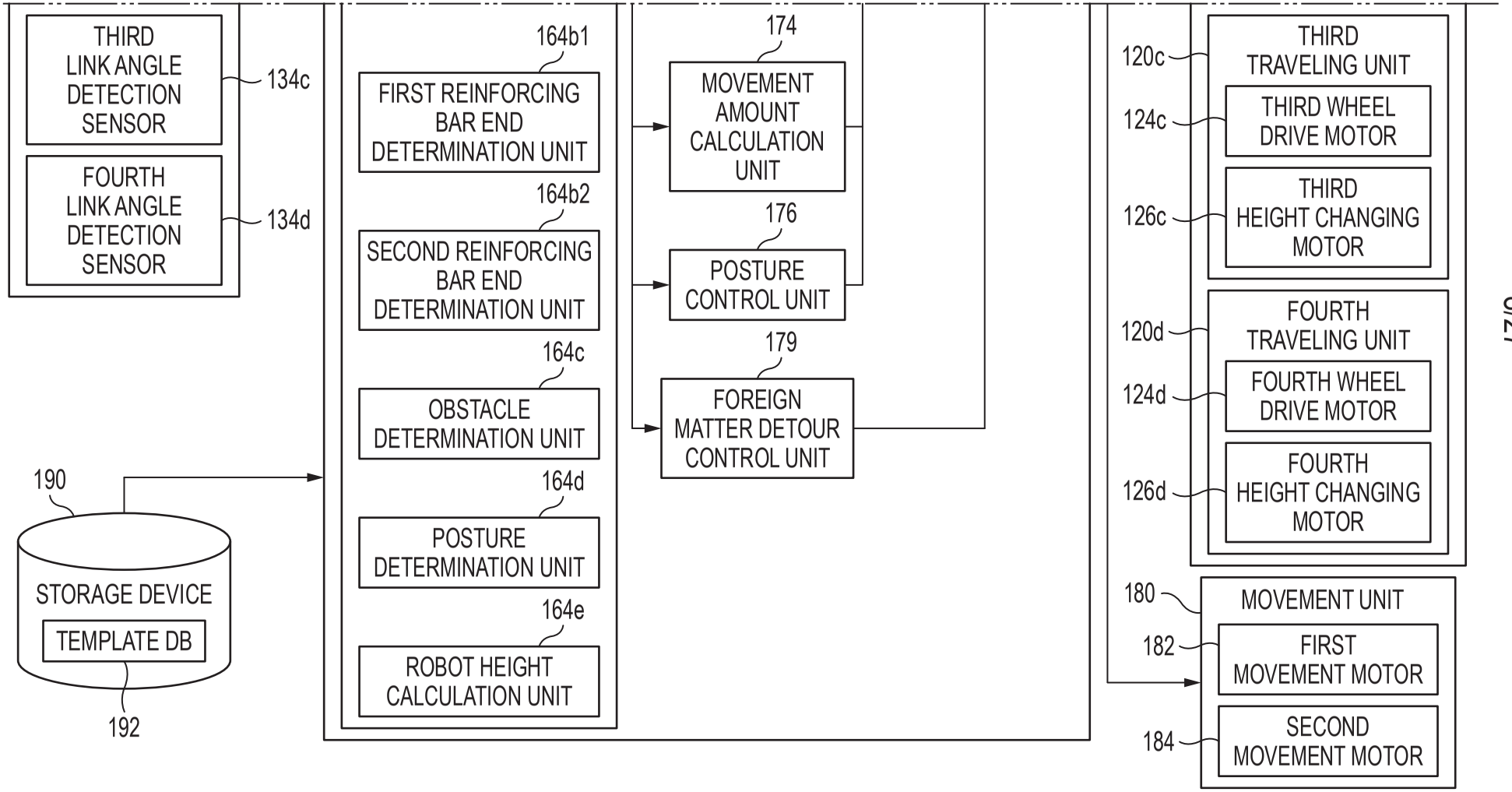
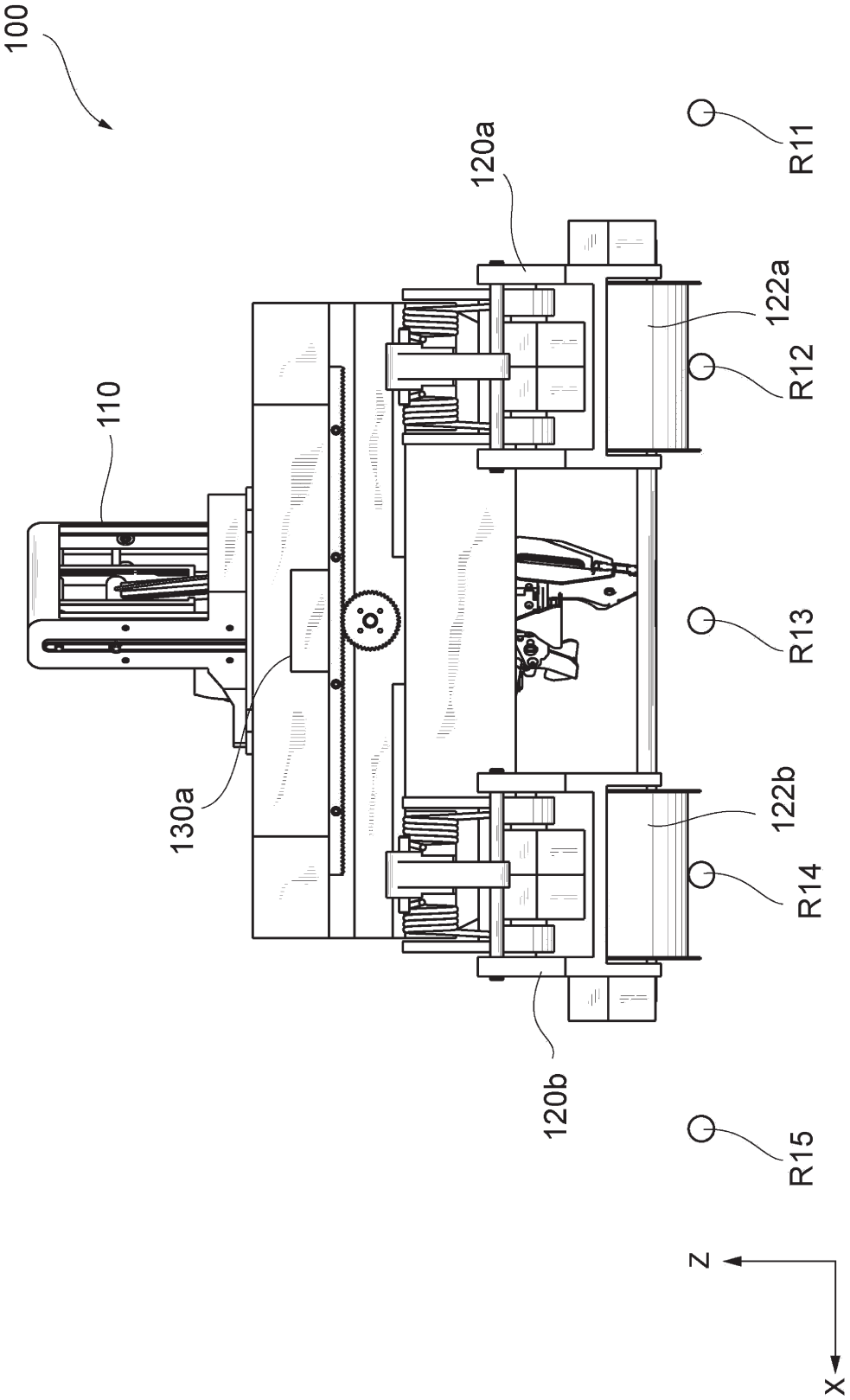


FIG. 8



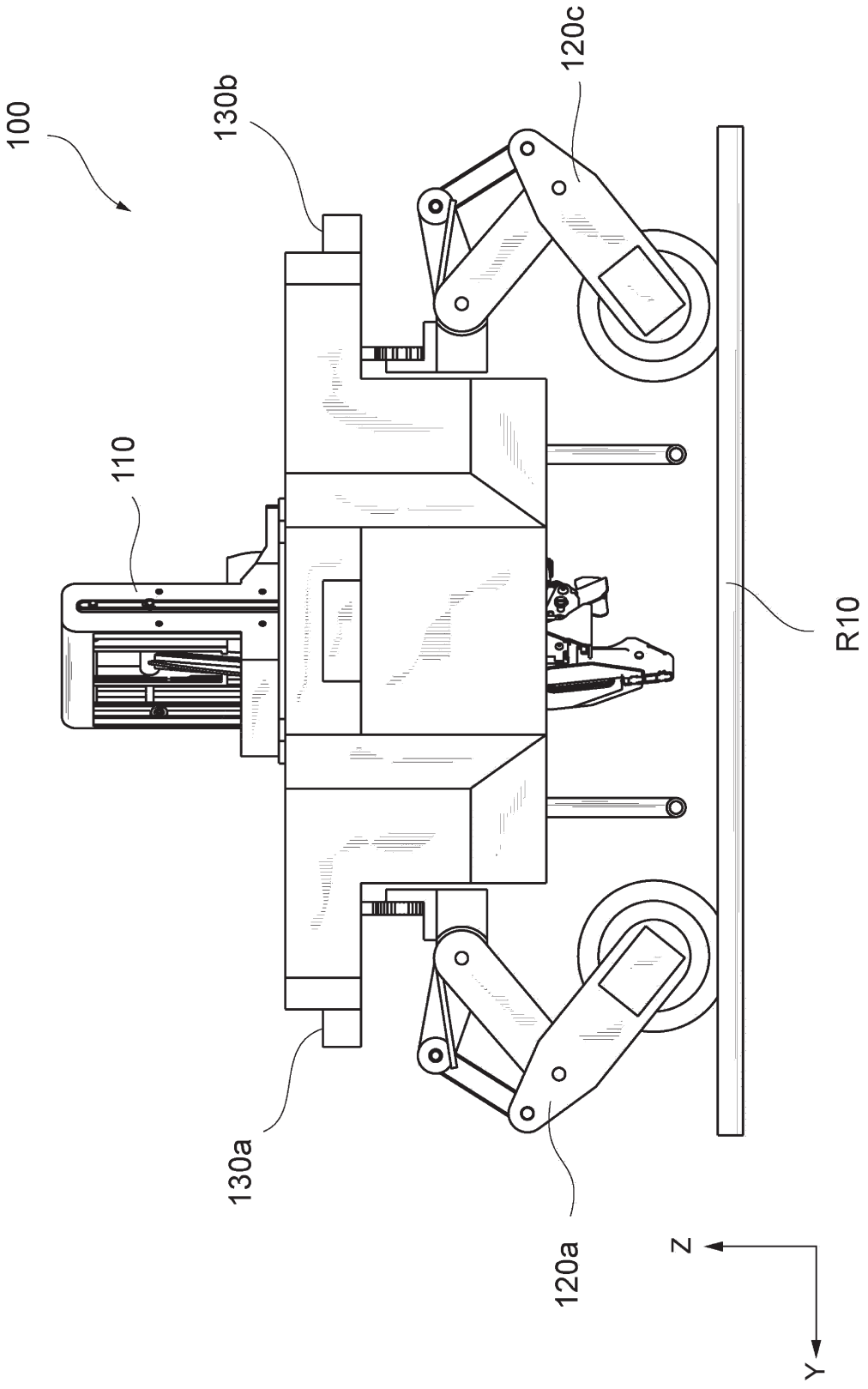


FIG. 9

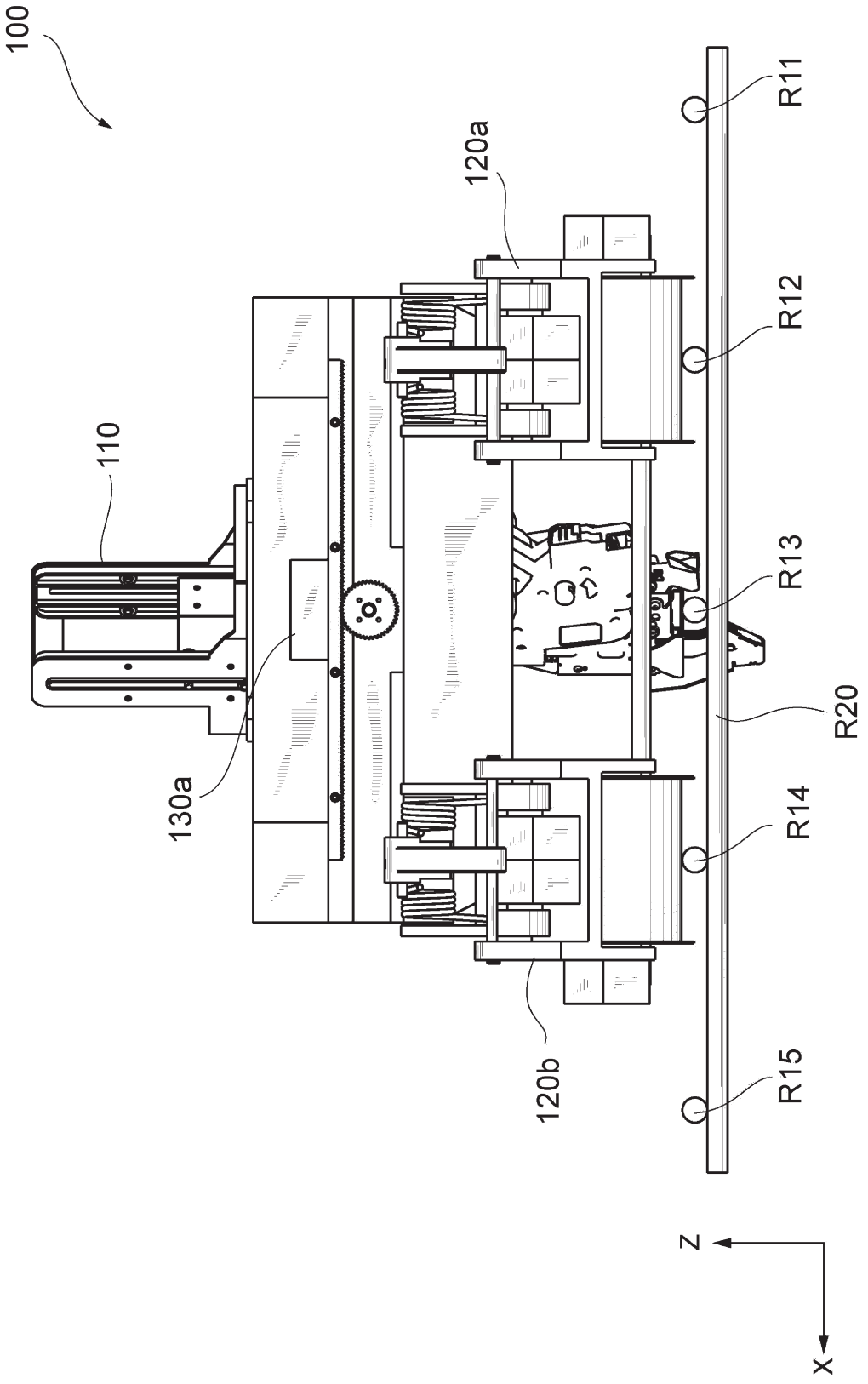


FIG. 10

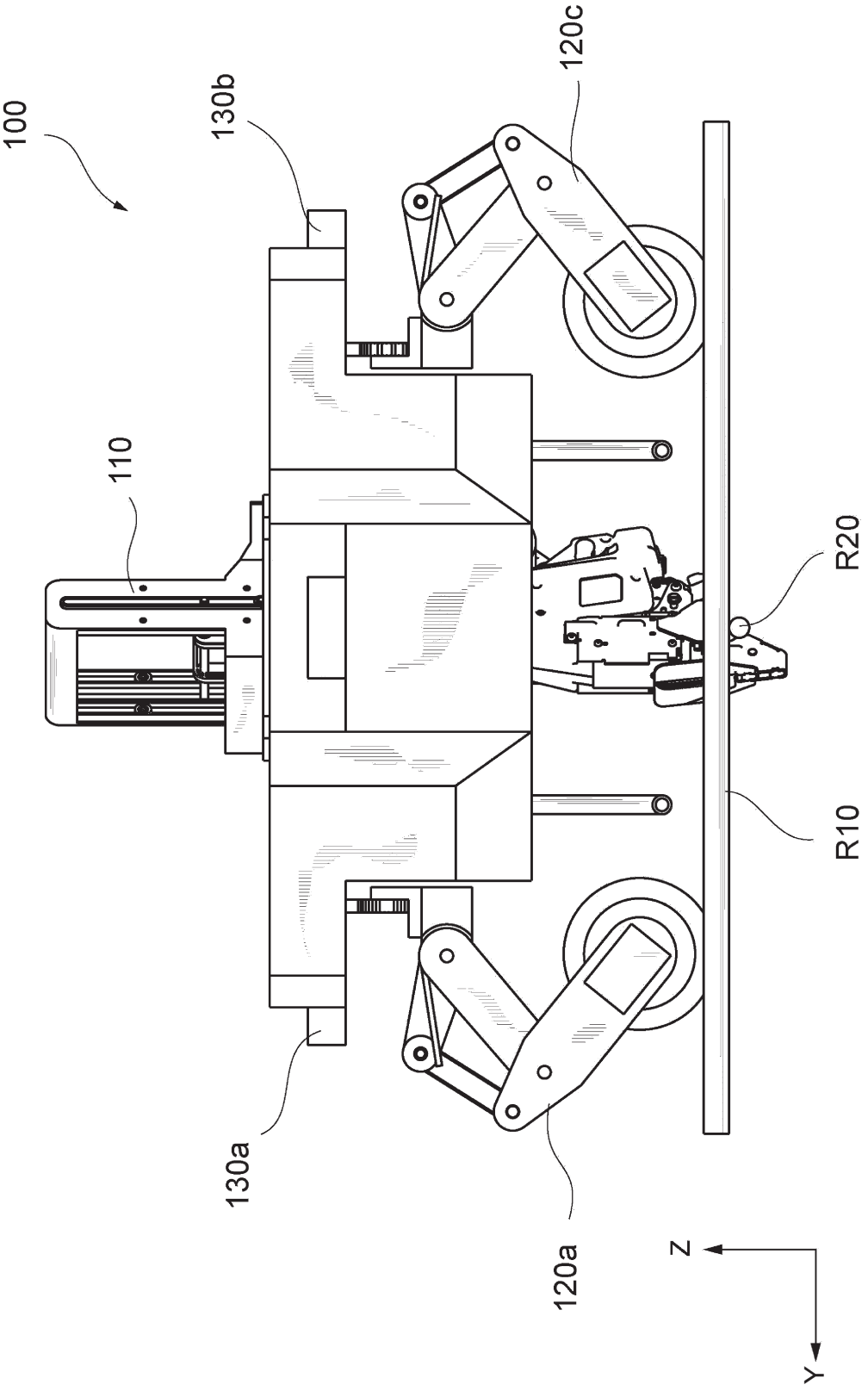


FIG. 11

FIG. 12

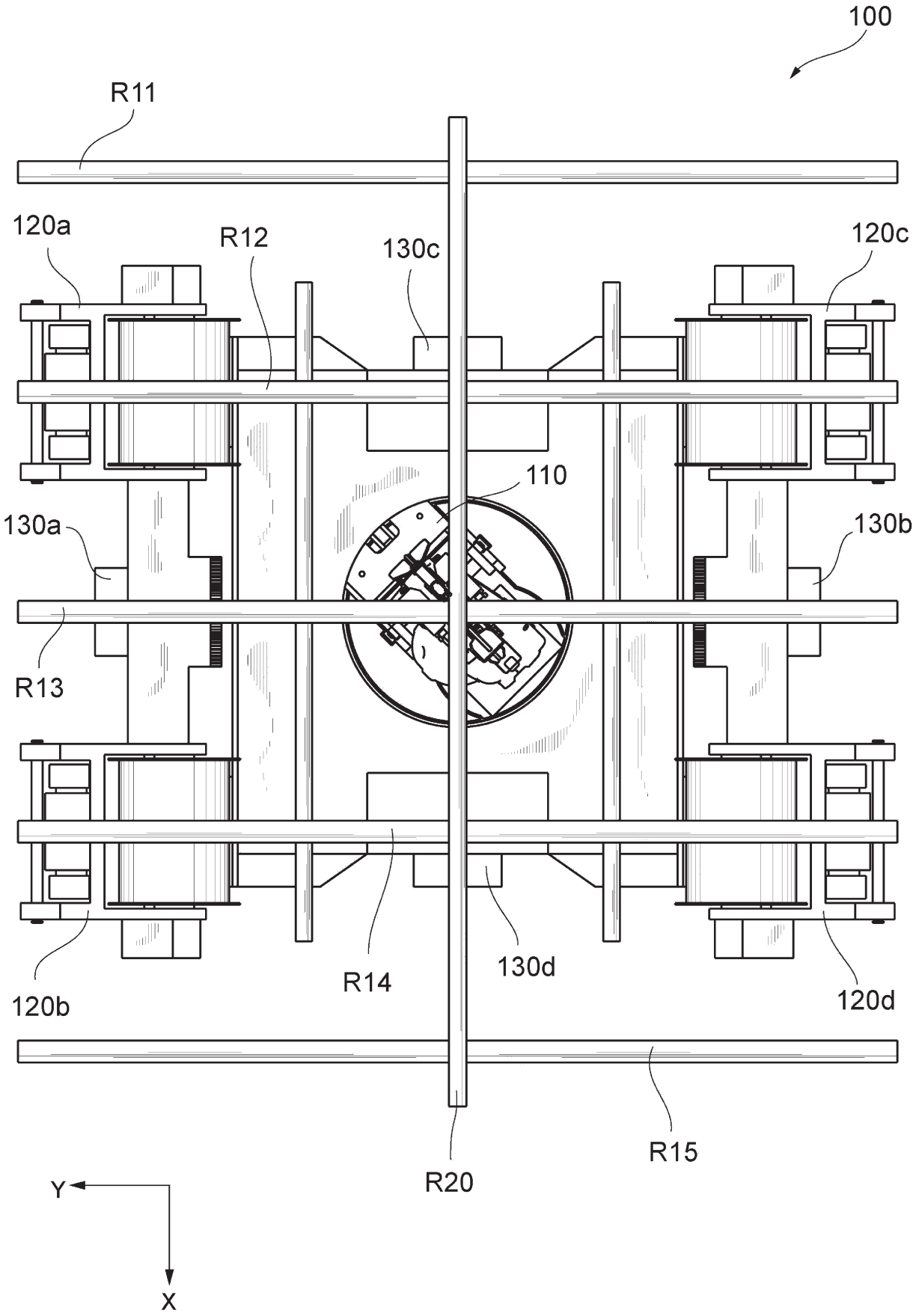

100
R11
120a
R12
130c
120c
110
130a
130b
R13
120b
R14
130d
120d
R15
R20
Y
X

FIG. 13B

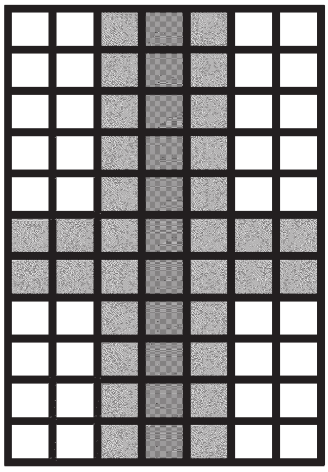


FIG. 13A

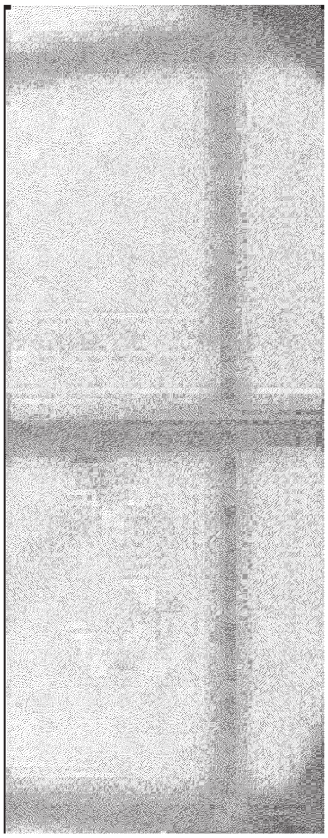


FIG. 14B

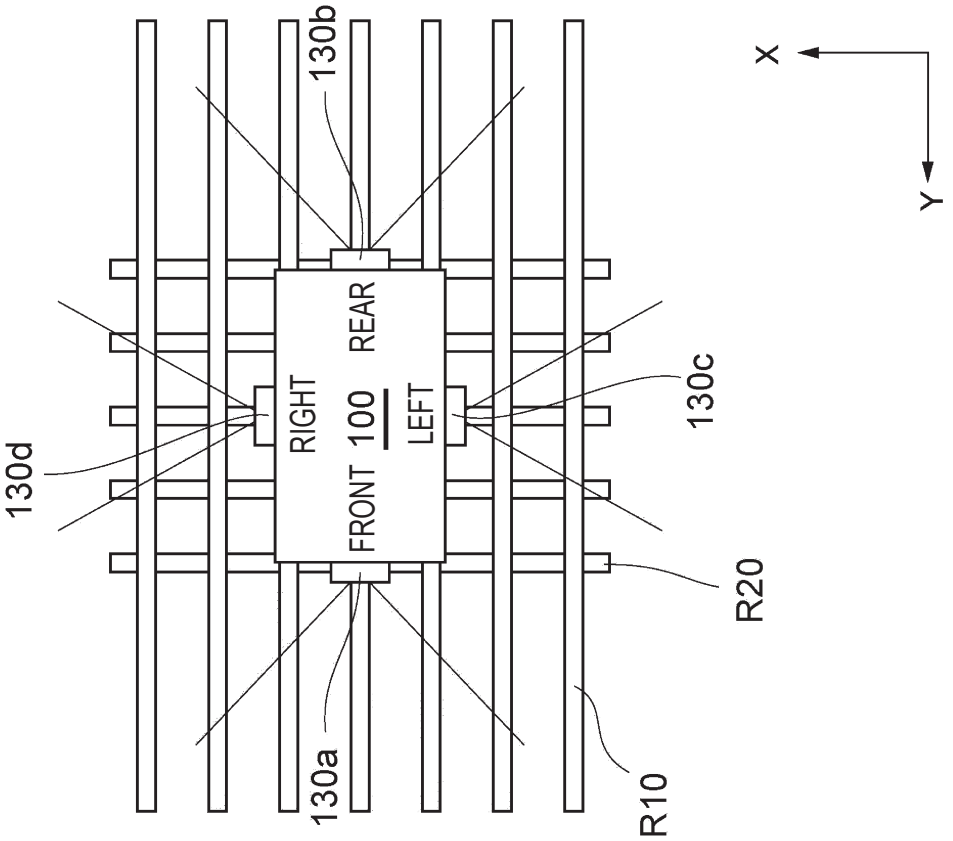


FIG. 14A

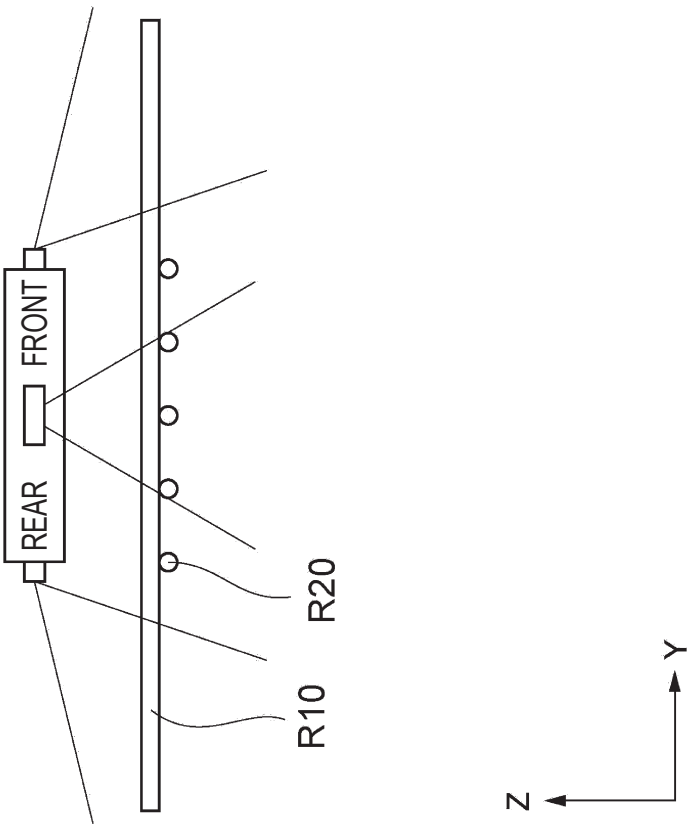


FIG. 15

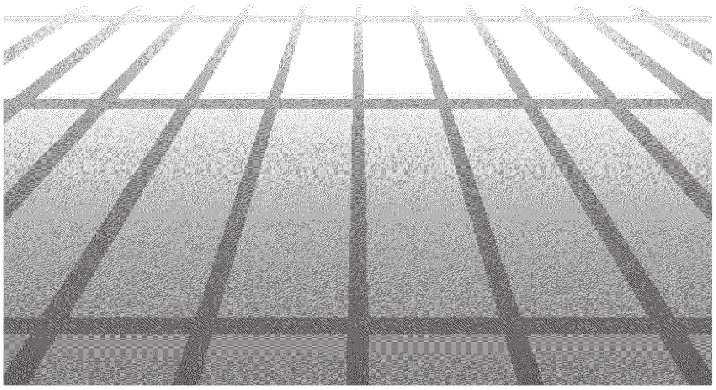


FIG. 16

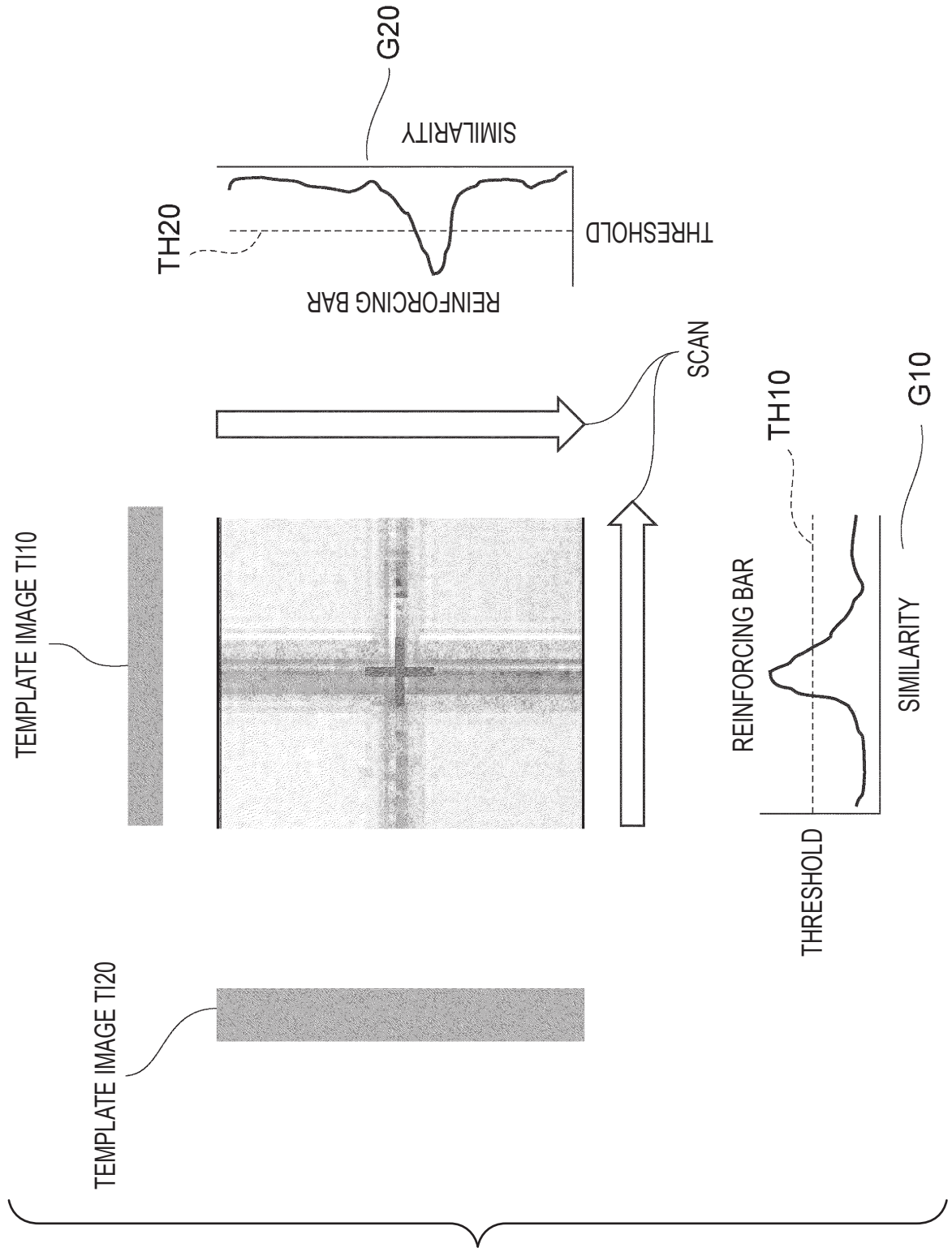

TEMPLATE IMAGE TI20
TEMPLATE IMAGE TI10
SCAN
REINFORCING BAR
TH10
G10
SIMILARITY
THRESHOLD
REINFORCING BAR
TH20
G20
SIMILARITY
THRESHOLD

FIG. 17

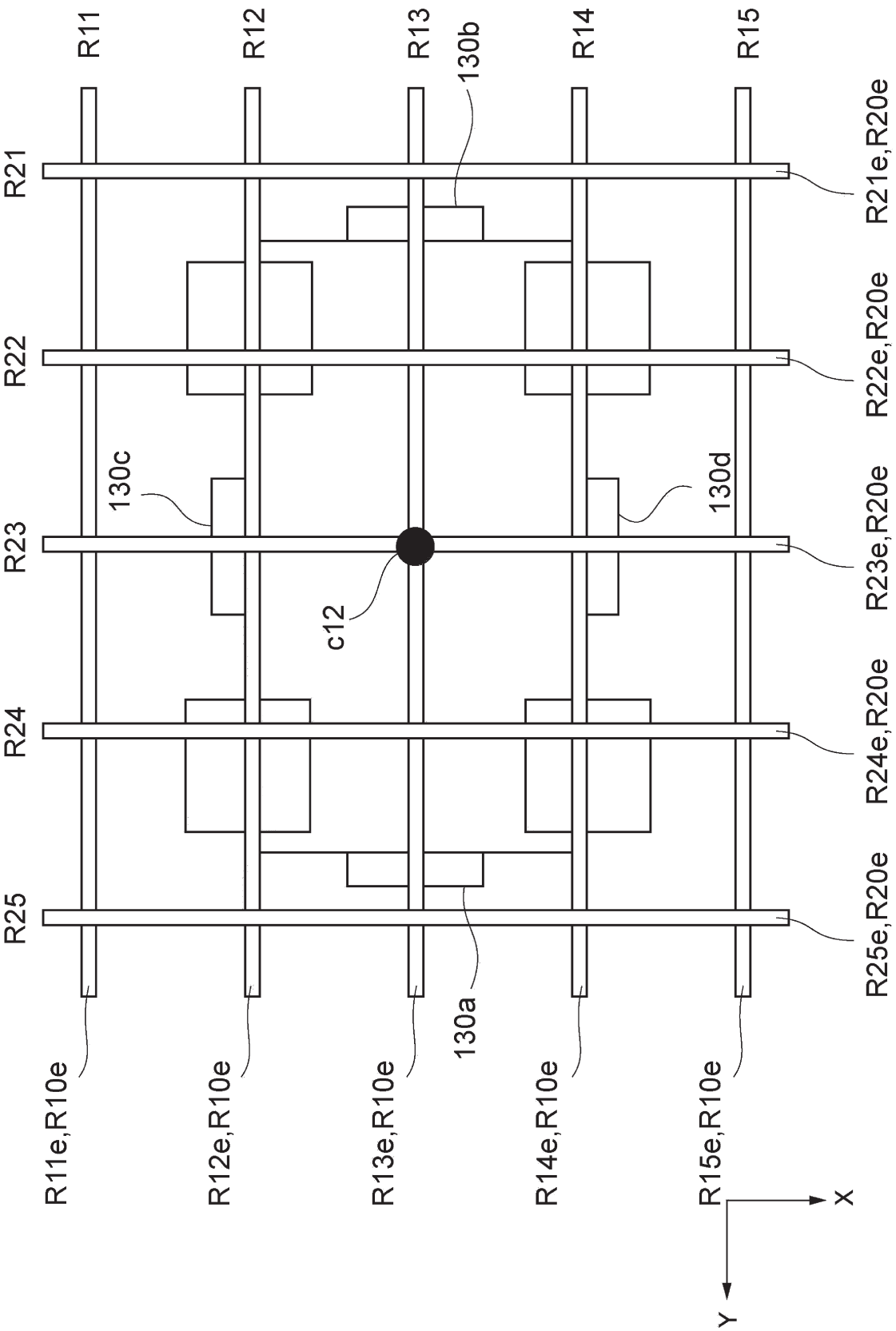

R11
R12
R13
R14
R15
130b
R21
R22
R23
R24
R25
R21e,R20e
R22e,R20e
R23e,R20e
R24e,R20e
R25e,R20e
130c
130d
c12
130a
R11e,R10e
R12e,R10e
R13e,R10e
R14e,R10e
R15e,R10e
X
Y

FIG. 18

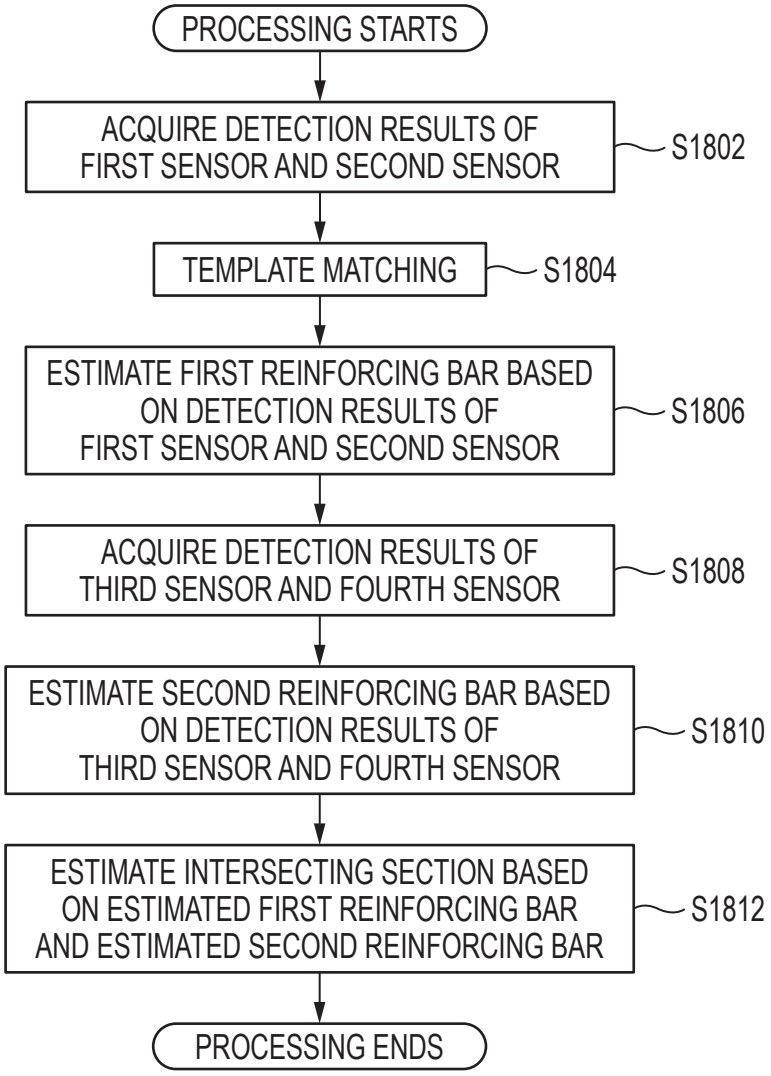

PROCESSING STARTS
ACQUIRE DETECTION RESULTS OF FIRST SENSOR AND SECOND SENSOR
S1802
TEMPLATE MATCHING
S1804
ESTIMATE FIRST REINFORCING BAR BASED ON DETECTION RESULTS OF FIRST SENSOR AND SECOND SENSOR
S1806
ACQUIRE DETECTION RESULTS OF THIRD SENSOR AND FOURTH SENSOR
S1808
ESTIMATE SECOND REINFORCING BAR BASED ON DETECTION RESULTS OF THIRD SENSOR AND FOURTH SENSOR
S1810
ESTIMATE INTERSECTING SECTION BASED ON ESTIMATED FIRST REINFORCING BAR AND ESTIMATED SECOND REINFORCING BAR
S1812
PROCESSING ENDS

FIG. 19

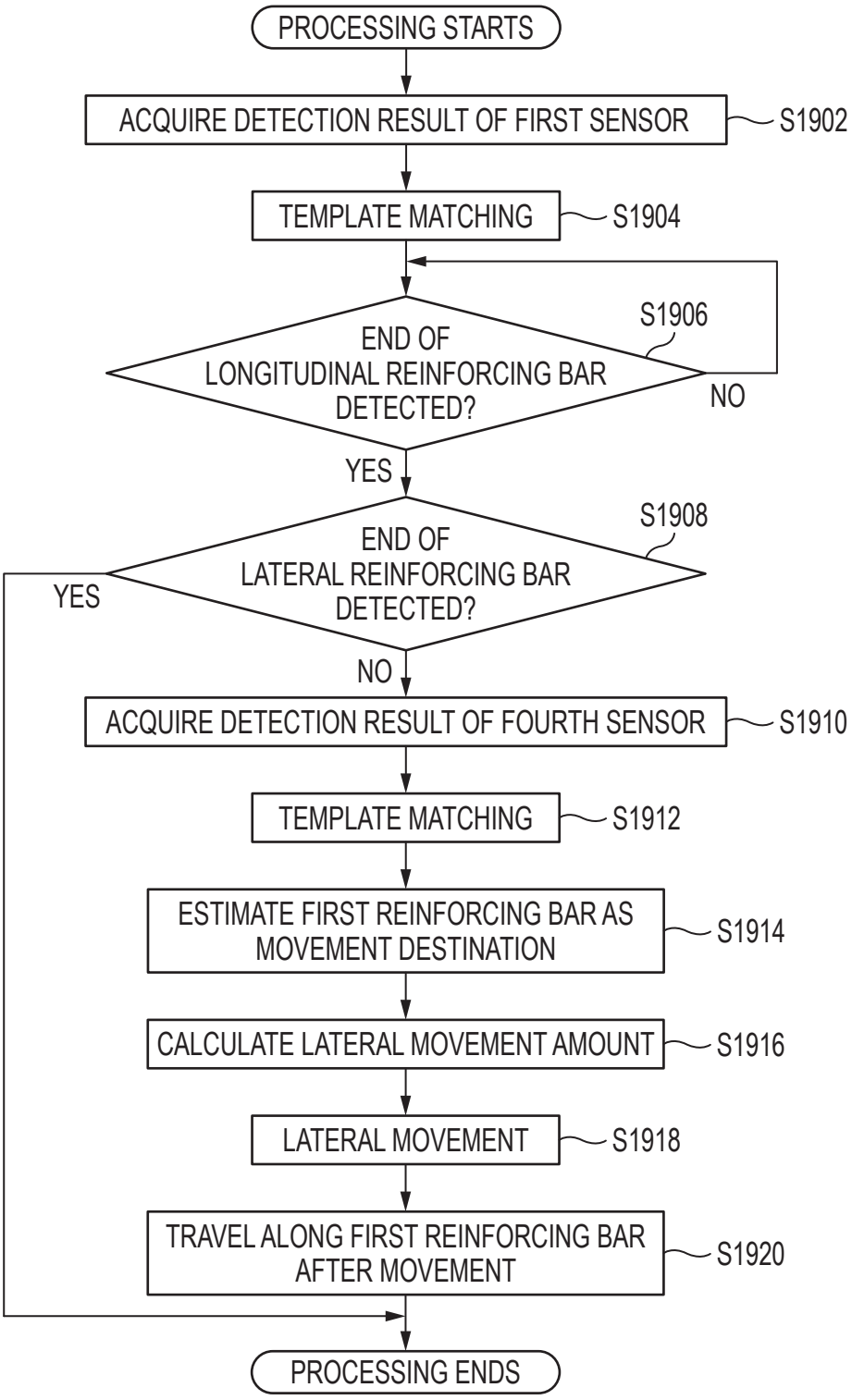

PROCESSING STARTS
ACQUIRE DETECTION RESULT OF FIRST SENSOR
S1902
TEMPLATE MATCHING
S1904
END OF LONGITUDINAL REINFORCING BAR DETECTED?
S1906
NO
YES
END OF LATERAL REINFORCING BAR DETECTED?
S1908
YES
NO
ACQUIRE DETECTION RESULT OF FOURTH SENSOR
S1910
TEMPLATE MATCHING
S1912
ESTIMATE FIRST REINFORCING BAR AS MOVEMENT DESTINATION
S1914
CALCULATE LATERAL MOVEMENT AMOUNT
S1916
LATERAL MOVEMENT
S1918
TRAVEL ALONG FIRST REINFORCING BAR AFTER MOVEMENT
S1920
PROCESSING ENDS

FIG. 20A

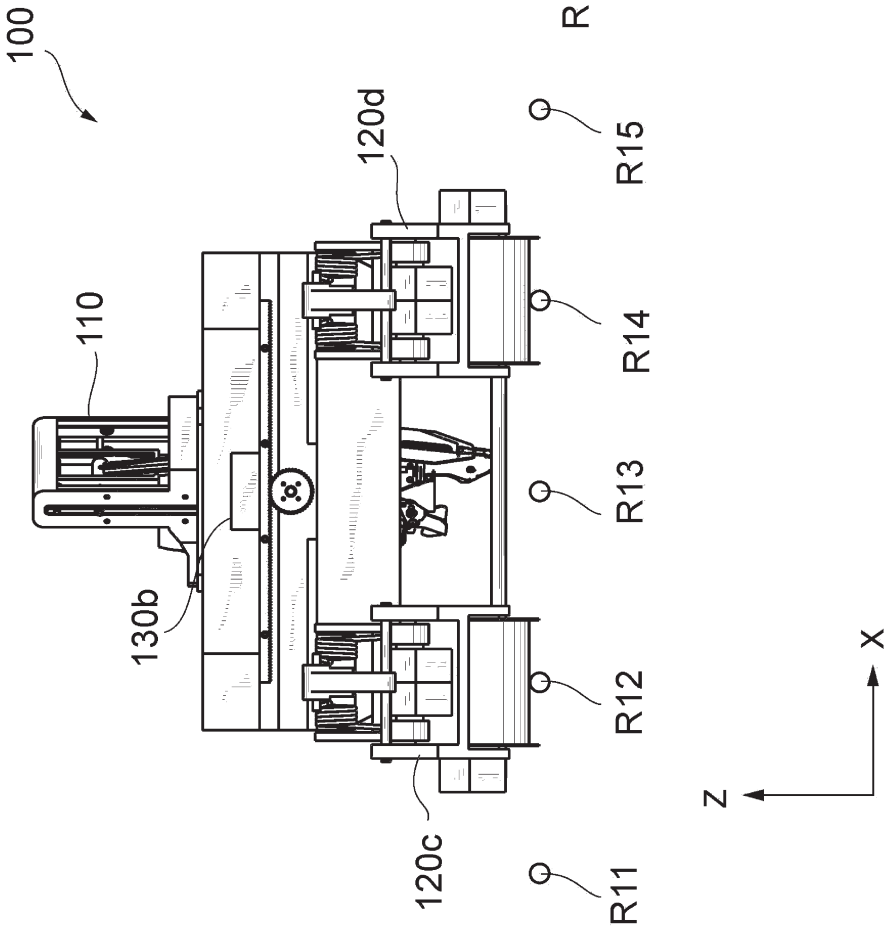


FIG. 20B

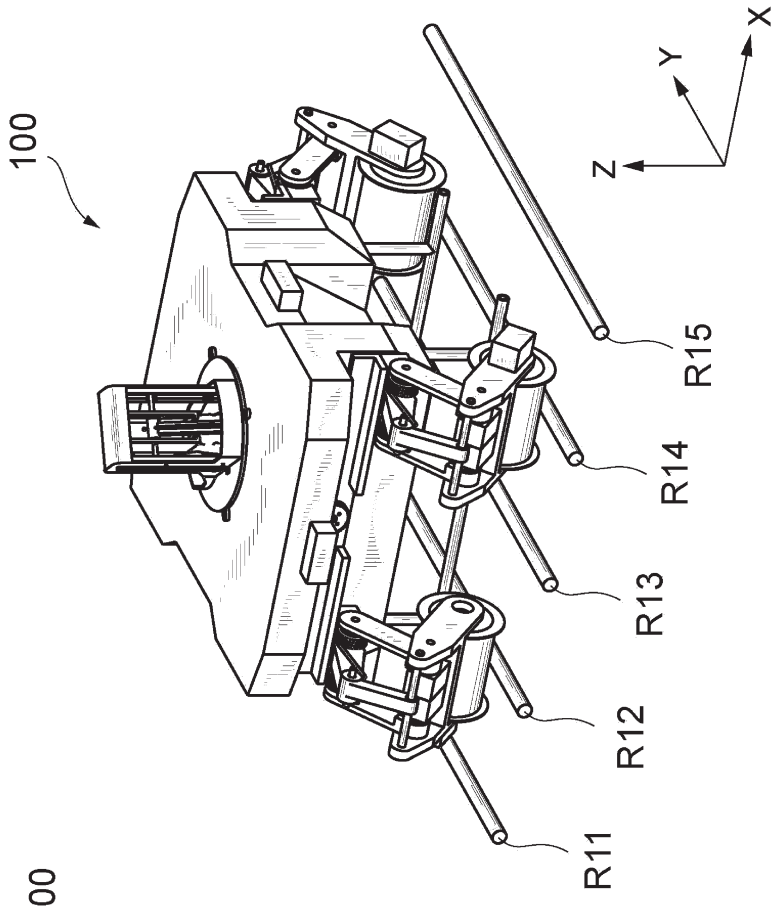


FIG. 21A

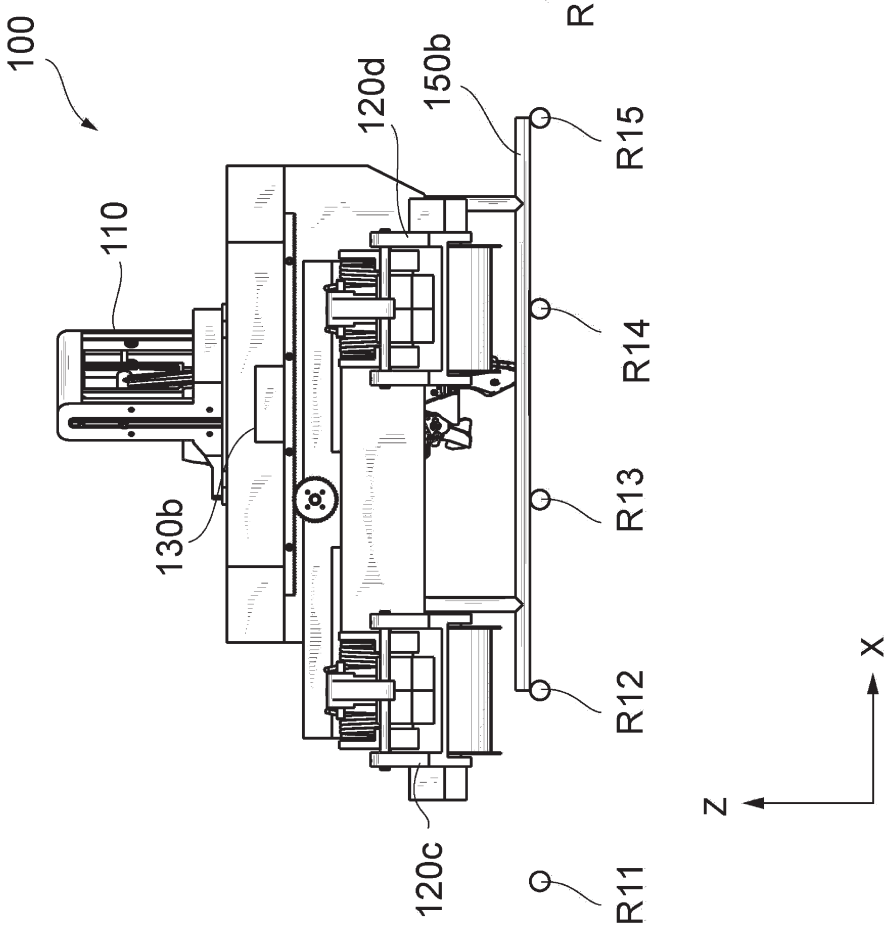


FIG. 21B

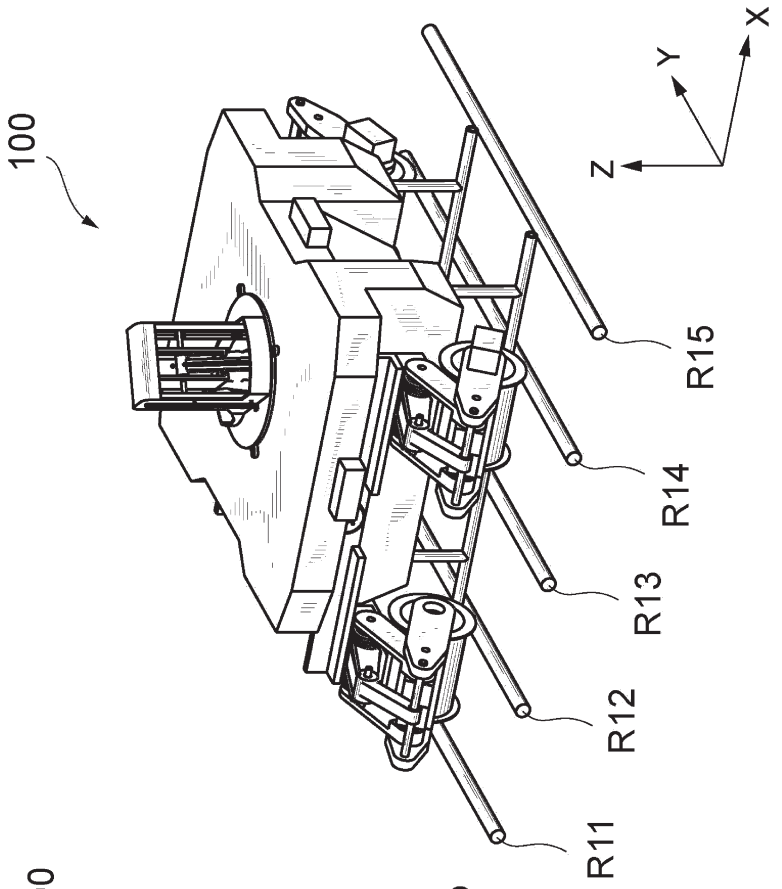


FIG. 22A

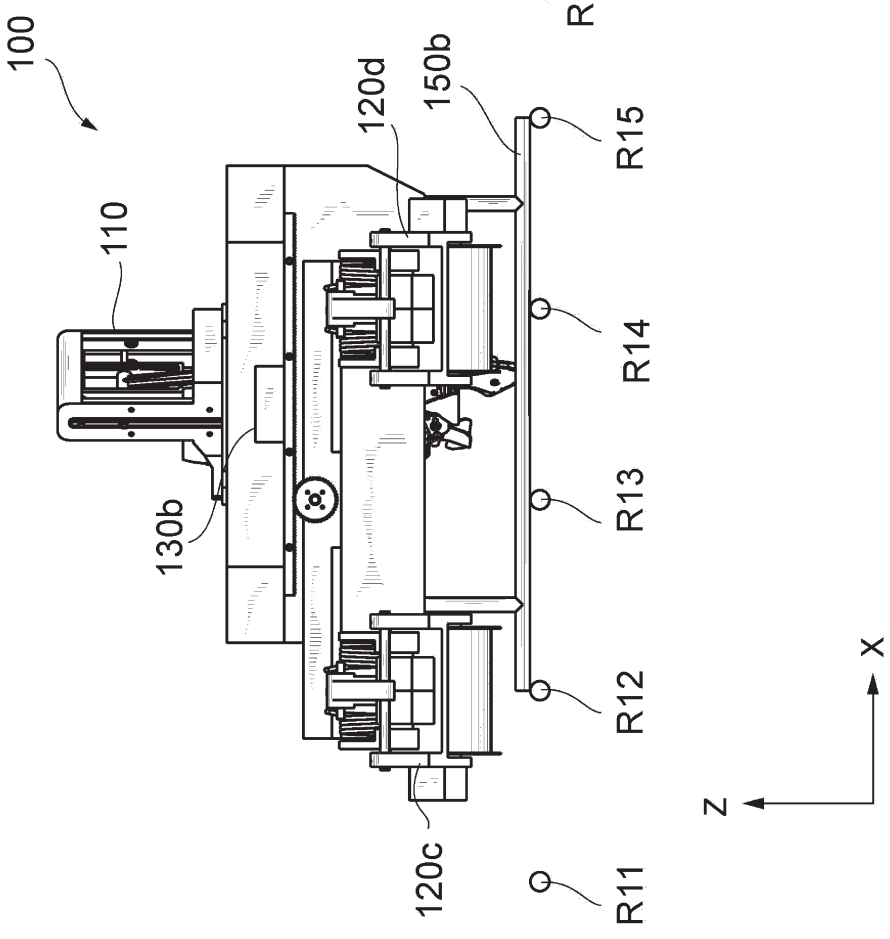


FIG. 22B

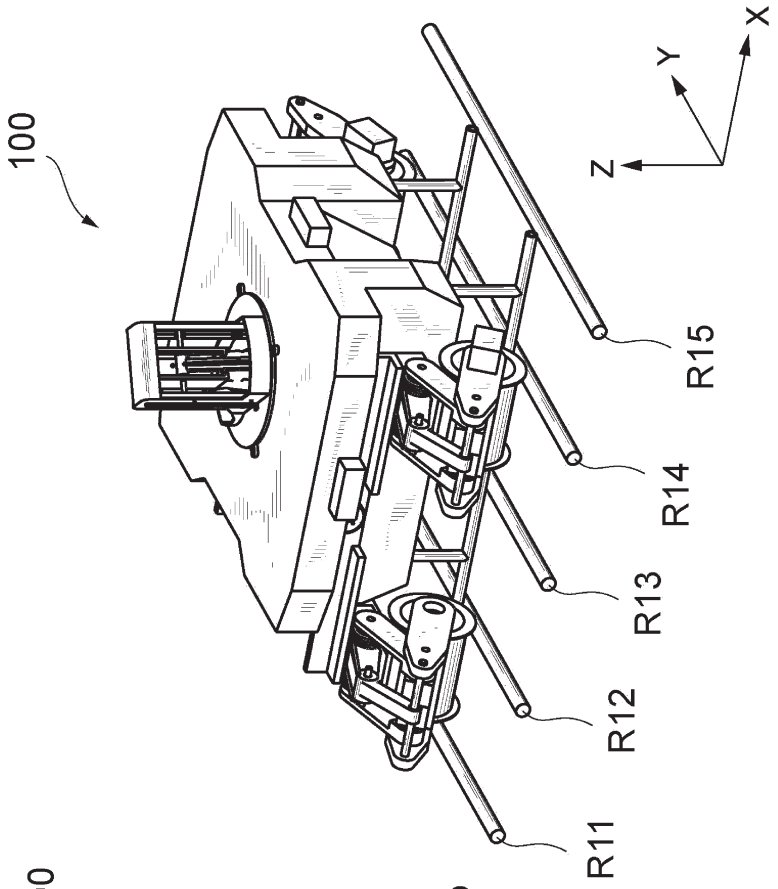


FIG. 23A

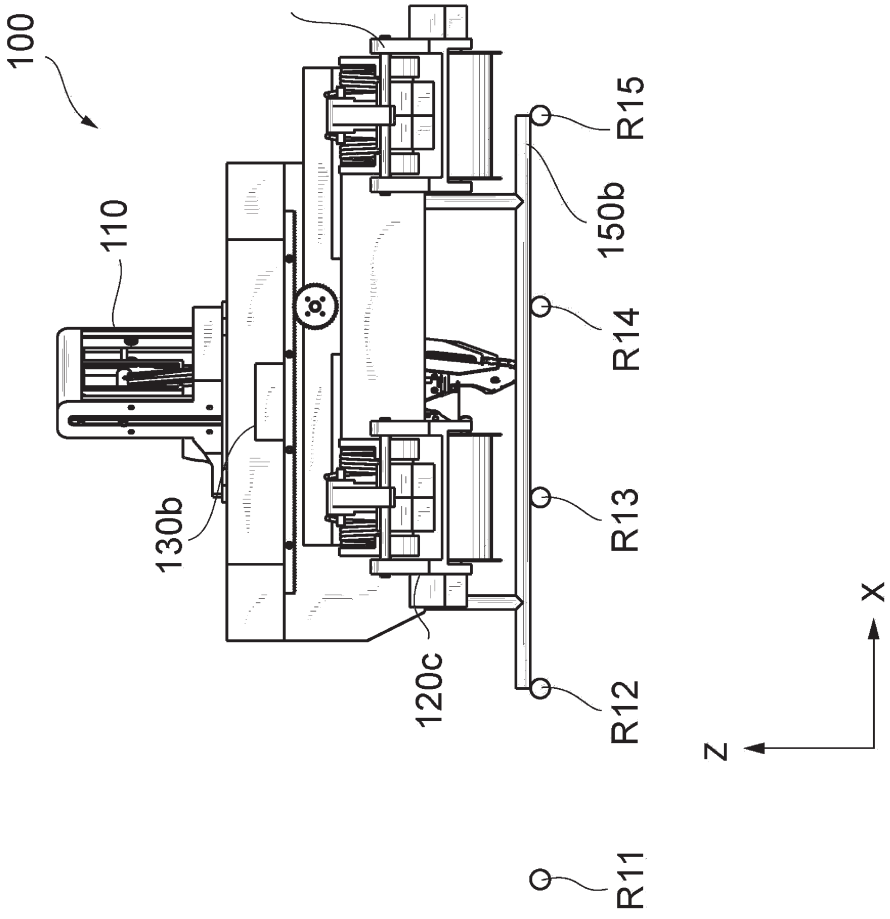


FIG. 23B

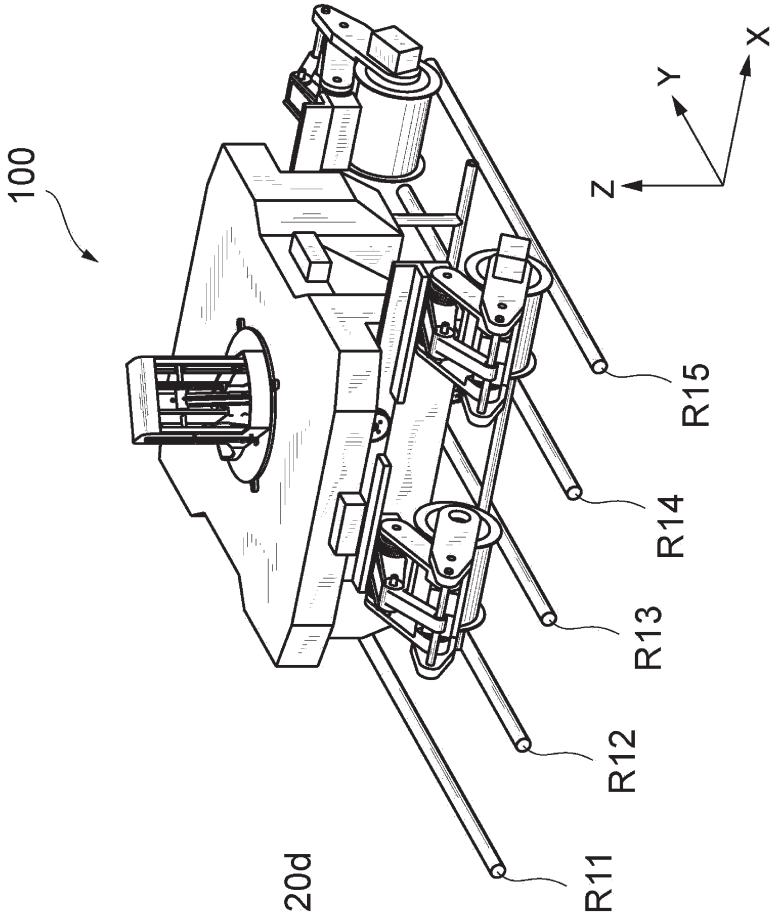


FIG. 24A

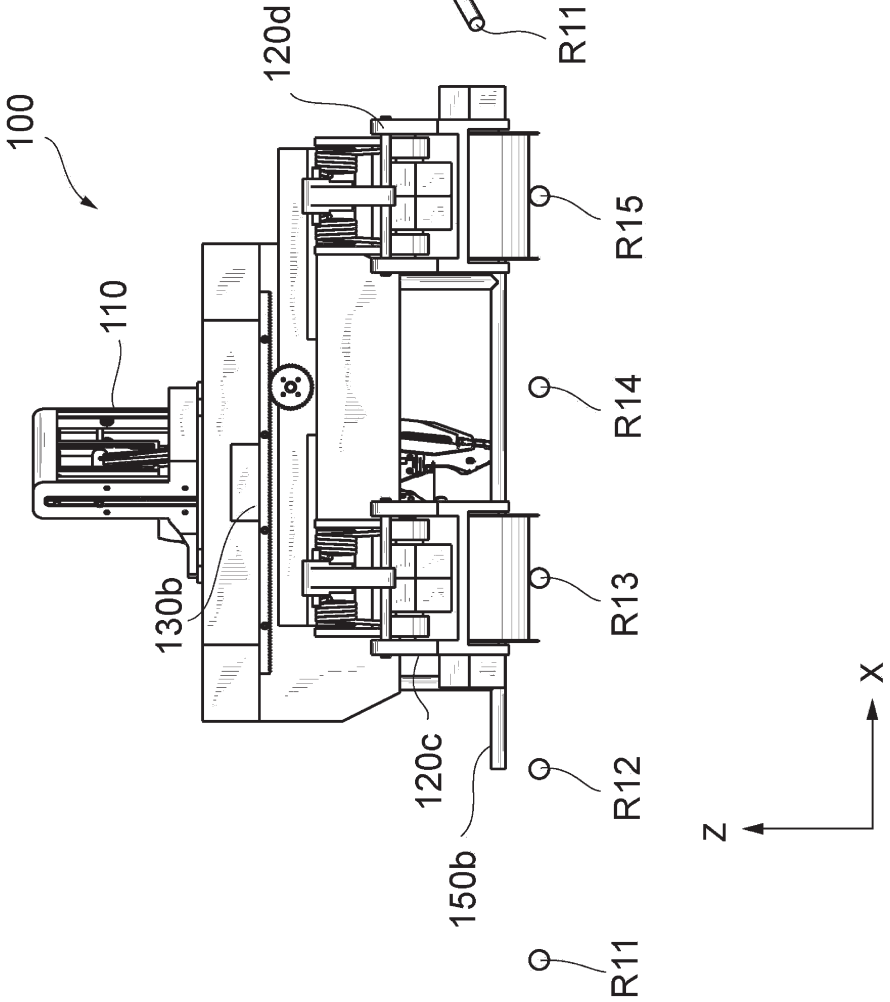


FIG. 24B

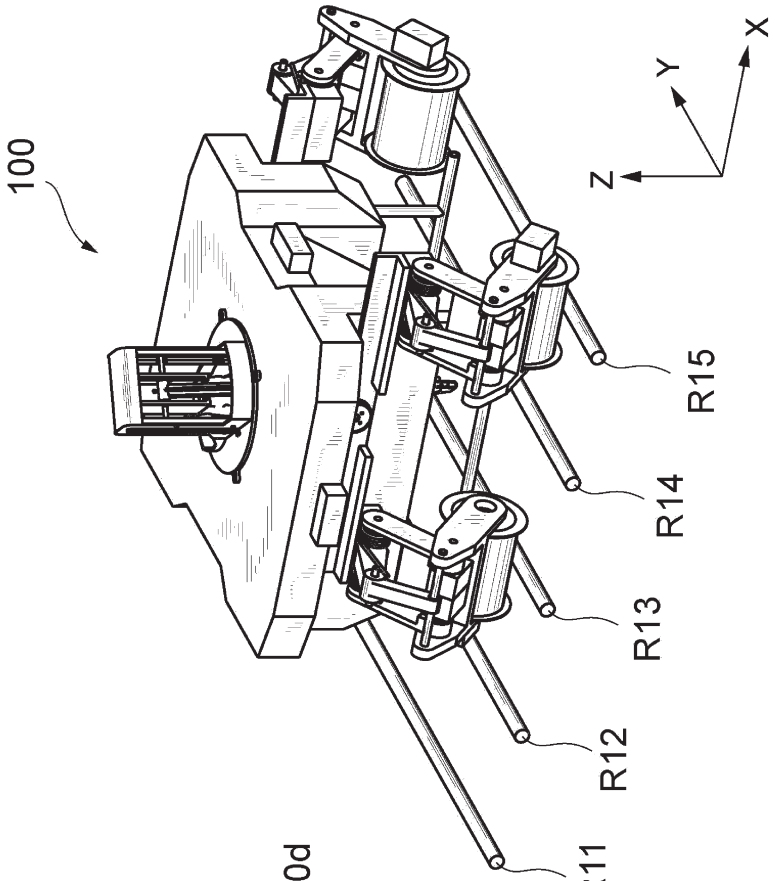


FIG. 25A

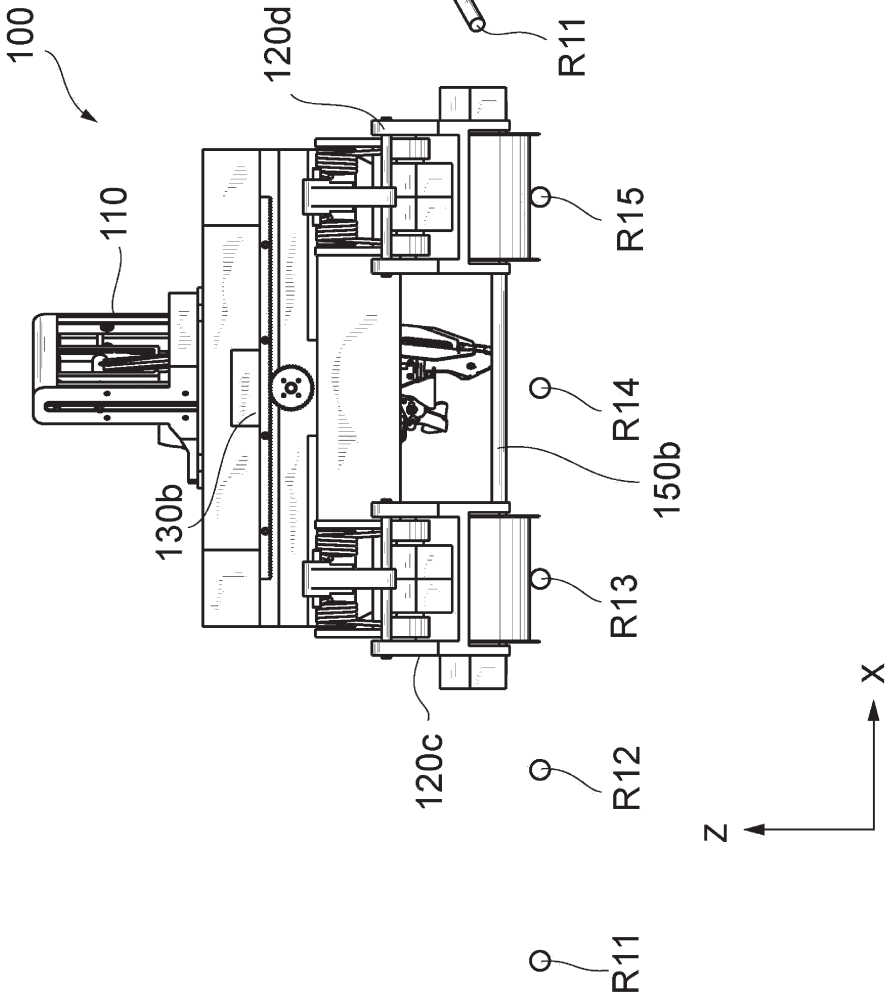


FIG. 25B

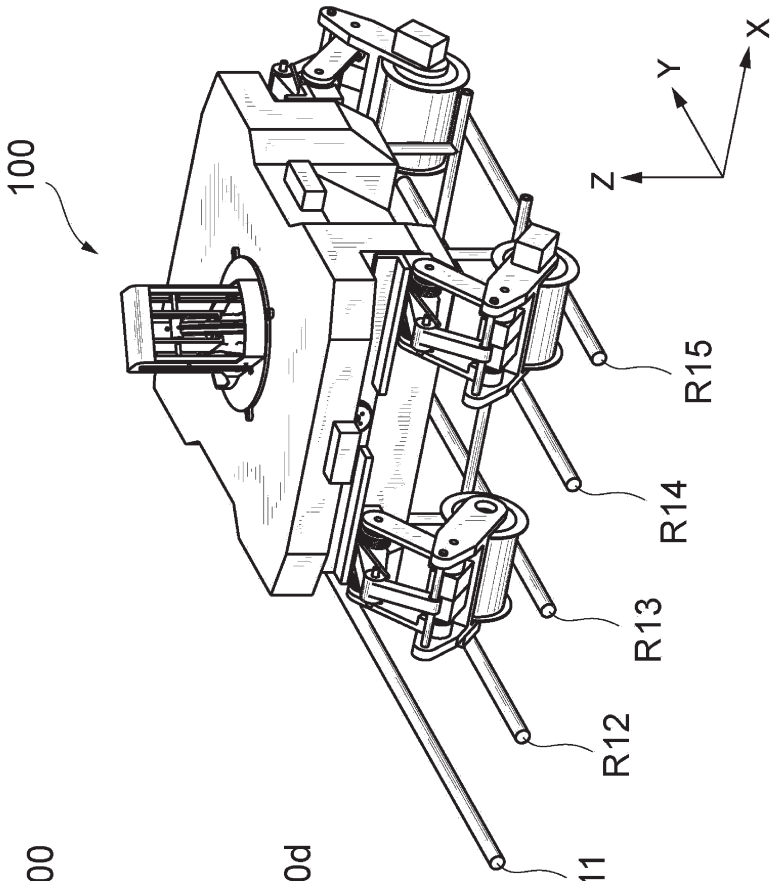


FIG. 26

