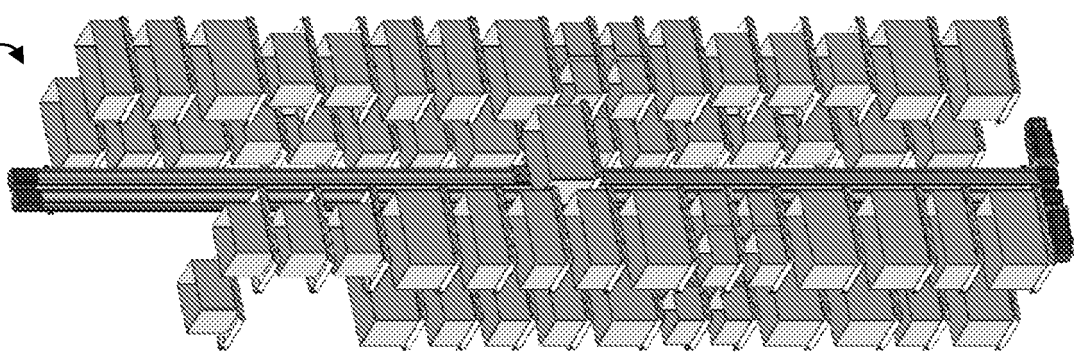


FIG. 1C

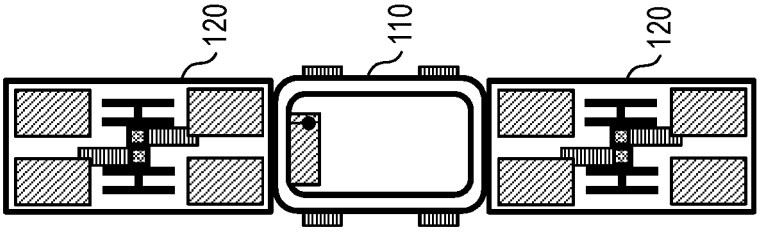


FIG. 1B

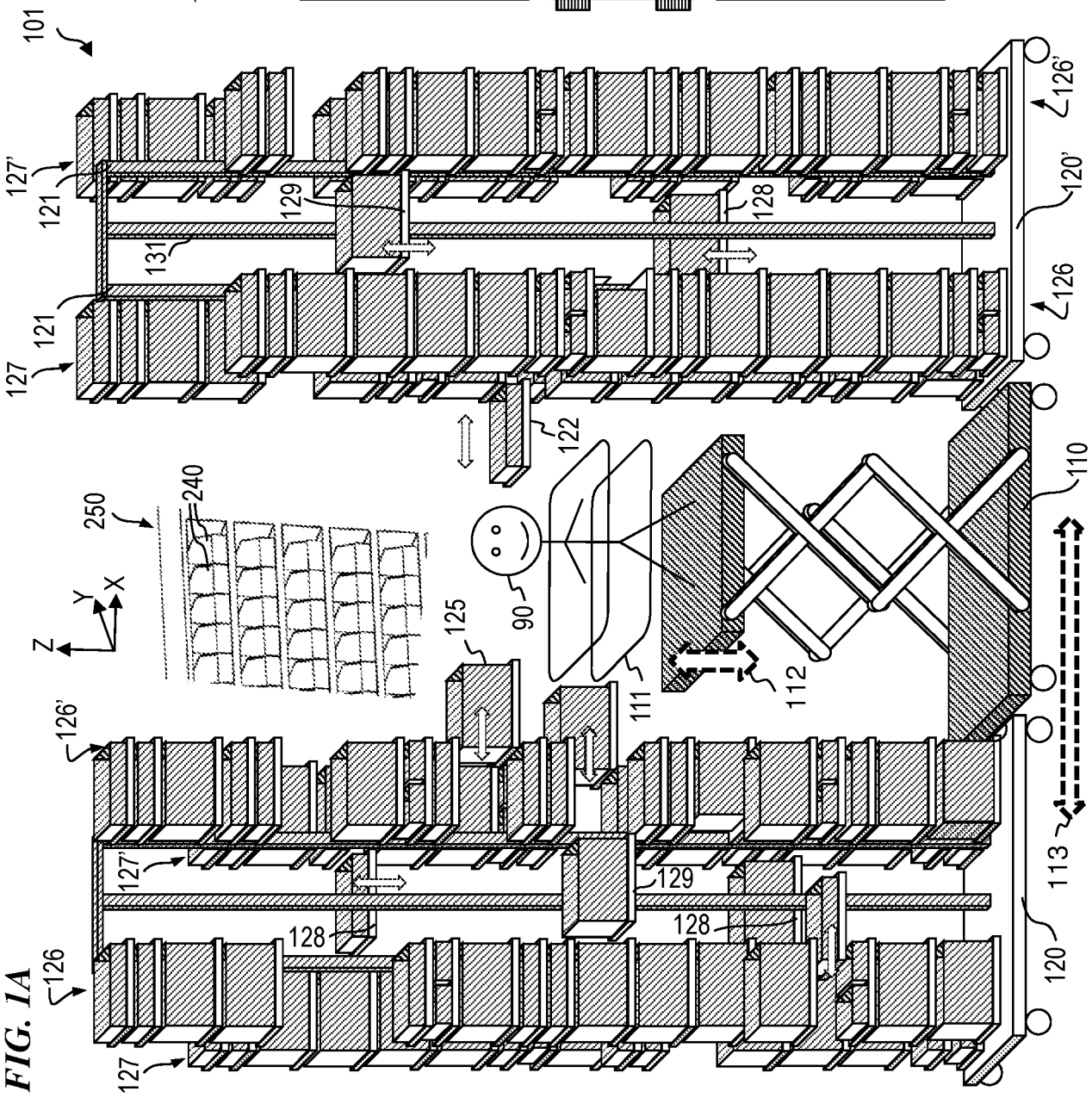


FIG. 1A

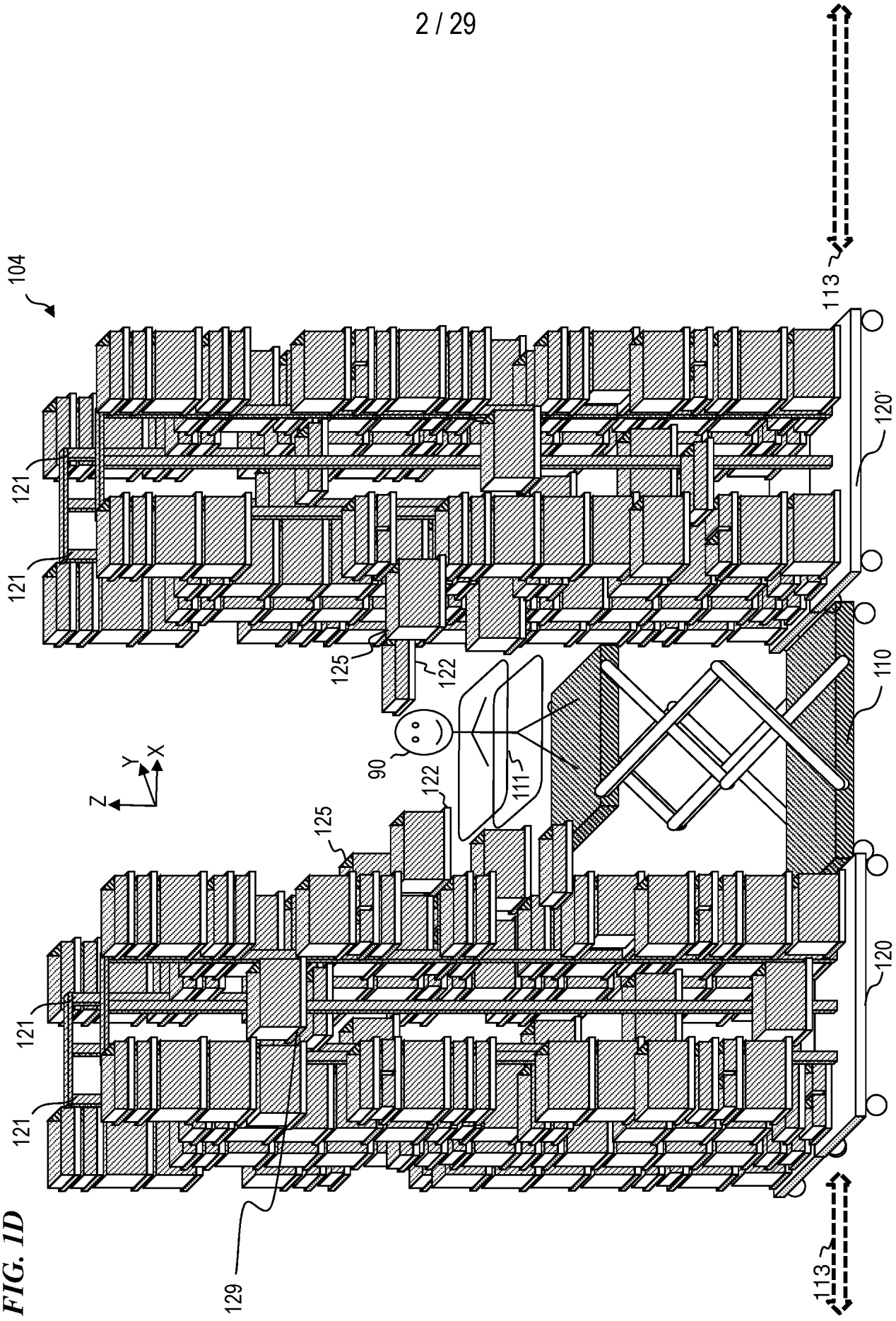

104
113
120'
121
121
125
122
110
90
122
111
Y
X
Z
125
121
121
120
129
113

FIG. 1D

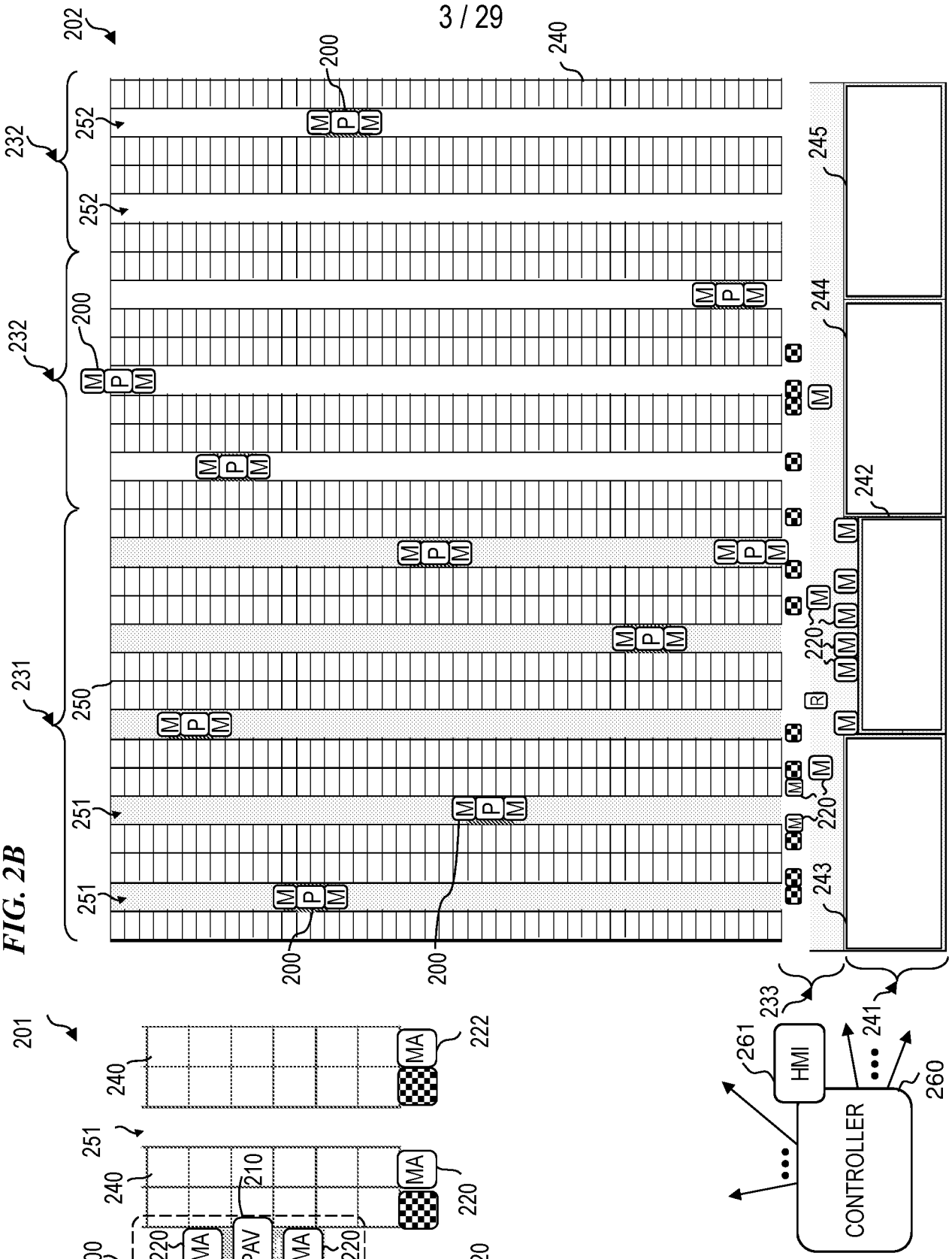

202
200
240
232
252
252
200
232
231
250
251
251
200
200
M
P
M
245
244
242
243
220
R
233
241
261
HMI
CONTROLLER
260

FIG. 2B

201
240
222
MA
251
240
210
220
200
220
MA
PAV
MA
220
250
230
221
251
250
230

FIG. 2A

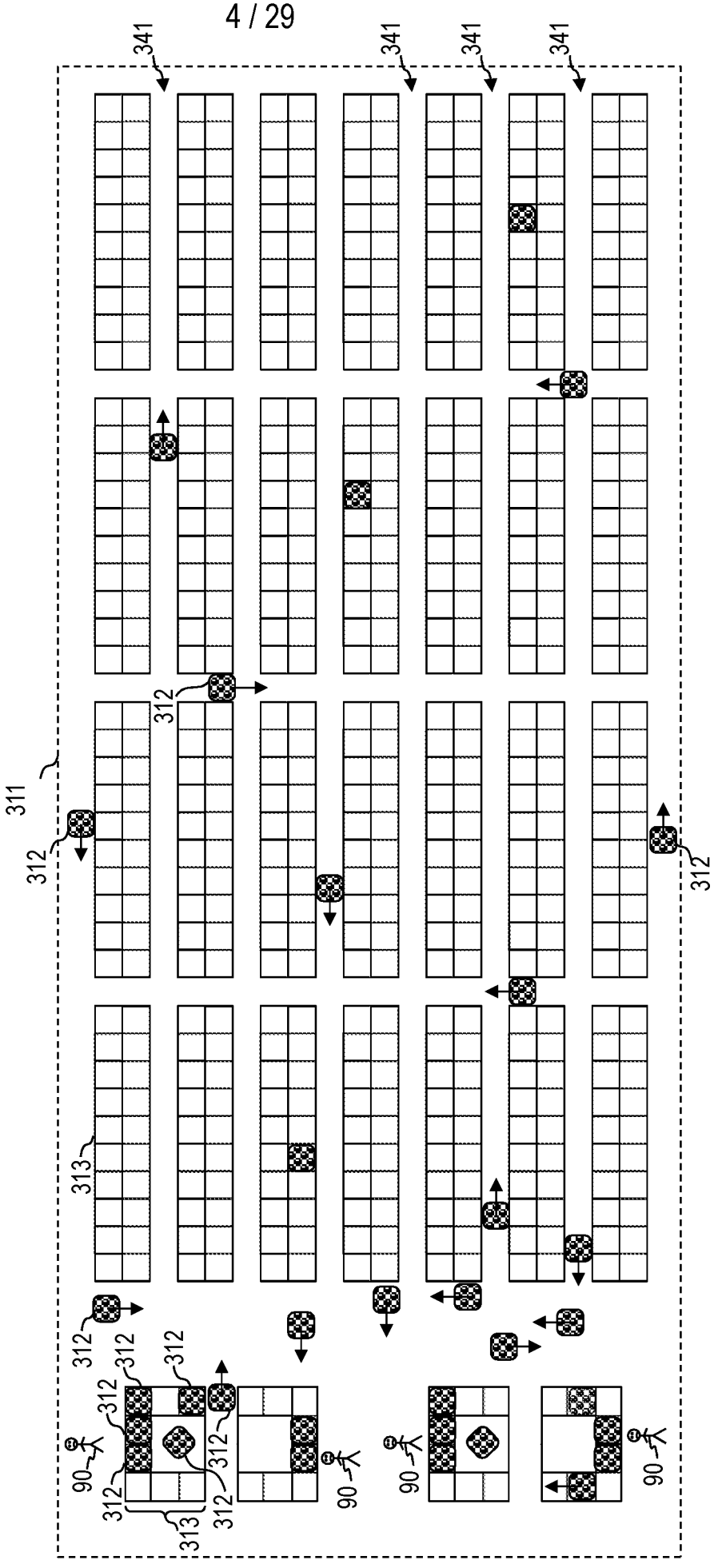


FIG. 3

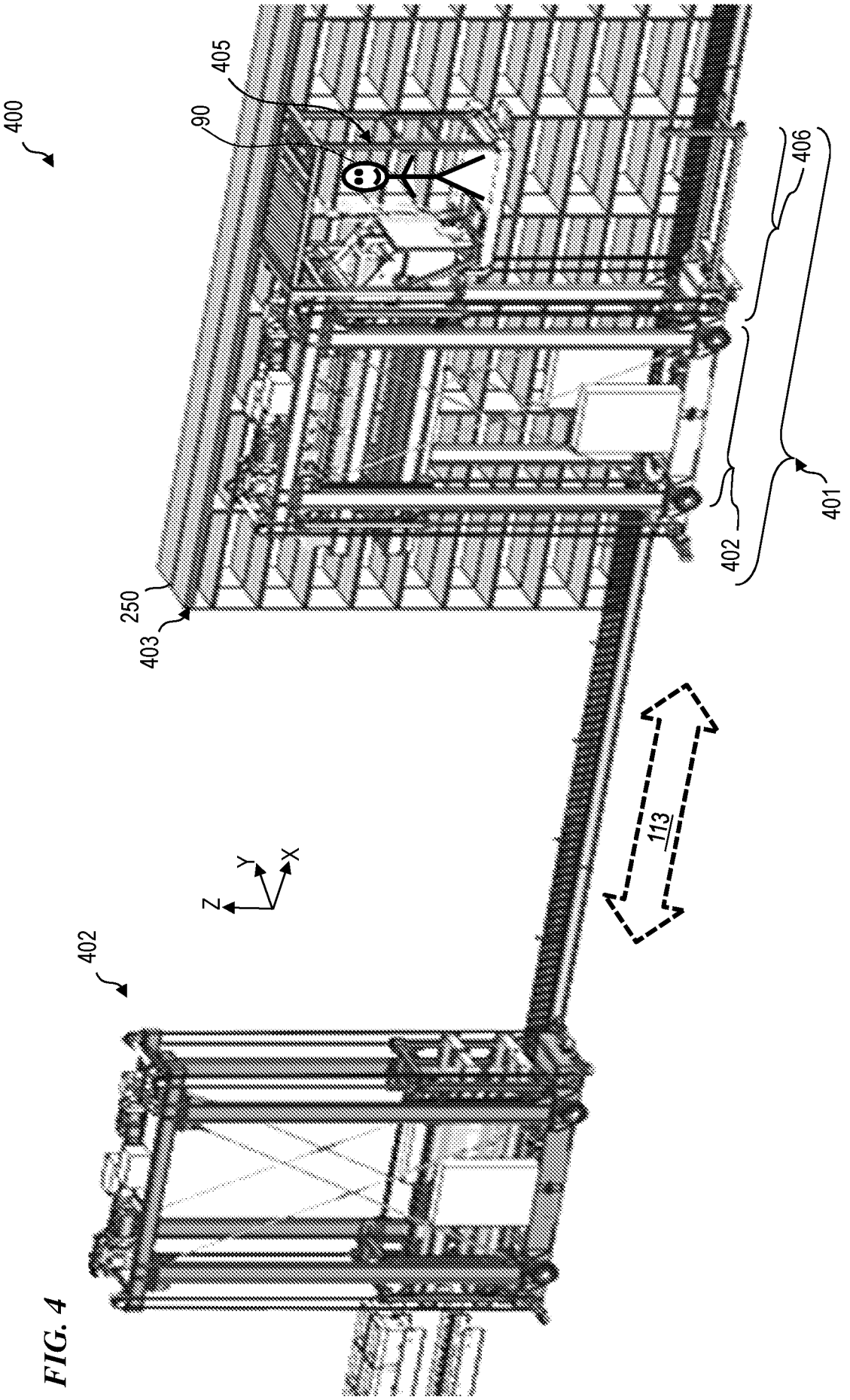


FIG. 4

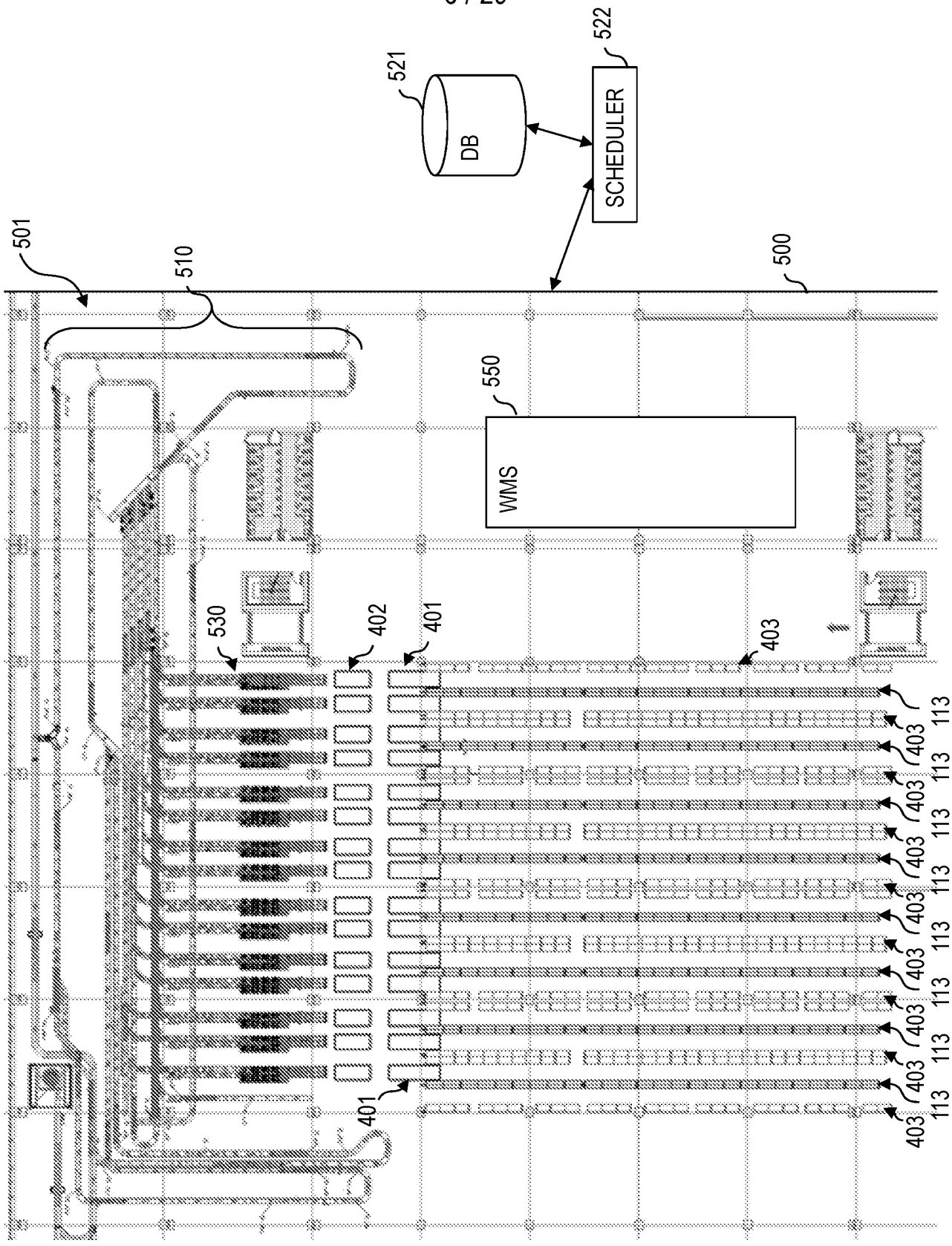


FIG. 5

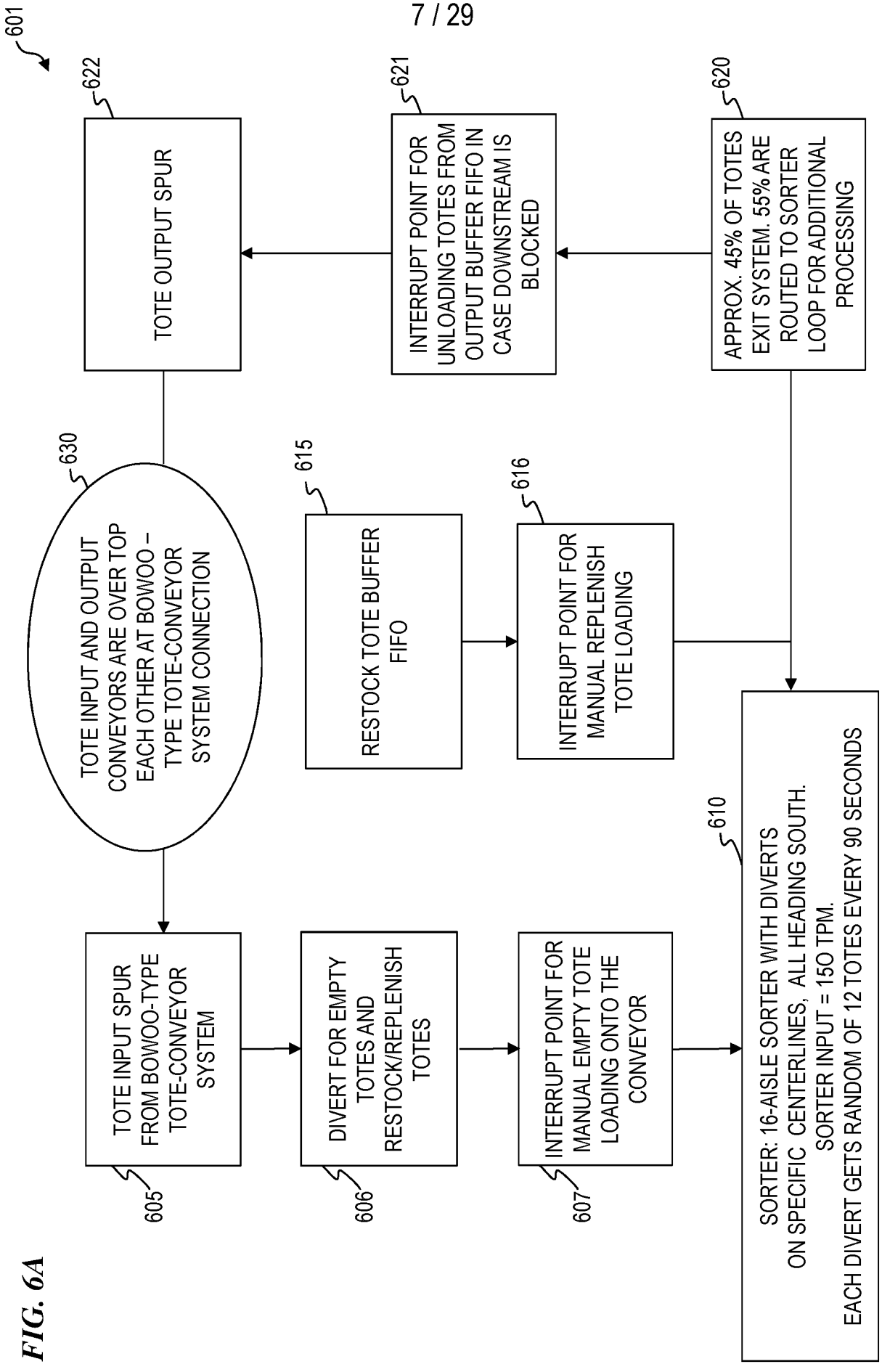

601
622
TOTE OUTPUT SPUR
621
INTERRUPT POINT FOR UNLOADING TOTES FROM OUTPUT BUFFER FIFO IN CASE DOWNSTREAM IS BLOCKED
620
APPROX. 45% OF TOTES EXIT SYSTEM. 55% ARE ROUTED TO SORTER LOOP FOR ADDITIONAL PROCESSING
630
TOTE INPUT AND OUTPUT CONVEYORS ARE OVER TOP EACH OTHER AT BOWOO – TYPE TOTE-CONVEYOR SYSTEM CONNECTION
615
RESTOCK TOTE BUFFER FIFO
616
INTERRUPT POINT FOR MANUAL REPLENISH TOTE LOADING
610
605
TOTE INPUT SPUR FROM BOWOO-TYPE TOTE-CONVEYOR SYSTEM
606
DIVERT FOR EMPTY TOTES AND RESTOCK/REPLENISH TOTES
607
INTERRUPT POINT FOR MANUAL EMPTY TOTE LOADING ONTO THE CONVEYOR
SORTER: 16-AISLE SORTER WITH DIVERTS ON SPECIFIC CENTERLINES, ALL HEADING SOUTH.
SORTER INPUT = 150 TPM.
EACH DIVERT GETS RANDOM OF 12 TOTES EVERY 90 SECONDS

FIG. 6A

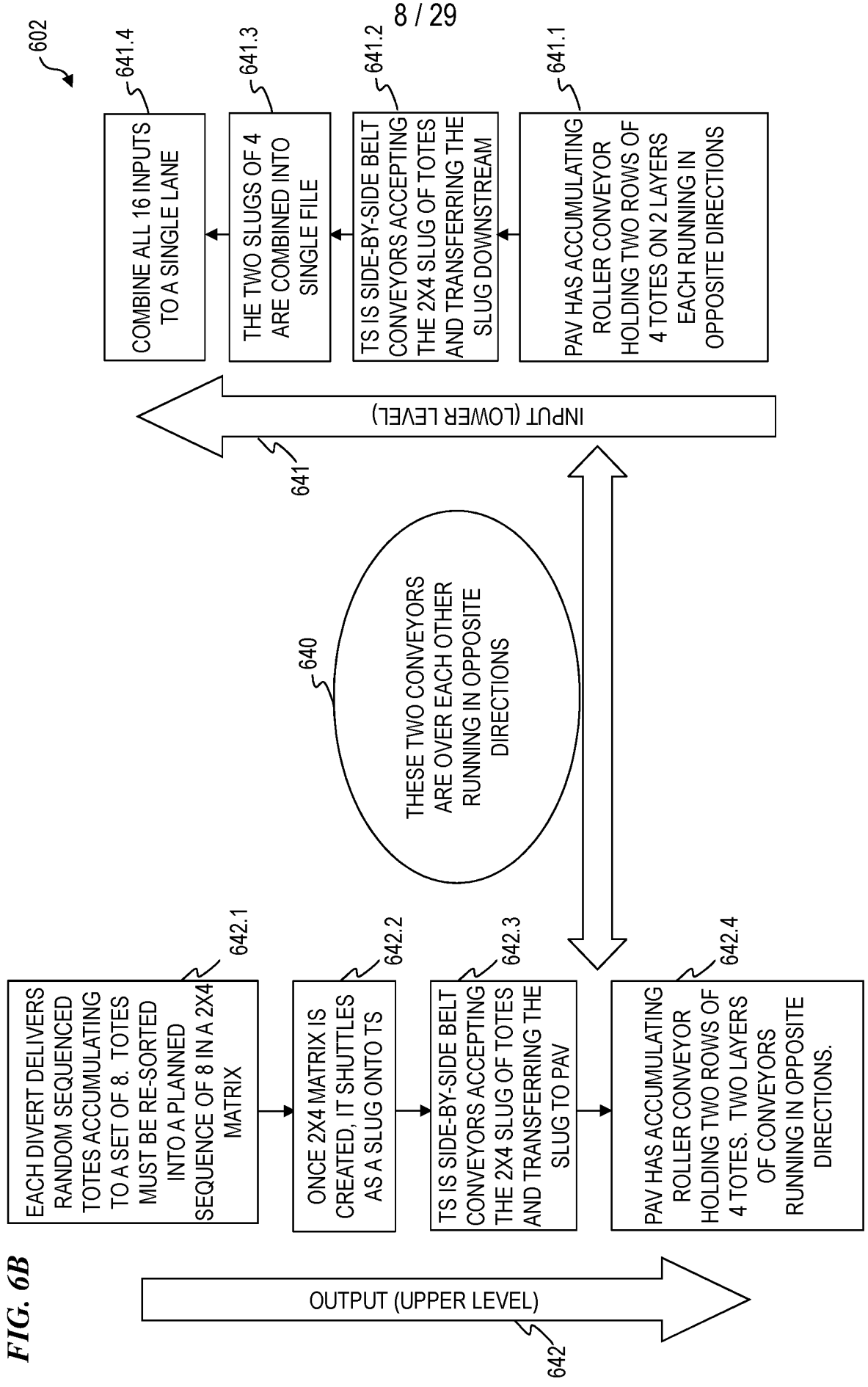

602
641.4
641.3
641.2
641.1
COMBINE ALL 16 INPUTS TO A SINGLE LANE
THE TWO SLUGS OF 4 ARE COMBINED INTO SINGLE FILE
TS IS SIDE-BY-SIDE BELT CONVEYORS ACCEPTING THE 2X4 SLUG OF TOTES AND TRANSFERRING THE SLUG DOWNSTREAM
PAV HAS ACCUMULATING ROLLER CONVEYOR HOLDING TWO ROWS OF 4 TOTES ON 2 LAYERS EACH RUNNING IN OPPOSITE DIRECTIONS
INPUT (LOWER LEVEL)
641
640
THESE TWO CONVEYORS ARE OVER EACH OTHER RUNNING IN OPPOSITE DIRECTIONS
642.1
642.2
642.3
642.4
EACH DIVERT DELIVERS RANDOM SEQUENCED TOTES ACCUMULATING TO A SET OF 8. TOTES MUST BE RE-SORTED INTO A PLANNED SEQUENCE OF 8 IN A 2X4 MATRIX
ONCE 2X4 MATRIX IS CREATED, IT SHUTTLES AS A SLUG ONTO TS
TS IS SIDE-BY-SIDE BELT CONVEYORS ACCEPTING THE 2X4 SLUG OF TOTES AND TRANSFERRING THE SLUG TO PAV
PAV HAS ACCUMULATING ROLLER CONVEYOR HOLDING TWO ROWS OF 4 TOTES. TWO LAYERS OF CONVEYORS RUNNING IN OPPOSITE DIRECTIONS.
OUTPUT (UPPER LEVEL)
642

FIG. 6B

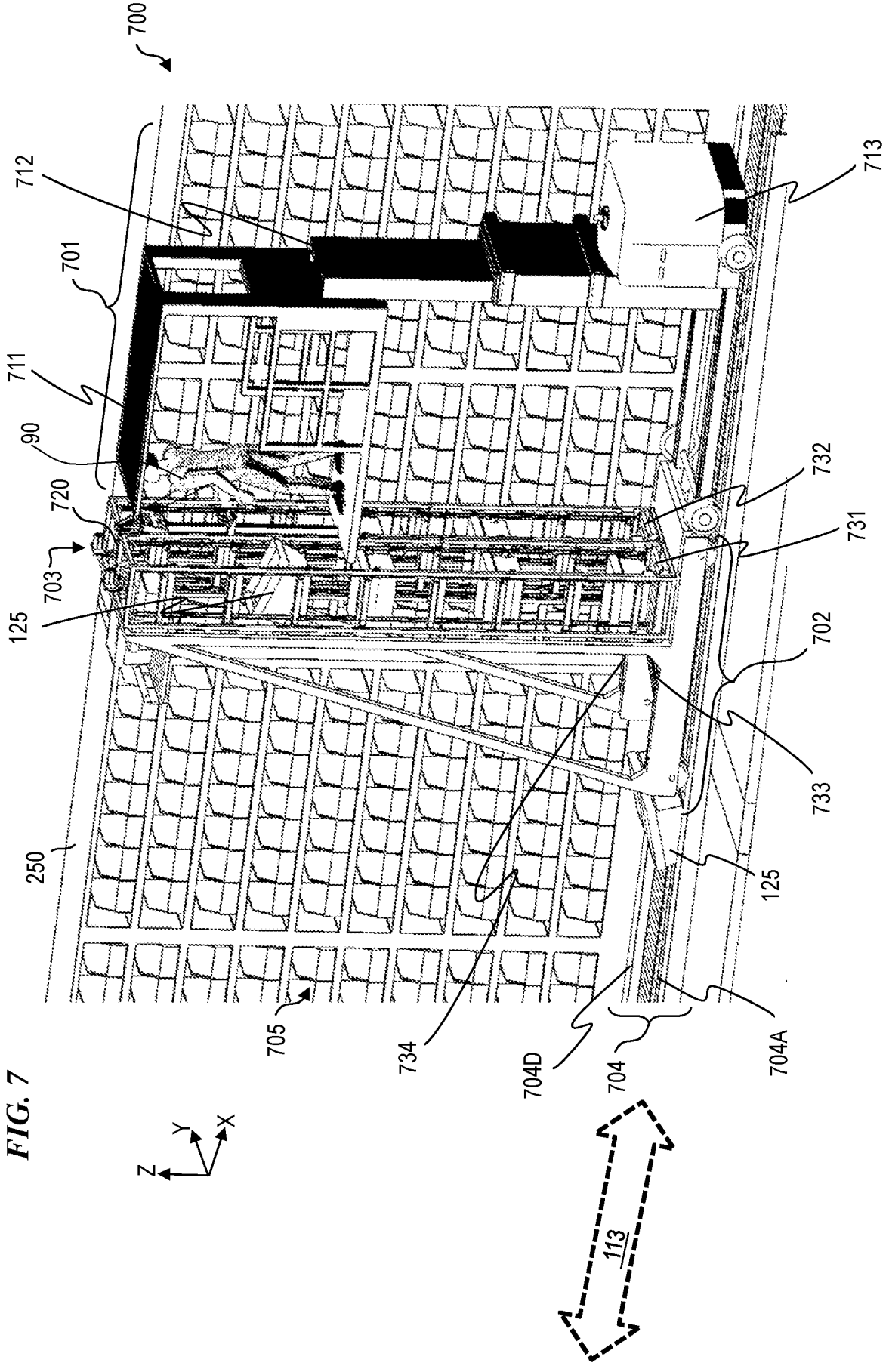

700
712
701
711
90
720
703
125
250
705
734
704D
704
704A
733
702
731
732
713
125
113
Z
Y
X

FIG. 7

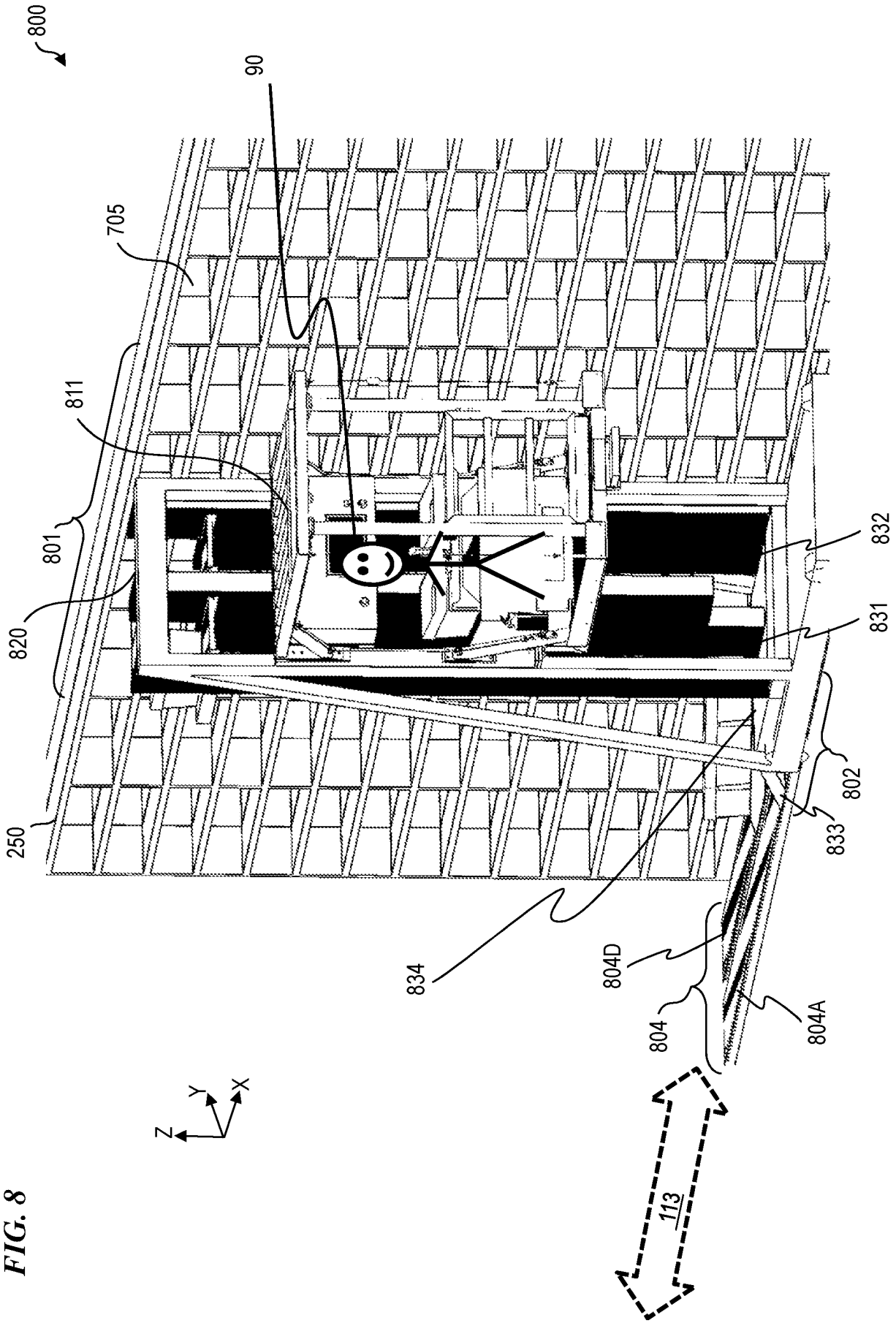

800
90
705
811
801
820
832
831
802
833
250
834
804D
804
804A
113
Y
X
Z

FIG. 8

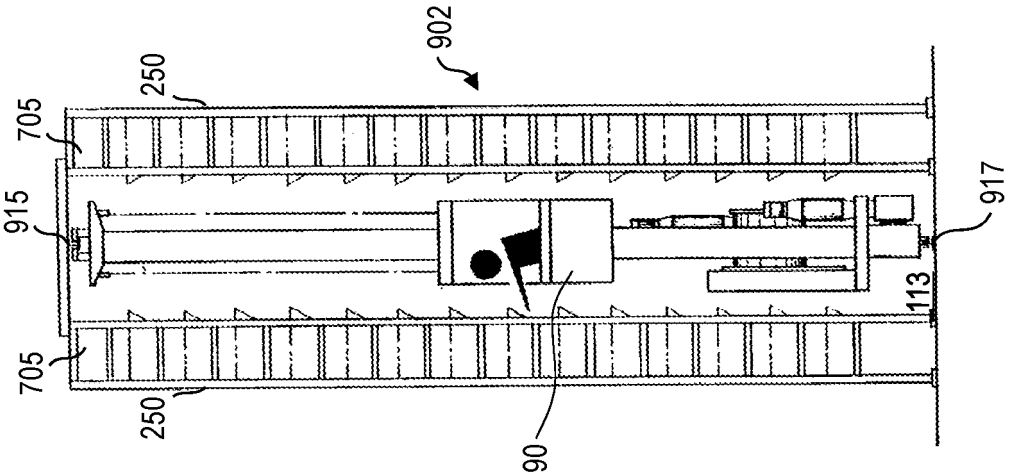


FIG. 9B

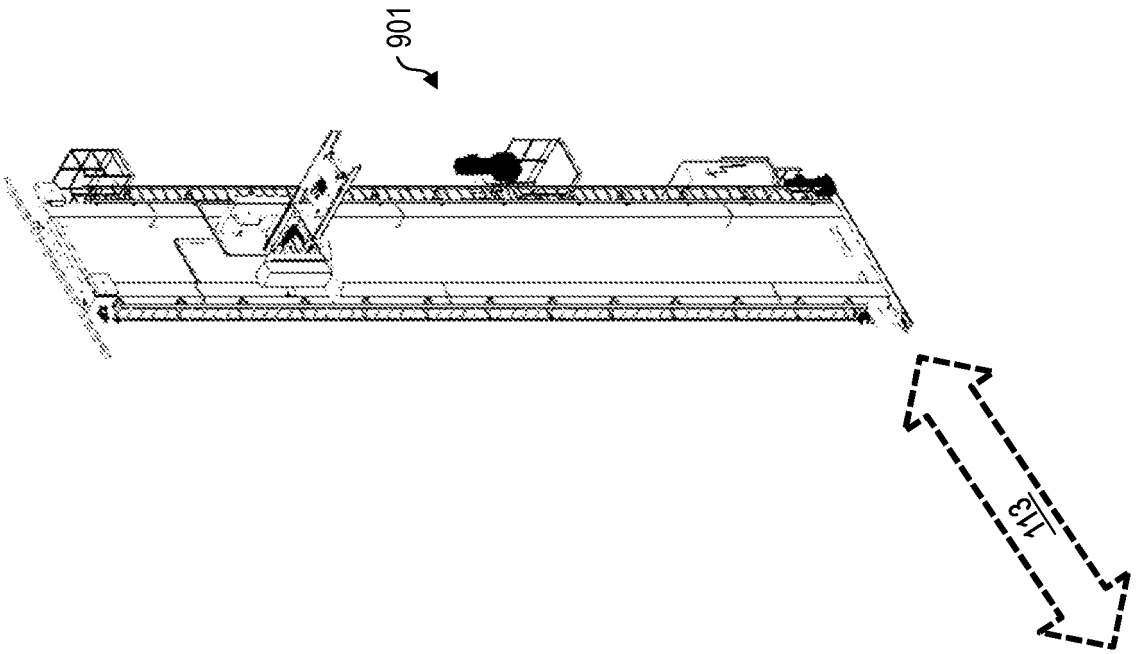


FIG. 9A

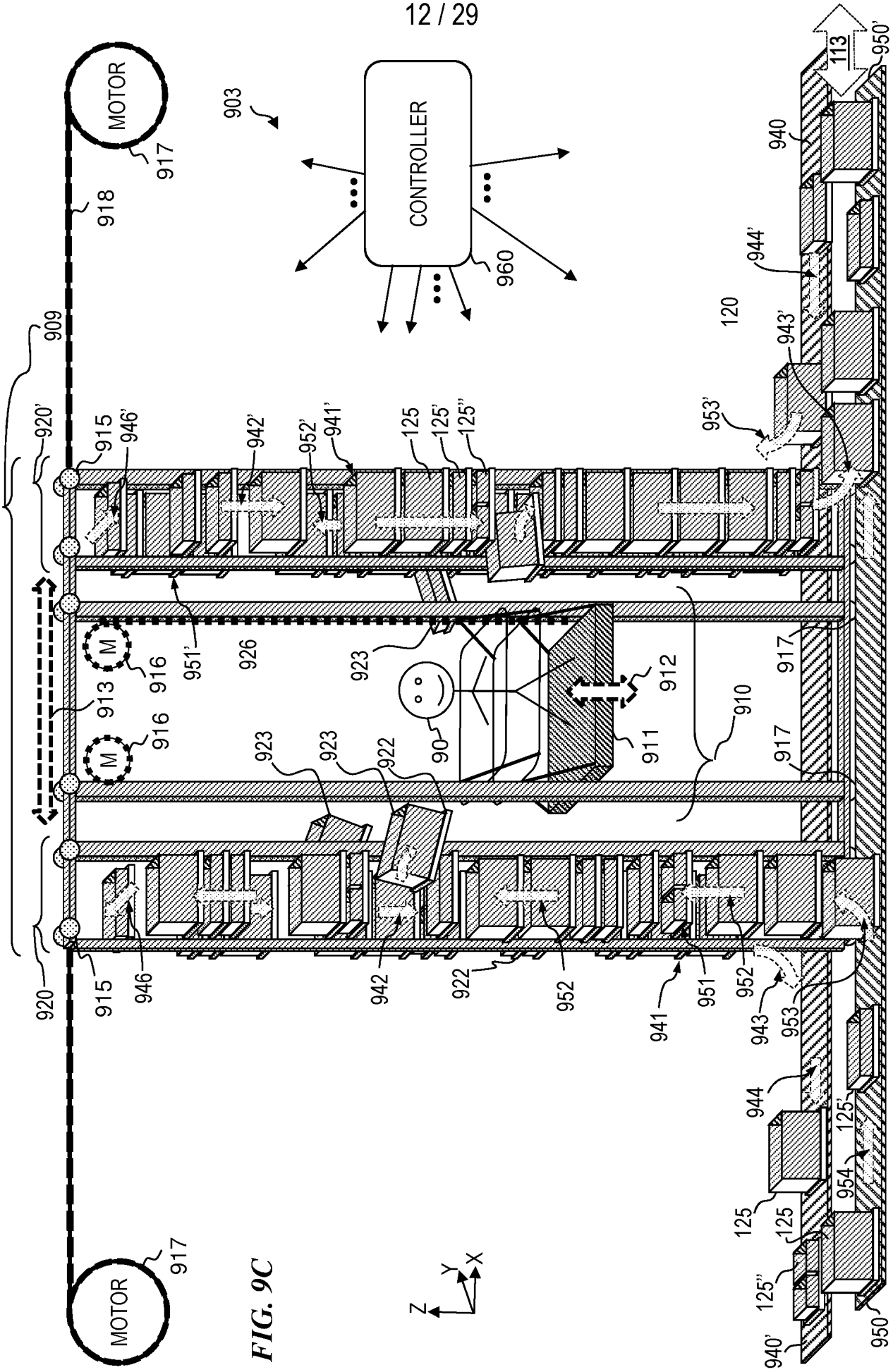

MOTOR
917
918
903
CONTROLLER
960
940
113
950'
909
920'
915
946'
942'
952'
941'
125
125'
125''
944'
120
943'
953'
926
951'
923
912
917
910
916
913
911
90
922
946
942
952
941
951
943
953
944
954
940'

FIG. 9C

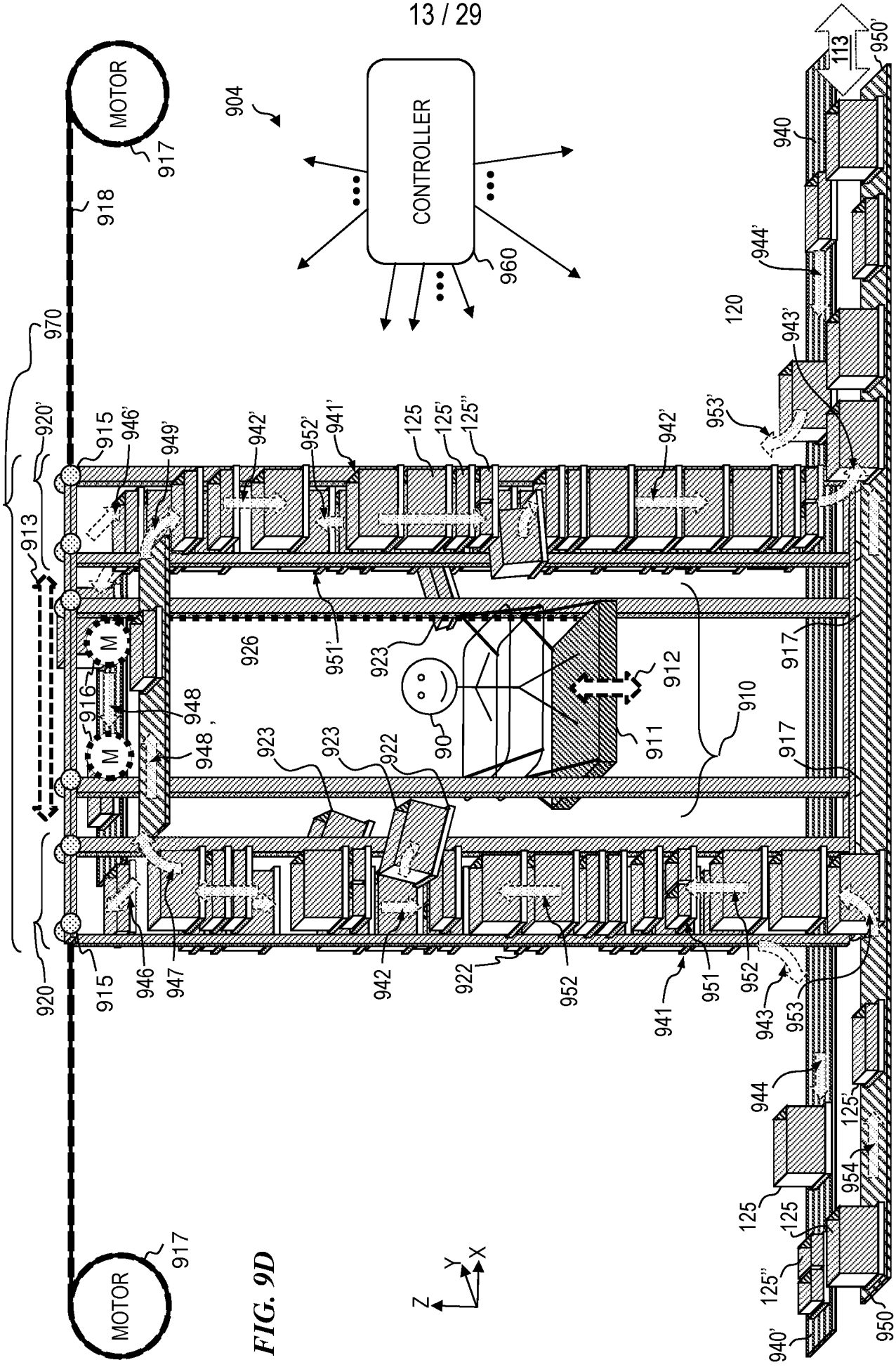

MOTOR
917
918
904
CONTROLLER
960
113
950'
940
944'
120
943'
953'
970
920'
915
946'
949'
942'
952'
941'
125
125'
125''
913
926
951'
923
912
917
910
916
948
948'
911
90
922
920
915
946
947
942
922
952
941
951
952
943
953
944
125'
954
125
125''
940'
950
MOTOR
917
Z
Y
X

FIG. 9D

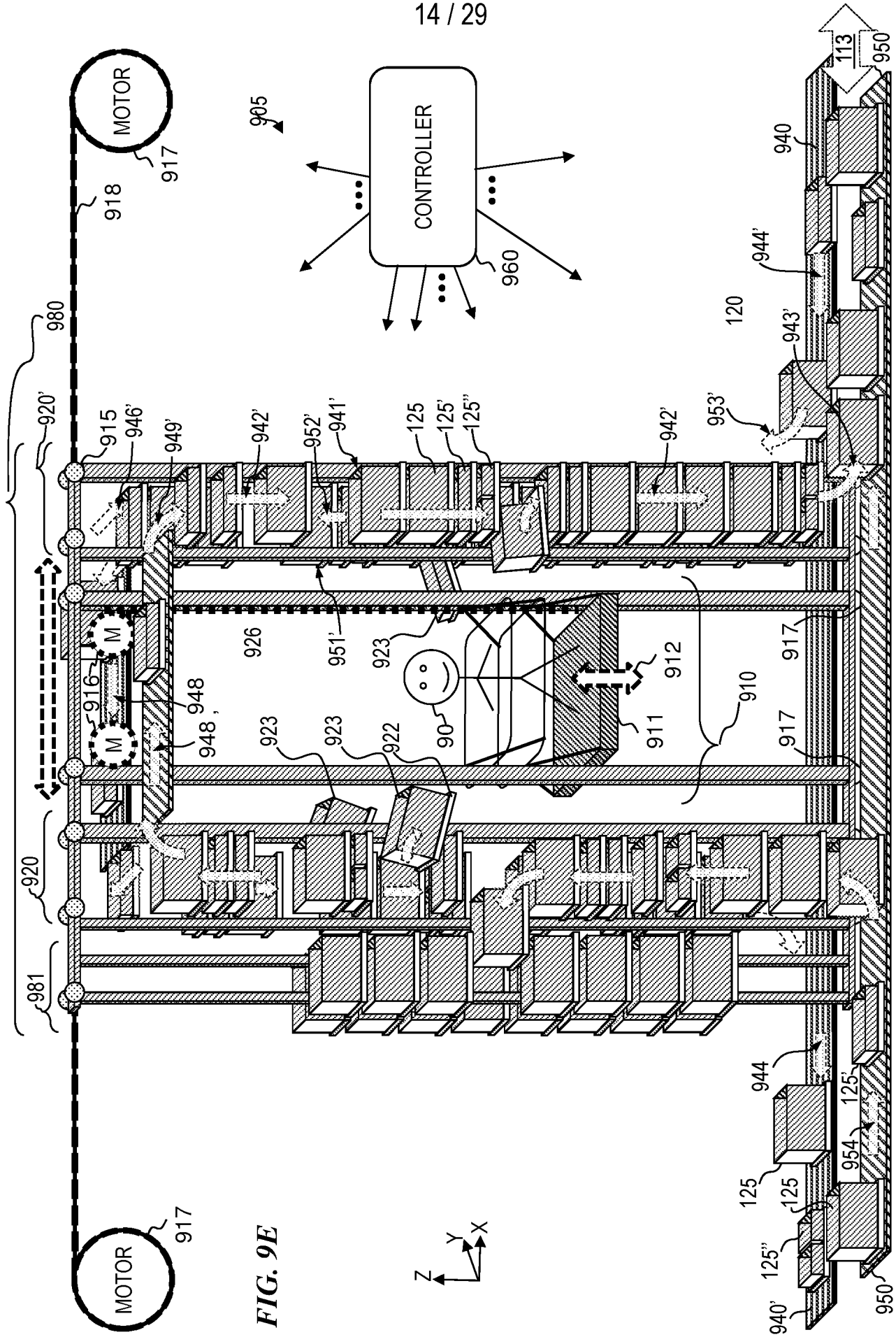

MOTOR
917
918
905
CONTROLLER
960
980
920'
915
946'
949'
942'
952'
941'
125
125'
125''
942'
953'
943'
944'
940
113
950
120
926
951'
923
912
917
916
948
948'
923
923
922
90
911
910
917
917
920
981
944
125'
954
125
125
125''
940'
950
MOTOR
917
Y
X
Z

FIG. 9E

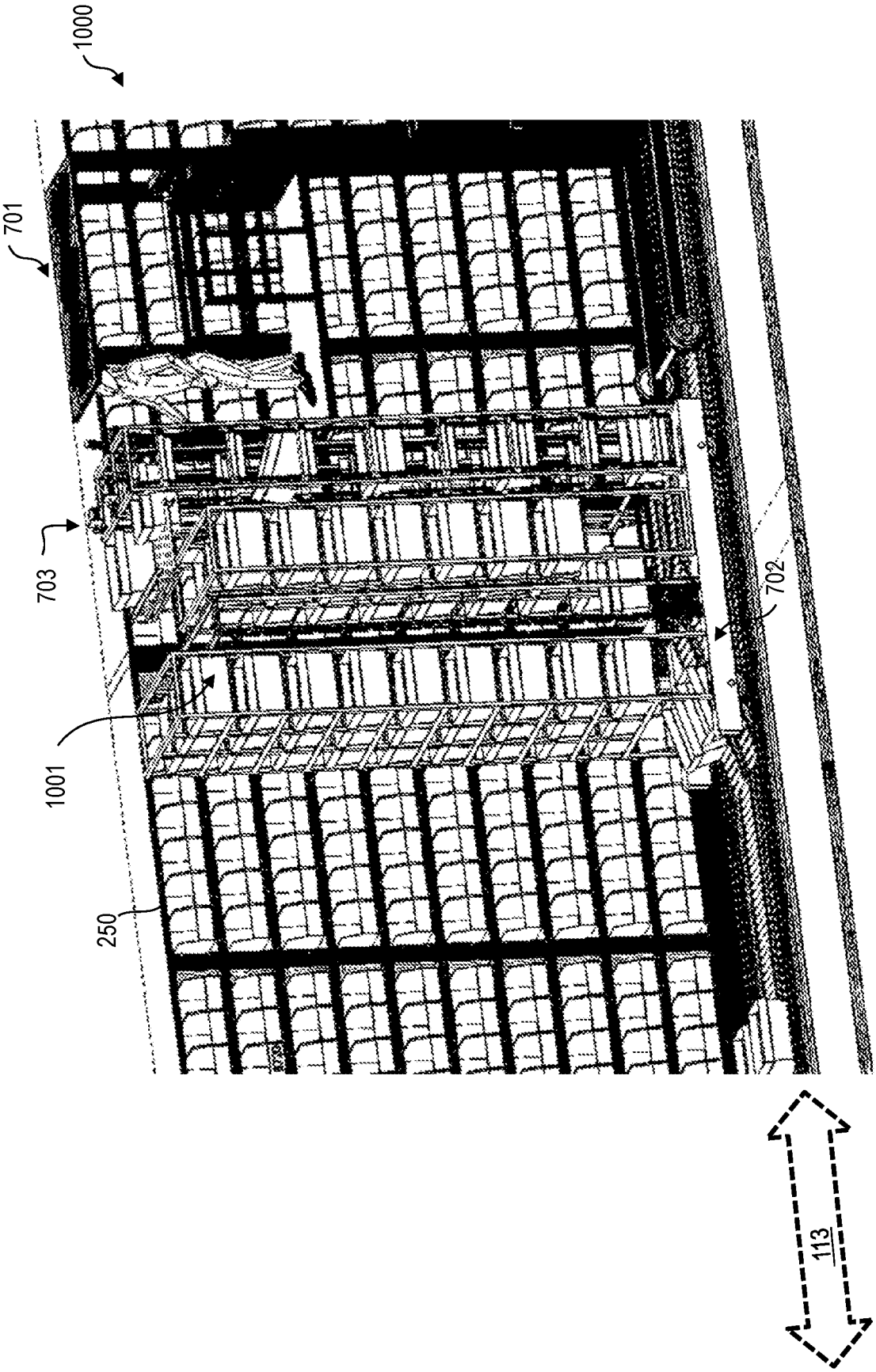


FIG. 10

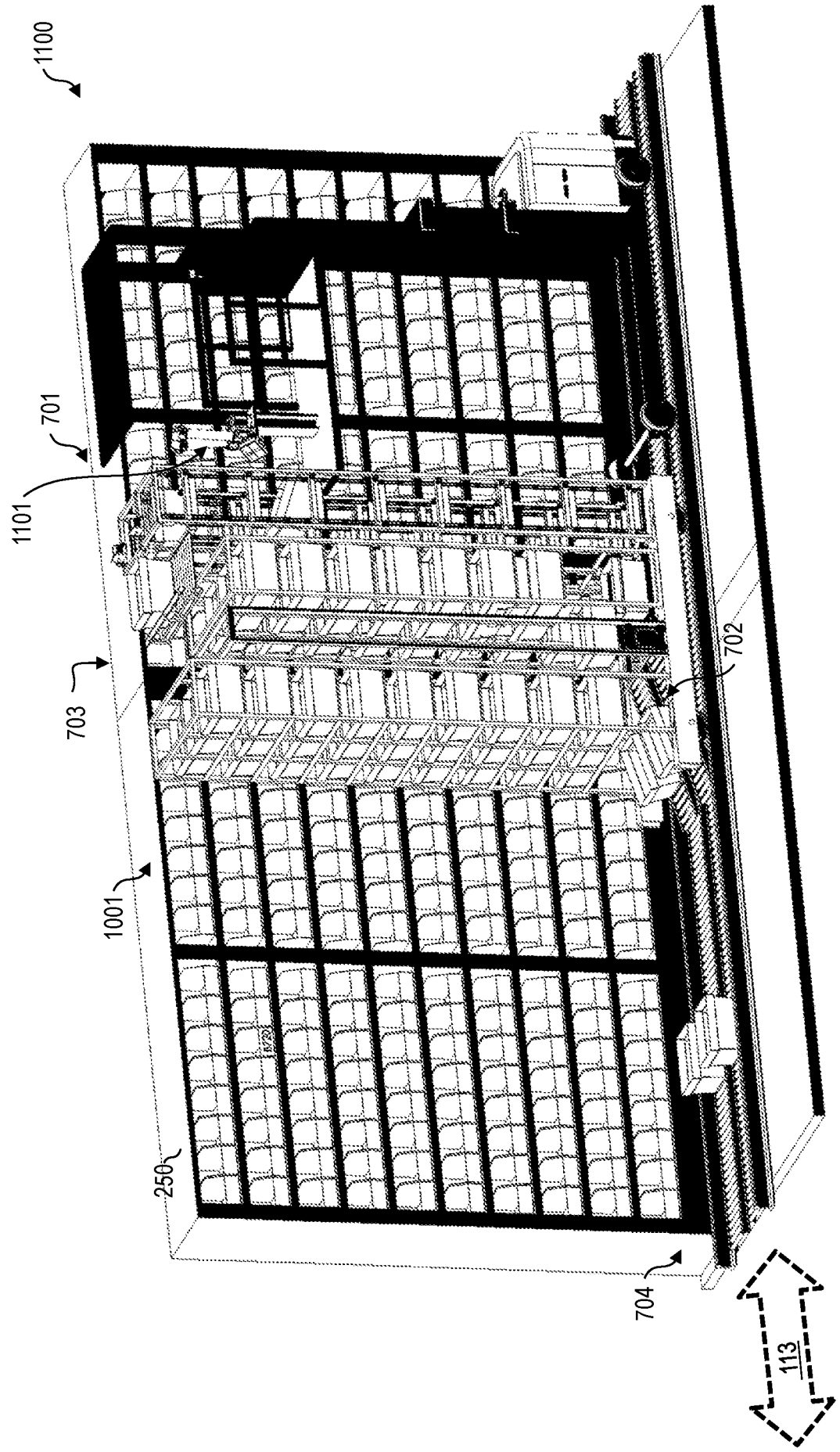


FIG. 11

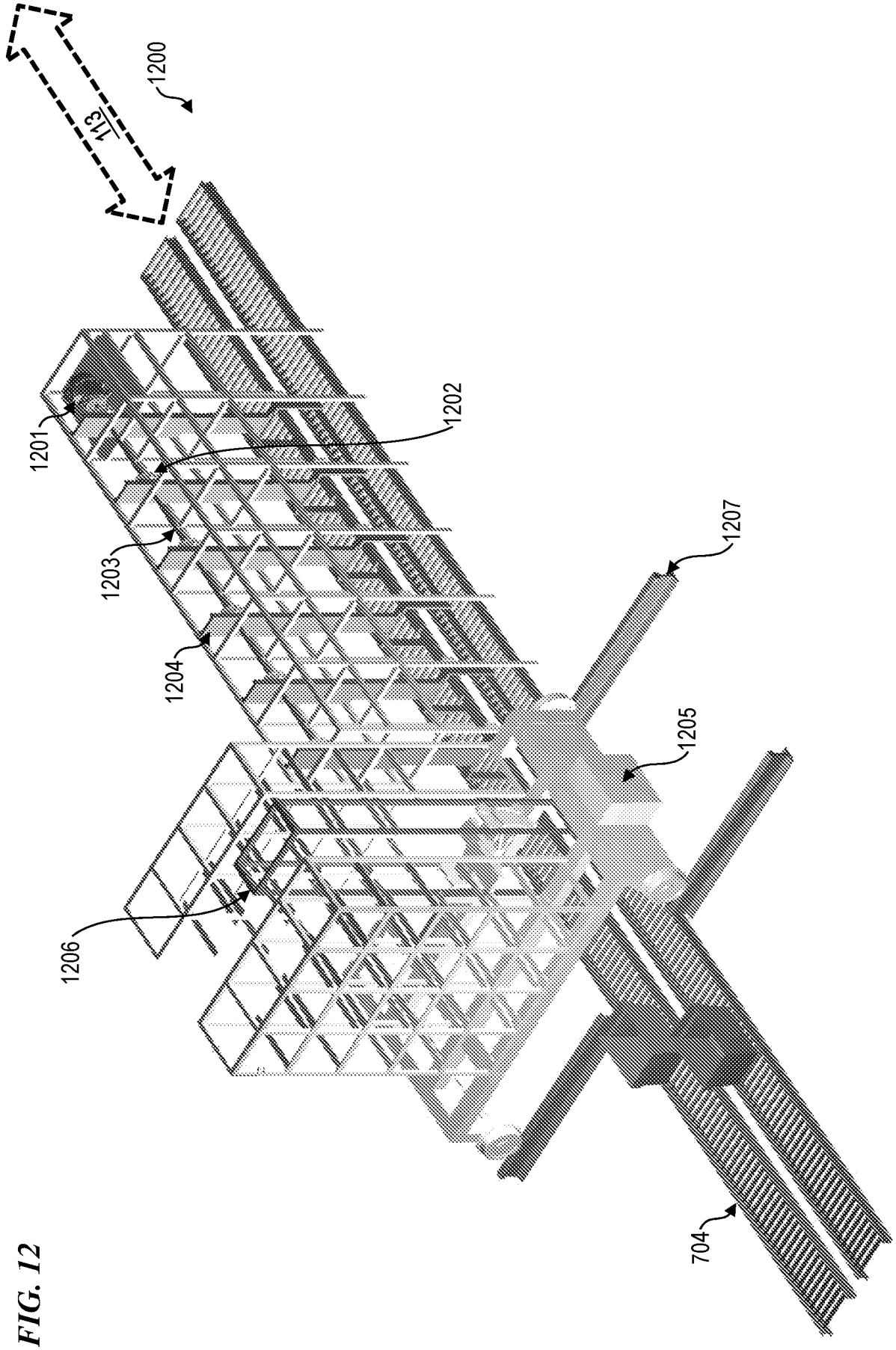


FIG. 12

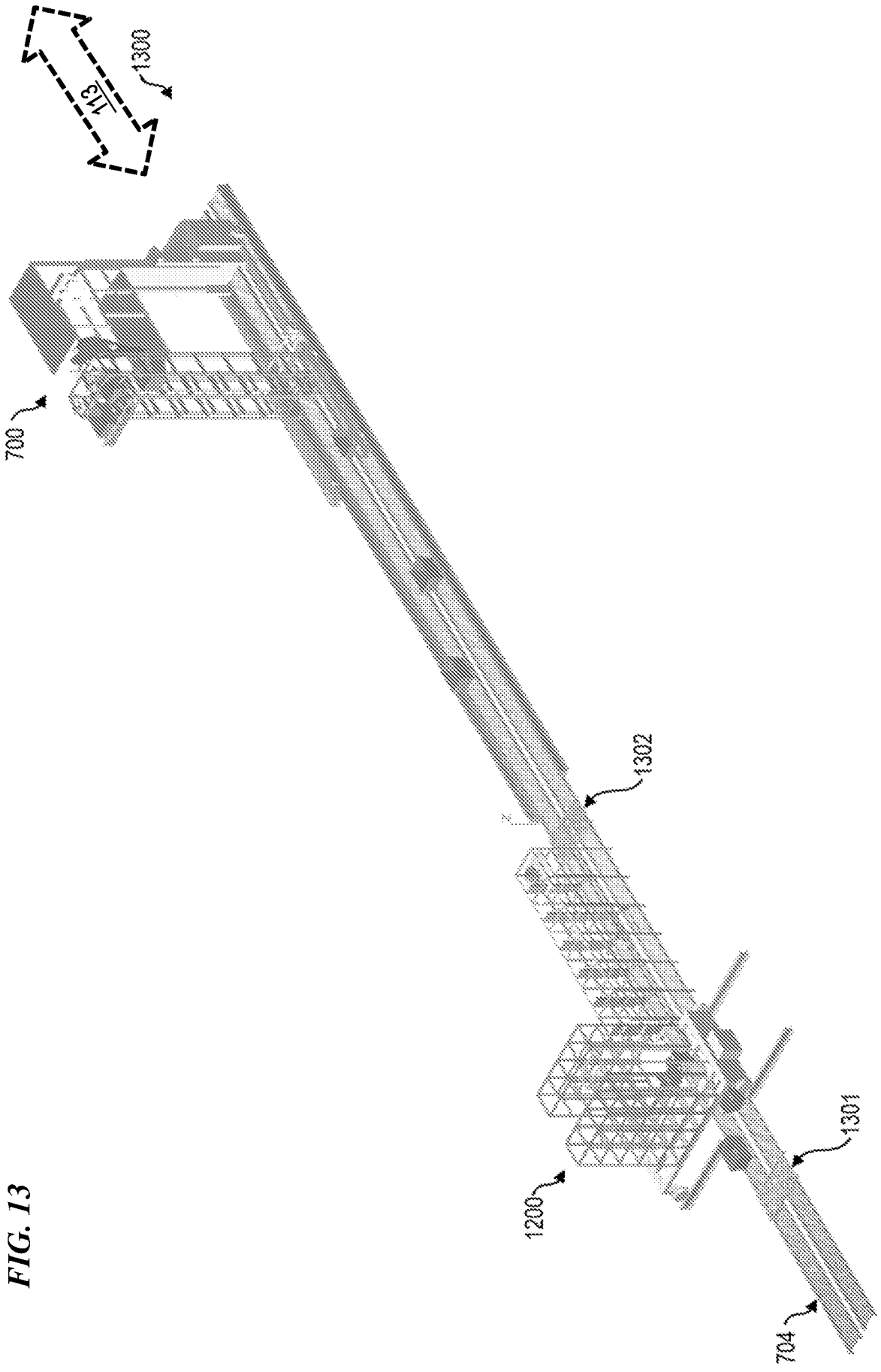


FIG. 13

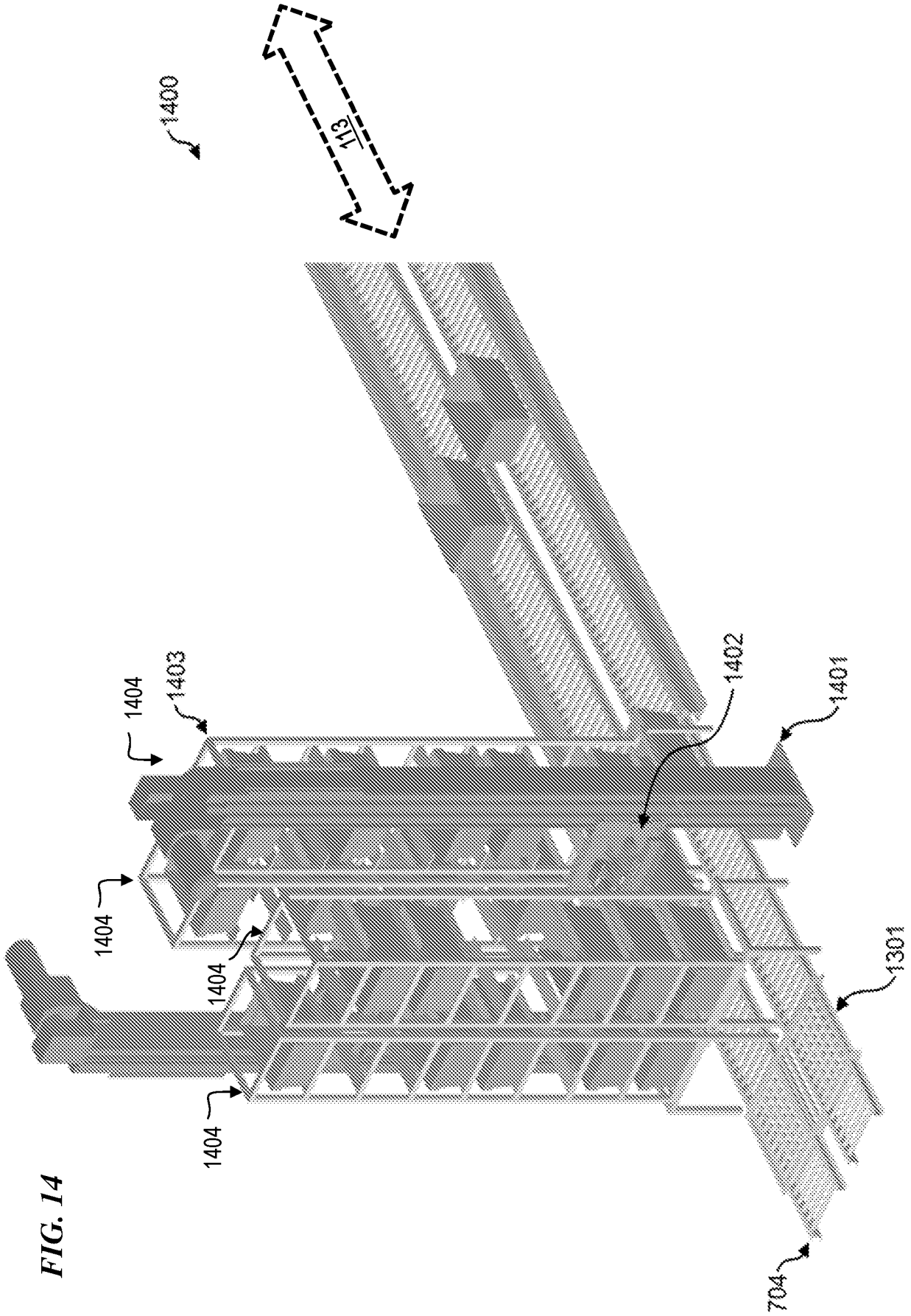


FIG. 14

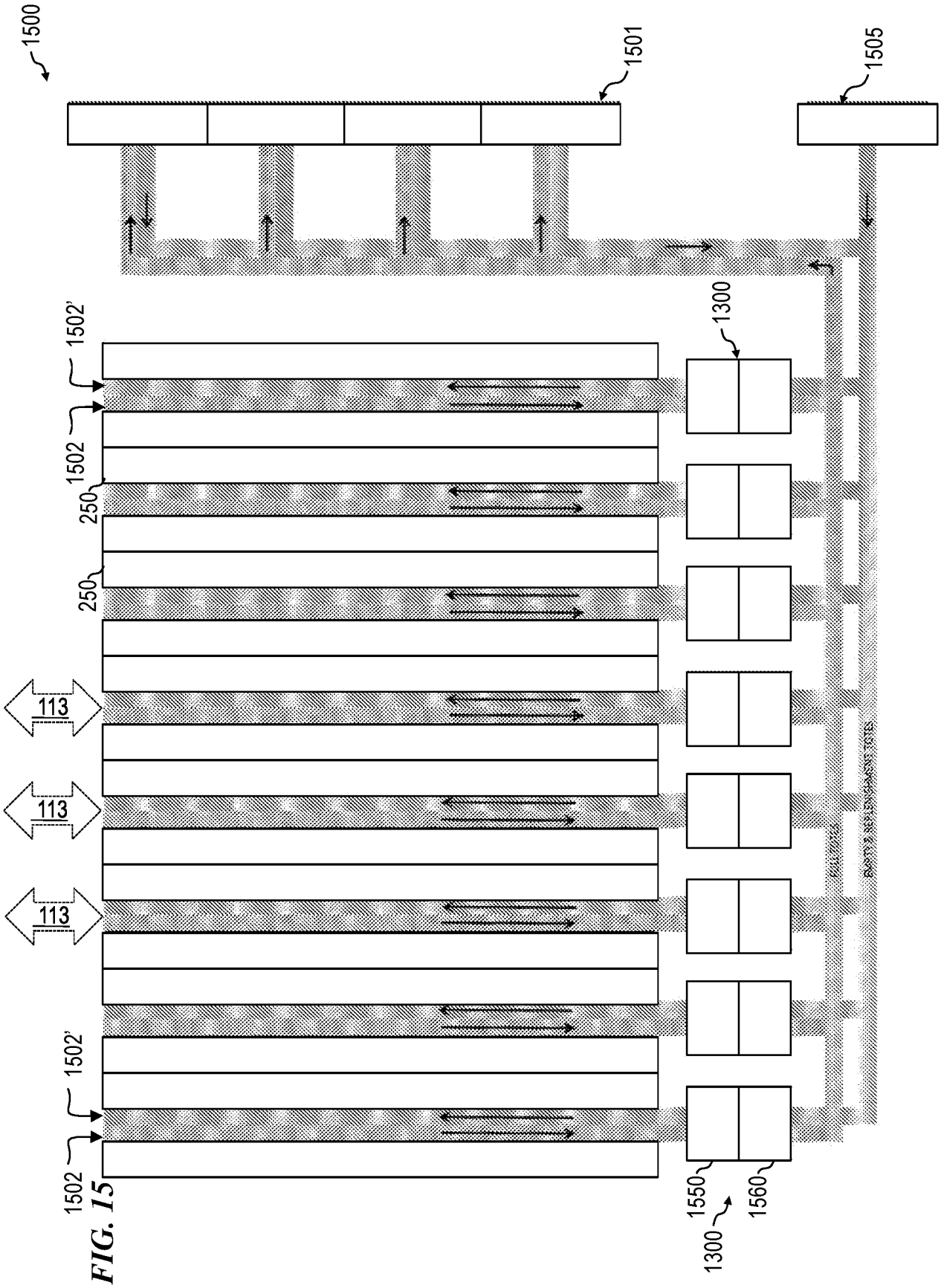

1500
1501
1505
1502'
1502
250
250
1300
113
113
113
1502'
1502
1550
1560
1300

FIG. 15

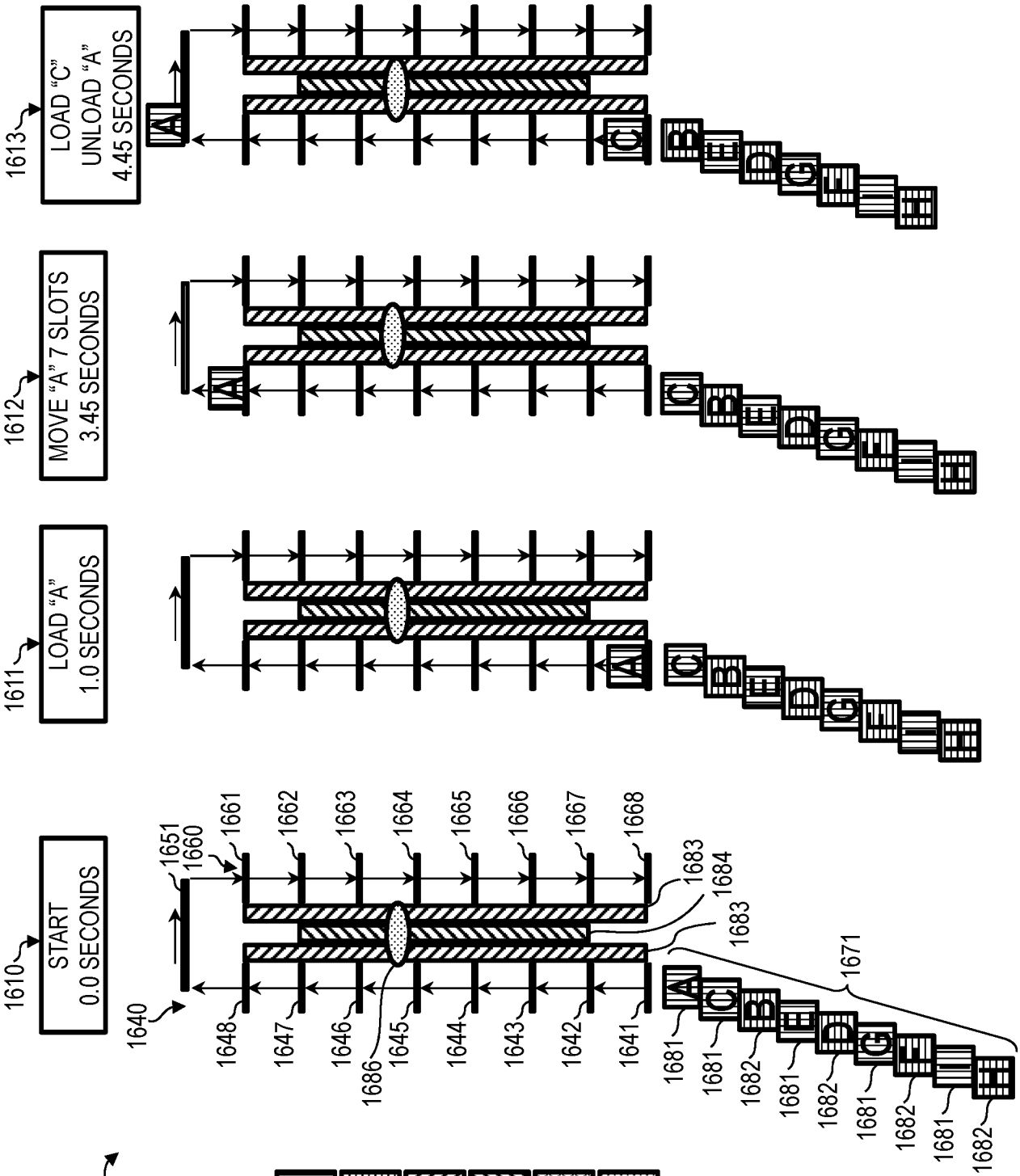

1600A
KEY
1681
1682
1683
1684
1685
1686
1610
START
0.0 SECONDS
1611
LOAD "A"
1.0 SECONDS
1612
MOVE "A" 7 SLOTS
3.45 SECONDS
1613
LOAD "C"
UNLOAD "A"
4.45 SECONDS
1640
1641
1642
1643
1644
1645
1646
1647
1648
1651
1660
1661
1662
1663
1664
1665
1666
1667
1668
1671
1683
1684
1686
A
C
B
E
D
G
F
H

FIG. 16A

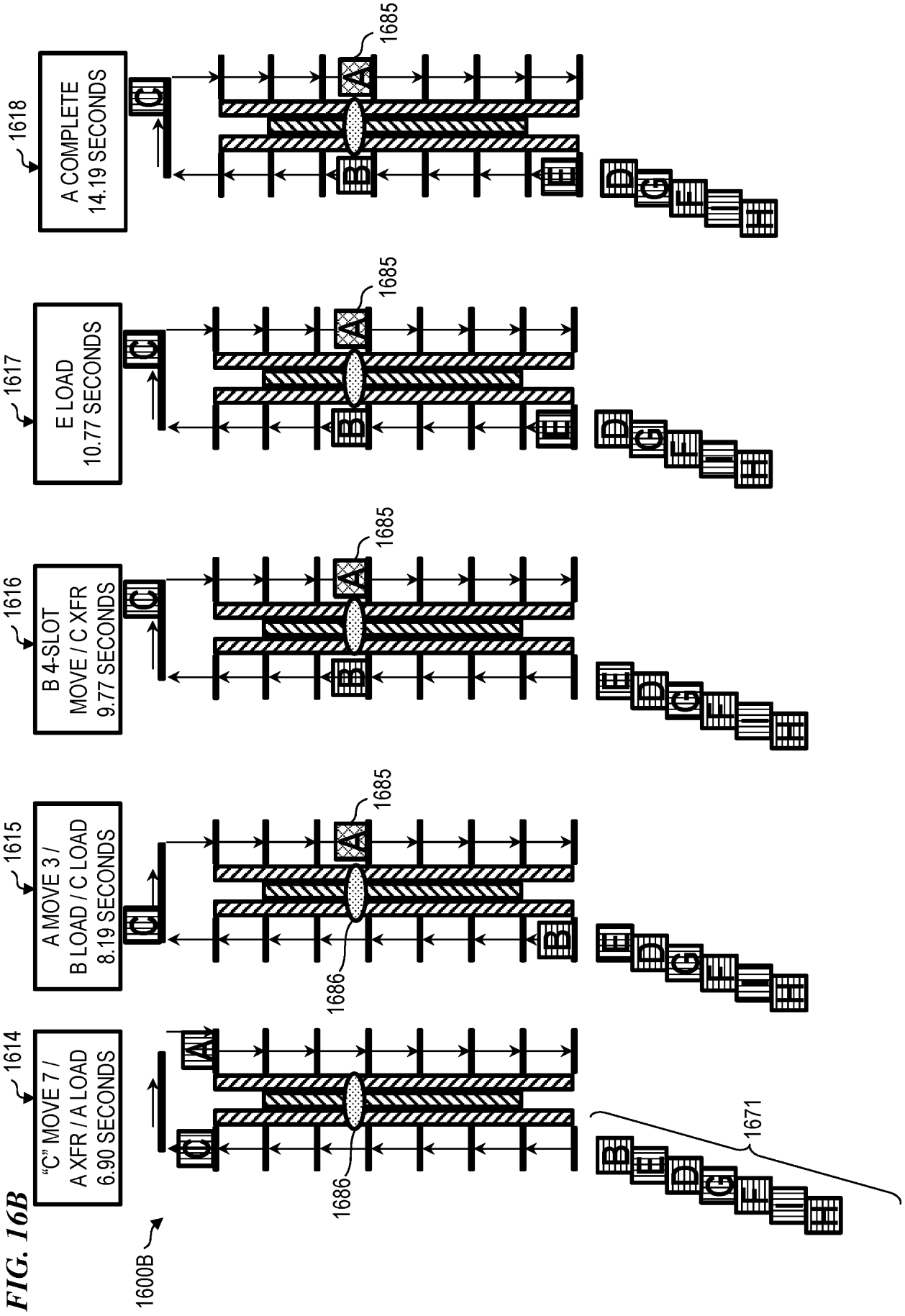

1600B
1614
"C" MOVE 7 /
A XFR / A LOAD
6.90 SECONDS
1615
A MOVE 3 /
B LOAD / C LOAD
8.19 SECONDS
1616
B 4-SLOT
MOVE / C XFR
9.77 SECONDS
1617
E LOAD
10.77 SECONDS
1618
A COMPLETE
14.19 SECONDS
1685
1686
1671
A
B
C
D
E
F
G

FIG. 16B

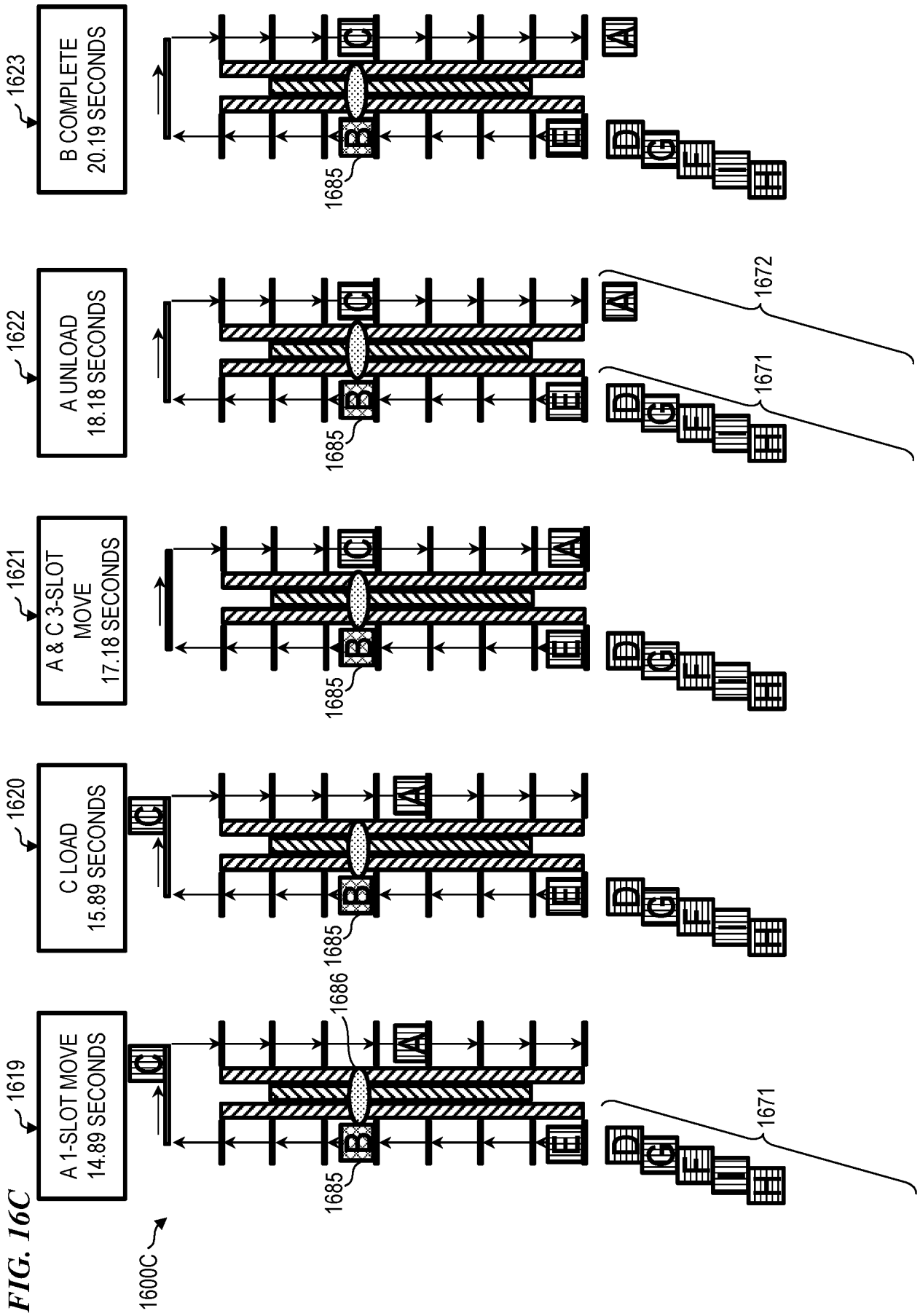

1600C
1619
A 1-SLOT MOVE
14.89 SECONDS
1620
C LOAD
15.89 SECONDS
1621
A & C 3-SLOT
MOVE
17.18 SECONDS
1622
A UNLOAD
18.18 SECONDS
1623
B COMPLETE
20.19 SECONDS
1685
1686
1671
1672
A
B
C
D
E
G

FIG. 16C

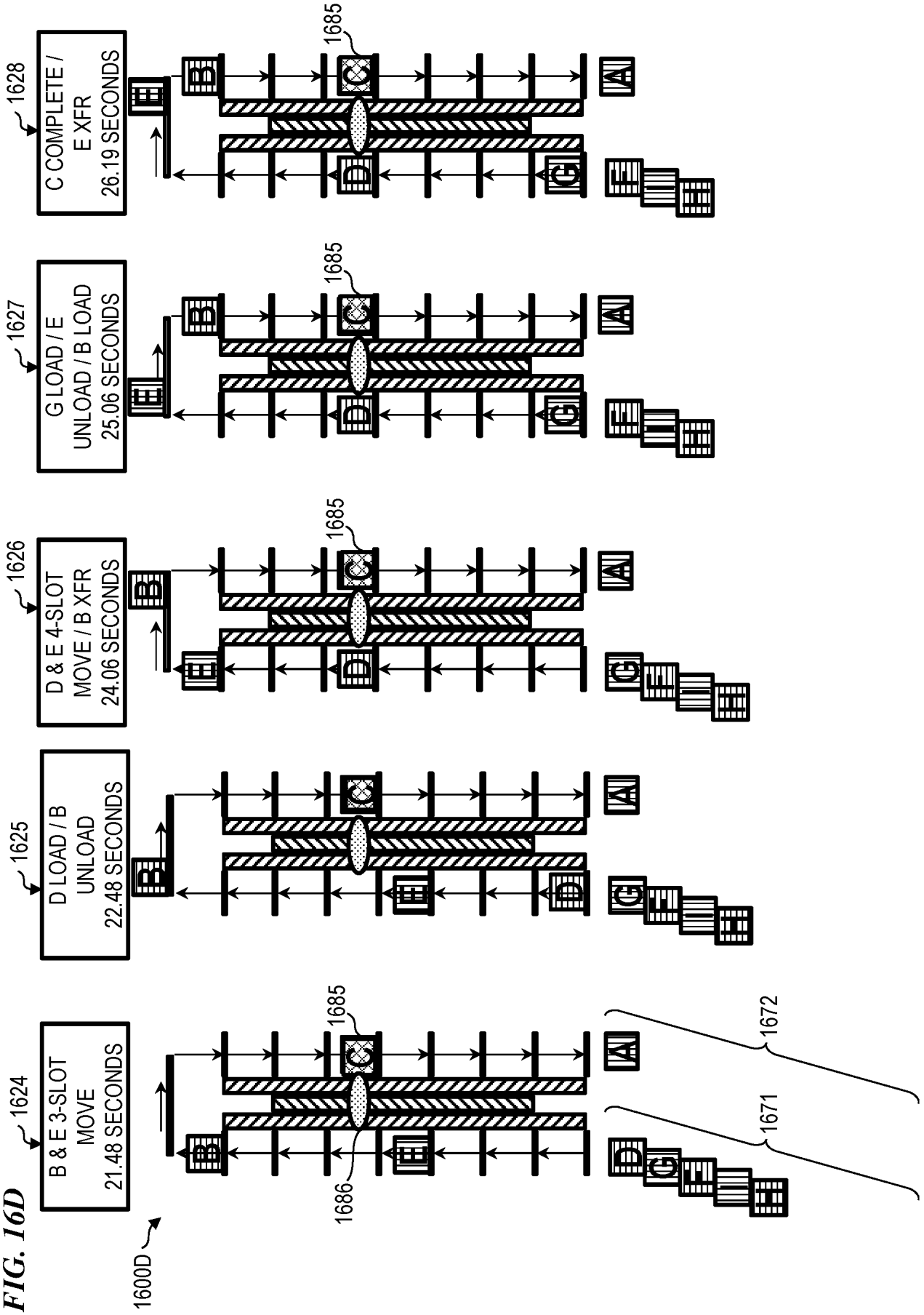

1600D
1624
B & E 3-SLOT MOVE 21.48 SECONDS
1625
D LOAD / B UNLOAD 22.48 SECONDS
1626
D & E 4-SLOT MOVE / B XFR 24.06 SECONDS
1627
G LOAD / E UNLOAD / B LOAD 25.06 SECONDS
1628
C COMPLETE / E XFR 26.19 SECONDS
1685
1686
1671
1672

FIG. 16D

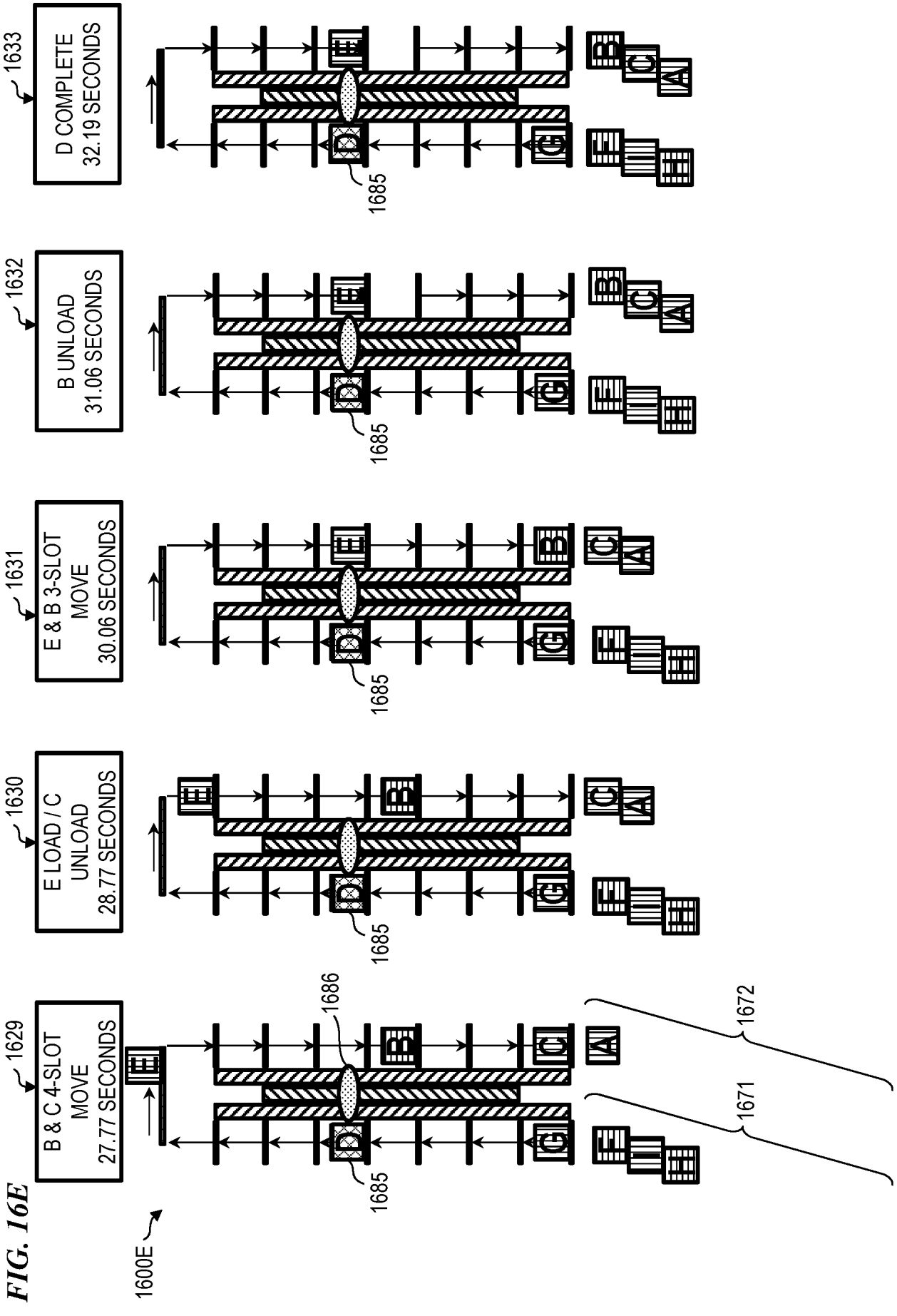

1633
D COMPLETE
32.19 SECONDS
1632
B UNLOAD
31.06 SECONDS
1631
E & B 3-SLOT
MOVE
30.06 SECONDS
1630
E LOAD / C
UNLOAD
28.77 SECONDS
1629
B & C 4-SLOT
MOVE
27.77 SECONDS
1600E
1685
1686
1671
1672

FIG. 16E

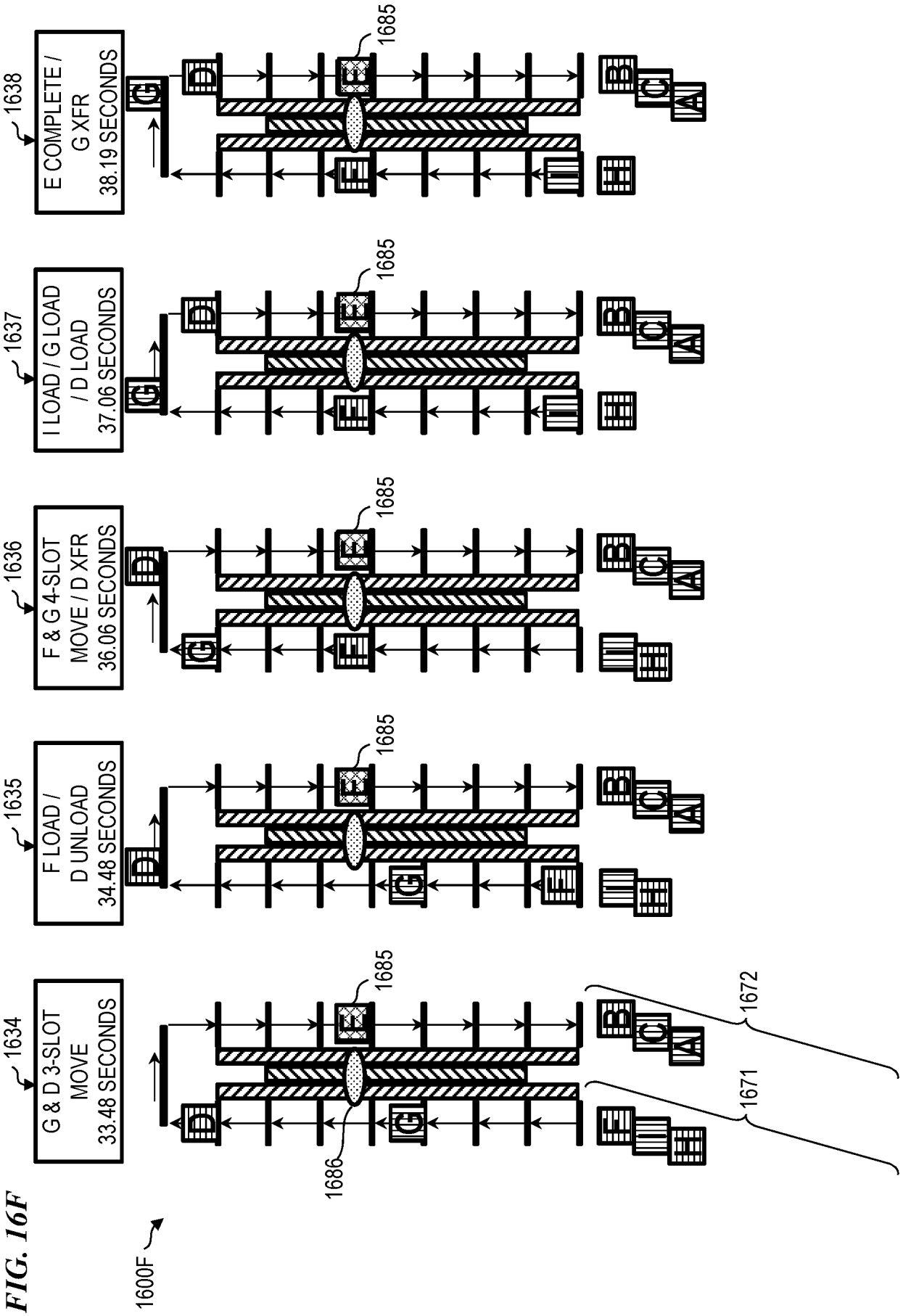

1600F
1634
G & D 3-SLOT MOVE 33.48 SECONDS
1635
F LOAD / D UNLOAD 34.48 SECONDS
1636
F & G 4-SLOT MOVE / D XFR 36.06 SECONDS
1637
I LOAD / G LOAD / D LOAD 37.06 SECONDS
1638
E COMPLETE / G XFR 38.19 SECONDS
1685
1686
1671
1672

FIG. 16F

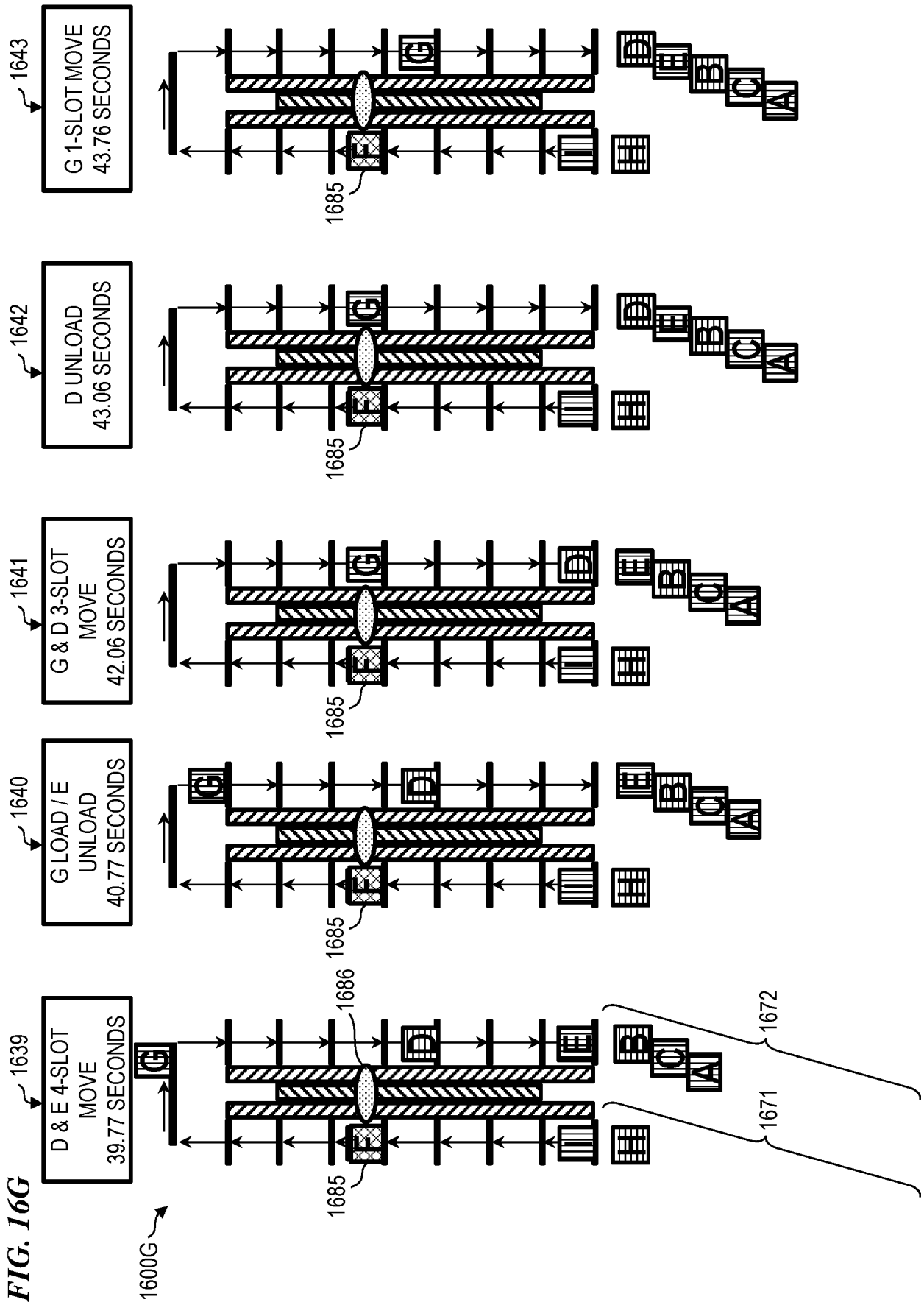

1600G
1639
D & E 4-SLOT MOVE 39.77 SECONDS
1640
G LOAD / E UNLOAD 40.77 SECONDS
1641
G & D 3-SLOT MOVE 42.06 SECONDS
1642
D UNLOAD 43.06 SECONDS
1643
G 1-SLOT MOVE 43.76 SECONDS
1685
1686
1671
1672

FIG. 16G

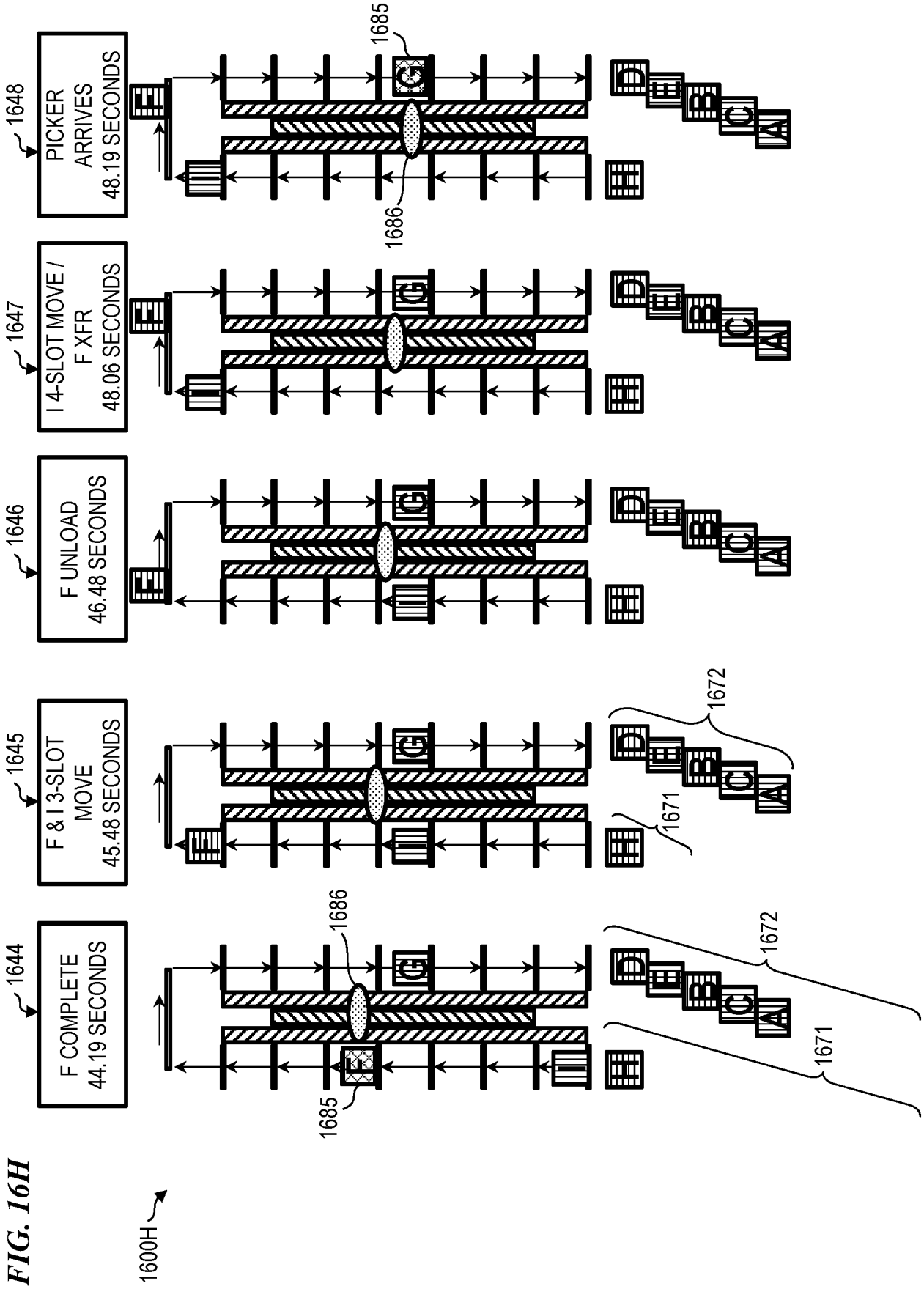

1600H
1644
F COMPLETE
44.19 SECONDS
1645
F & I 3-SLOT
MOVE
45.48 SECONDS
1646
F UNLOAD
46.48 SECONDS
1647
I 4-SLOT MOVE /
F XFR
48.06 SECONDS
1648
PICKER
ARRIVES
48.19 SECONDS
1685
1686
1671
1672
A
B
C
D
E
F
G

FIG. 16H

FIG. 16I

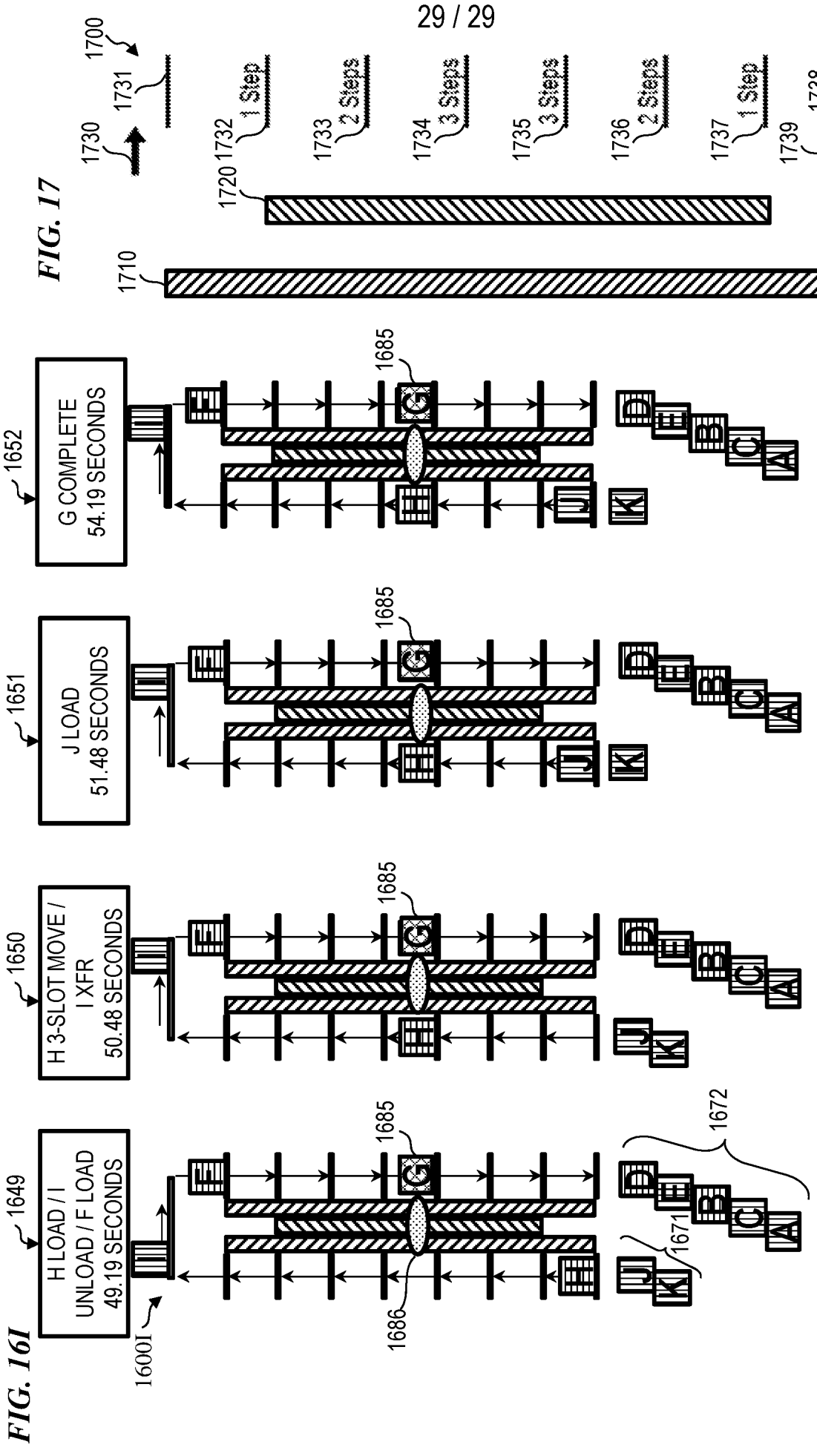


FIG. 17