

3

, ,

,

가

()

1 (facedown plating apparatus)

1

(310)

(312)

(W)

(W)

가

(314)

(314)

(312)

(312)

(316)

(310)

(316)

(314)

(W)

(314)

가

(316)

(mesh - like)

(312)

(312)

(318)

(312)

(312)

(320)

(31

8)

(322)

(328)

(328)

(324)

(326)

가

(322)

(320)

(330)

(W)

(314)

(W)

(312)

(310)

(312)

(316)(

)

(W)(

)

가

(322)

(318)

(312)

(jet)

(W)

()

가

(316)

(W)

가

(W)

(330)

(312)

(310)

(320)

(322)

가

가

가

()
(overhung portions),

가 ; 가

() ,

가

가 (clean gas), 가

가

(tilting mechanism)

(mist)가

가

가

가

가

가

가

22
23
24
25
26
27
28
29
30
31
32
33
34
35
36

30

가 2 16 . 2

. 2 , (1) , / (10), () / / (16), / (18) 4 (22) . (1) , / (10), / / (16) (18) (24) (18) (22) 2 (28) 가 .

가 (face side)(가) 4) . (18) / (10) . 1 (2 (18) , (18) .

(18) , (18) 가 (18) 2 (28)

2 (28) 가 (22) ()

(22) 4 (22)

3 (22) 3 (22) 4

3 5 (32) (W) (22) (30) 2 (W) (W)

(W) (W) (34) 가 (34) (W)

(32) (34) (36) (34) (36) (36a)가 (36a)가 (22)

22) (38)가 (36a) (38)가 가 ()

(22) (32) (34) (pivoted end) (42)

가 (40) 가 (40) (40)

(42) (32) (P) (34) (Q)

(22) (40) (32) (P) (34) (Q)

(42) 가

6 (22) (32) 6 (32)

ir) (46) (48) (44) (44) (we

0) (52) (50) (46) (44) (5)

(50) (54)

(46) (54) (46)

) (56) (56) ()

(54) (58) (56)

(50) 1 (62) (50)

(48) 2 (64) (48)

(48) (46) 3 (66) (46)

1 (62) () (68) (62)

2 (64) 3 (66) ()

()

() .

, () (60) (50) (52) 1 (60) (52)
 (60) (54) 가 (52) (62)

(52) (52) 가

7 (40) (42) 7
 (40) (74) (74)
 (76) 가 (78) (74) (74)
 (80) (78)

(42) (40) 7 (42) (40)
 (82), (82) (84), (W)
 (86) (86) (82) 가 가 (96)

(86) (88) (84)

(84) (82) (90) (82) 가
 (92) (84) (92) (94)

(80) (94) (78)

(84) (86)

(97) 가 (96) (82) (98) (99)
 (96) (82) (99) 가 (98) (98) , 가
 (100) (96) (102) (104)

8 (86) , 9 8 IX - IX 8
 (86) (86a) (6a)

6 (86b) . 6 (86b) 3
 (86b) (106) (9)
 (110) (108) (86b) (106)
 (108) 가 (96) (100)가 (112) (106) (106)
 (106) (110) (106) (108)
 , (112) 9 (86)

10 (112) . 10 (114)
 (112) (114) (86) (114) (tip)
 (116) (112)가 (W) (W) 가
 (114)가 (W) 가 (W) 가
 가 (118) (114) (118) (110) (114)가 (W)
 가 (W)

3 (86b) (120) 가 9
 (120) (86b) (122), (122)
 (124) (126) 가 (claw)(128) (130) (124)
 , (132) (130) (122) .

9 (128) 가 (134) (124) , (1
 24)가 , (128) (126) (124)가
 , (128) (126) (124)
 (130) (102) 가 가 (96) (104)가
 (124) (132) (128) (126)
 . (104) , (128) (126)
 (132) (124)가 . ((

W) (120) , (W) 3 (120)((
 128)) (W) (86) .

11 7 (42) (86)가
 . 11 (140) (42) (84)
 , (142) (86) (14)

0, 142) (88) (142) (86) (88) (144)
 (86) (140) (142) (144)
 , (146) (144) (14)

2) (146) (140) (140) 가 (1)
 46) 가 (140) (86) . L
 (146) (86) .

8 11 (150) (82) (82) (152)
 (150) (150) (150)가 ,
 (152)가 (148) (148)가 (148)
 (86) (144) (88)
 (150) , (148) (86) (144)
 가 , (146) 가 (140)

, (22) (34) . 12 3 (34)

3 12 (34) (W), (W) (1
 12) , 6 (160) (160) ()
 , 가 (160) (W) , (34) (W)
 () , (162) . (162) (164)
 . (162) (162) (W) 가 .

, (74) 가 가 (74)
 (78) (74) 가 (74)
 (78) 13 16 13
 , 14 , 15 13 XV - XV , 16
 13 XVI - XVI 4 5 (170) (36)
 , (170) (32)
 가 (170) , (170)

13 16 (170) (22)
 (172) (172) 가 (174)
 (172) / (176) (174)
 (178) (180)

16 (182) (184) (172)
 가 (174) (186) (182)
 (188) (182) (190) / (176)
 / (192) 가 (174) (172)
 (194) / (176) 가 (energize),
 (172) (194) (196)가 (186)
 (174) (182)

(74) (198) (174) , (200) (74)
 (202) (180) 가 , (180)(14)
 (204) (74)

(40)

15 (206) , (206) (74) (78)
 가 (208) (178) 가 , (178) (210)
 (78) (178) 가 , (80) (92)
 (42) (84)

()

가 (가)
 / (10) 1 (24)
 (18) (18) (18)
 가 , , (18) 가 (18)
 , 2 (28) (36) 2 (28) (22)
 (38)가 , 2 (28) (36a) (22)

(22) , (170) (180) 가 (74)
 (42) (Q) , (1)
 00)가 (106) 가 (96)가 (106) (11)
 0) (86) , (112)
 (86)
 , (102)가 (120) (130) 가 (96) (104)가
 , (128) (124)가 (132)
 (22) 2 (28) (W) () (86)
 (116) , (102) (120) (128)
 , 2 (28) (104) 가 (22) , (W) (128)
 (38)가
 (W) , (112) 가 (96)가
 (122)가 , (W) 가 (118) (160) (W)
 (114) , (34) (W) ()
 (W) ()
 , (170) (180) 가 (74) (P)
 (W) (42) (152) (86) (148)
 (148)가 (42) (150)가 1° 3°
 / (176) 가 (86) (86) 가 , (170)
 (74) (W) (44)
 (W) , (W) (W)
 (overflow surface) , (W)
 (42) (84) , (86) (W)
 (42) (40) 가 , (W) ,
 (W) 가 (86)
 (W) , (86) (150)
 , (170) (178) 가 (74) (78)
 (42) (84) rpm 가 (W) (W)
 (52) (W) 가
 1° 3° , (W) (152) (148) (86)
 (150)가 , (W)
 / (176) 가 (74) (42) (86) 가 ,

(86)

(150)

(170) (180) 가 (74) (176) 가
 (W) (42) (Q) / (176) 가
 (74) (178) 가 100rpm
 (86) (160) (W)
 (W) (112) (W) (86)
 (112) (42) (112) (W)
 (114)

(86) , 300rpm 가
 (W) (162) (W) 가 가
 가 2000rpm 가 (162) (W)
 (W) (W) (100) (106)
 (108) (106) (110)
 가 (96)가 (W) (112)

(22) (38)가 2 (28) 가 (36) (36a)
 (22) (28) 가 (W) (132)
 가 (96) (104) (102) (120) (130) (W)
 (124) (128) (w) (28) (28)
 가 2 (28) (38)가

(W) 2 (28) (W) / / (16)
 / / (16) (W) (W) / / (16)
 가 (W)
 , 1 (10) / (10) (W)

가

(W) 가 (34) (22) (W)
 (pre - dipped) (pre - plating) ()

17 (40) (74) (250), 17 / / (251) 2
 (252) 가 , (22)

가

가

가

가

가

가

가

가

18 / (520), 18 (530)
 (540) (540) / (520) (530)
 (521) / (520) (540) (523)
 (540) (530)

(521) () 가 / (520) (5
 40) () 가 (523) (523)
 (540) (530)
 (524) (540) (530) 가

18 / (520),
 (530) (540)
 / (520) > (540) > (530)
 / (520) (530) (540)
 / 가 (540) / (520) 가 (540)
 / (520) 가

/ (520) (520a) (5
 20b) 2 (540) (541)
 (542) (541)
 (540) () (543)
 (530) (531)
 (532) (530) () (543)
 19 (546)
 가 , 가 (541) (542) (544)
 (540a) (540)
 (540b) (545) 가 (544) (540)
 (540a) (552) (541) (542)
 (540)
 (531) (532) (530) (530) (wet zone)
 가 (531) (532) (539)
 (533) (530a) (530)
 가 (530) 가 가
 (530) 가 (530)
 (540) (530) (553) (530) 가
 (530) (534, 535) (534)
 (540) (530a) (533) (535)
 (540) (540) (534)
 (530) 가 (535)
 (534) (scrubber) (536) (537) 가 가
 (540) (536) (537, 538) (530a)
 (534) 가 가 ()
 533) (530)
 (530) (530b) (53) (530)
 가 (553) (530) 가 ()
 530) (533) 가 (539)
 (530)

20), (540) (530) (520) (530) (540) (522, 524)(18)가 , 20 (540) (530) (540) (530) (552, 553) (554)(21) .

21 18 (555) (556) (557) (557) (558) (559) (559) king zone) (558) (utility zone) (559) (559) . , (557) 가 가 (558) (wor

530) / (520) (540) / (520) (530) (521) (540) (523) (540) (558) (555) (555) (557) (558) 가 가 (557) , ,

18 19 0) 가 . , (540) (530) (520), (540) (530) (520) / (530) (540) (53) /

22 01), (606, 607) 22 (602), (605), (603, 604), (6) (602, 603, 604), (609) (609) (609) (609) (601), (602, 603, 604), (605), (606, 607, 608) (609) (606, 607, 608) (609) (609) (605),

1) (601 - 1) (602) (602) (W) (60) () 가 (W) .

(602) (W) (W) (W)
 (603, 604) (603, 604) (605) (605) (W)
 (W) TiN

(607, 608) (W) (609) (W) (606, 607) 가 (W) (608)
 (609 - 1)

23 23 (602), (611), (612),
 610), (613, 614) (615) 가 22 (605, 615), (606, 607, 608, 61
 0, 611, 612, 613) (602, 602, 603, 604, 614), (609)

23 (W) (601) (60
 1 - 1) (602, 602) 가 (W) (602, 602)
 (W) (W) (602, 602)가
 (W) (602) 2 1 2 가
 (602) 2

(605) (W) (W) (603, 604)

가 (W) (W) (610)
 (W) (611) (612) (W) (612) (W)
 (Ni)
 (B)

(613, 614)
 (615)

(W) (606, 607) (608)
 (609) (609 - 1)

24
 (616 - 1) (616) , , (616) (616 - 1)
 (602), (603, 604), (605), (611),
 (612), (608) / (617) (601)
 (609) / (617) (616), (60
 2, 603, 604), (605), (608, 611, 612), / (617), (601)
 (609)

24

(616 - 1) (601) / (617)
 (602) (602) ,
 가
 (616 - 1) (605) (605) ,
 (W)

(616 - 1) (604)
 (616 - 1) (611)
 (616 - 1) (612) (612) ,
 (W) (616 - 1) (604)
 (616 - 1) (608) (616 - 1)
 (609) / (617)

25 /
 (701), (702), 1 (703), 3 (704), (705), (706), 2 (707),
 2 (708), 1 (709), 1 (710) 2 (711)가 가 .
 (712) (W)
 (713) 1 (703)

1 () (710) (710 - 1), (710 - 2), (710 - 3), (71
 0 - 4) (710 - 5) 가 . 2 () (711)
 (711 - 3), (711 - 4) (711 - 5) 가 . (711 - 1), (711 - 2),

1) / (701) , 1 (703) (W) (701 - 1) (701 -
 (702) 가 , (W)
 712) (W) 가 (W)

(712) (W) 1 (703) (702) , ((703)
) 가 (702) , 1
 (W) (705) (705) (W) ((710) 2 (711)

(710) 1 (711) 2
 (708) (705) (W) (710) (710-5)
 (W) (710-2) (710-5) (W) 1
 (W) (710-1)
 1 (710-1) IC1000 (W)
 가

(708) (W) (710-2) (710-5) 2
 (W) 1 가 (W) 가 가

1 (709) , 2 (708) (W) 2 (711) (711-2)
 5) (W) (711-2) (711-5) (W) (W) (711-1)
 2 가 , 2

(711-1) IC1000 가
 (W)

2 SiO₂ 가 (711-1) 가 (W) (711-4) 2
 (W) . 2 가

2 (W) (711-2) (711-5) 2 (708) (711-5)
 (W) 가 (711-5) 가

2 (708) (W) 2 (707) (W) 2 (70
 7) 1 (709) (W) 가 , pH

가 가 (W) PVA PVA . DHF 가 , 가 (scrubbing cleaning)

3 (W) , 2 (708) (W) 1 (703) (706) 3 (704) (706) (megasonic wate

r)가 (704) , 가 (W) 가 (W) 가 (W) 가 , (W) 가 ,

pH 가 가 (W) , , .

(W) , (711 - 1) / (771) (711 - 4) 가 ,

26 (702) (750) 25 25

(701 - 1) (W) (701 - 1) / (701) (710)

2 (711) , 1 (709) (W) 1 (710) (W)

1 (709) , (750) (W) (W)

2 (708) (750) (W) 2 (701 - 1)

(707) / (701)

27 (709) (751) 26 26 3

(710 711) 1 (709) (W)

(750) 1 (707) 2 (732)

1 (709) , (W) (751) ,

(electromigration resistance) 가

가 (W) (751) 2 (70

7) (W) / (701) (701 - 1)

28 28 , 25 (710)

2 (711) (721, 722) 3 (704)

(702) (23) 1 (709) 3 (704)

(724) 2 (707) (702) , (

713) / (701) 1 (703)

1 (W) (703) (713)가 (701) (701-1)가
 1 (703) (W) (721) (703) (721)
 2 (723) (721) (W) (712) (702)
 , 2 (723) (W) (725)

[]

(710-2) (725) (W) 가 (W)
 (710-1) (W) (710-1)
 (710-2) (725) 2 (723) (W)
 1 (709) (W) (725)

(711-2) (725) (711-1)
 (711-1) 가 (W) (711-2) (72)
 5) 3 (724) (W) 2 (707) (726) (W) 3
 (704) (W) 3 (724)
 (722)

[]

(710-2 711-2) (W) (725) 가
 (710-1 711-1) (710-1 711-1) (W) (722)
 , 3 (724)
 1 (703) (722) (W) (713)
 가 (W) / (701) (701-1)
 29 (W)

(725) 1 (710) 2 (711)
 (721, 722) 2 (707) (727) (723)
 (727) (702) (724) 1 (709) 2
 (707) (713) / (701) 1 (702)

1 (703) / (701) (701 - 1)
 (W) (721) , 2 (723)
 (727) (W) . 2 (723)
 (712) , (702) 가

711 - 2) , 가 , (725) (710 - 2)
 (W) (725) (710 - 1) 711 - 1)
 (710 - 4) 711 - 4) (W) , (710 - 2) 711 - 2)
 (725) (710 - 2) 711 - 2) (W)

, 3 (724) (725) (W) 1 (709) . 3
 (724) 1 (709) (W) 2 (707) (72) 가
 2) (713) , 1 (703) (W) 가
 (701 - 1) , 1 (703) / (701)

29 , (W)

1 (703) / (701) (701 - 1) / (701)
 (721) , 2 (723) (701 - 1) (W)
 (727) (W) (712) . 2 (723)
 , (W) (702)

30
 (811), (812), (813), (814), 1 (815),
 (816), (817), 2 (818), 1 (aligner) (841), 2
 (842), 1 (843), 2 (844), (845), 3 (846),
 / (820), 1 (821), 2 (822), 1 (831), 2 (832), 3 (833)
 4 (834) . (841, 842, 846) (, ,)
 가 가 .
 , 가 가 (811) , 가 (812)
 , 가 (813) .

31

, 1 (831) (820) (820a)
 1 (841)
 가 (notch alignment)

, 1 (831) (811) (811)
 (, SiO₂) 가 (811)
 1 (831) 1 (841)

2 (832) (812)
 (determination) (813)
 (842) (842) Cu 2 (832) 2
 (842)

3 (833) (813)
 3 (833) (816)
 () (816) 가
 (816)
 (842) 2
 가

(816) 3 (833) (84
 3) (843)
 4 (834) (814) 가 /
 2 (842) 가
 , 4 (834) 1 (821)

(fixed abrasive) (dishing) 가
 . 1 4 (834) 1 (8
 15) 가

1 , 4 (834) 2 (82
 2) 가 , 4 가 (834) 1 (815)
 , 2 , 4 (834) 2 (844)
 , 3 ()
 845) .

2 (832) (845) (817) , 2 (832)
 (817) 3 (146) , 가 .
 , 1 (831) 2 (818) ,
 . / (820) (820a) .

(841) (842)

(182) , (817)

(816) () ,
 . 32 (816) , (816)
 , (920) ,
 가 (W) (921) (W)
 2) (926) (W) 가 (924) (926) (924); (922); (92)
 가 (926) (926) (926) (W) (928) (W)
 가 (W)

(926) (L) , L
 (W) , (C) 2mm 5mm ,
 (C) 가 가 가

(921) (W) (922)
 (924) (W) 가 (non - oxidizing acid) ,
 , (926) (W)
 가

(W) (C)
(924)

(steep etching profile)

가

(924)

(926)

(928)

(W)

가

가

가

(water - saturated surface) ()

(W)

가

가

(C)

가

, 80

가

(2mm

5mm)

CMP

CMP

CMP

()

(microvoids)

가

가

가

가

SEM(

(ultrafine pores)

(depression)가

(814)

(2%)가 가

가

300

400

, 1

5

가

35

36

(814)

(814)

(W)

(1000)

1004)

(1002),

(W) ,

, 400

가

(1002)

가 (

(cool plate)(1006)

(W)

(1002)

(1008)

(1002)

(1006)

(W)

(W) 가

(1004)

가

가

(1010)

가

(1010)

(W) 가

(1004)

가

가

(1012)

(1010, 1012) 가 (1004)

가 (1010) , (1014a) N₂가 (1016) N₂가 (1014b)
H₂가 (1018) H₂가 , (1022) 가 (1010)
가 (1020) , 가 (1022)

(1008) (1000) (1002) (W) 가 (W) (1008)
(1008) (1008) (W) 가 (1004) 가,
, 0.1mm 1.0mm가 . (W) , 400
가 (1004) 가 가 가 (1010) , 가 가
(W) 가 (1004) 가 (1012) 가 가 , (W)
(W) 60 . 가
100 600 . 가

mm가 , (1008) (W) (1006) 가, , 0 0.5
(W) (1008) , (1006) ,
10 60 100 .

% H₂가 가 N₂가 가 가 가 , N₂가 가

33 (W) (911), 33 (911)
(W) () (931) 가
(W) (941) (911)
) (W) (951), (965)
(911) (961), (W) (M) .

(911) (W) (913) 가 . (913)
(W) (913) (W)
(W) 가 (915)가 (913)
(915) , , (911) (M)
() 가 .

가 (931) , (W) (933)

(941)
(W)
가 .

(951) (953)

(965) 가 , (965) (W) (W)

(931)

(911) (911) (931) (913)

, 8 (W)

(911) , (931) (933) (931) (W)

(W) (931) (933) (W)

(W) 가 , , 70 () (W) 가

(915) , 50 가 가 (941) (W) (931) (W)

1mm (30ml)가 10mm

가 , 1mm 가 (W) , 70

50 가 (W) , 60 가 ,

(W) (M) (W)

(W) 100rpm 1 10 (W)

, 1

(931) (965) (W) (W) , 100rpm (W)

(W) (W) (931)

(W) 가 (911) (931)

() (951) (953) (W) (953)

(931) (931) (961)

(M) (W) (911) (W)

34 (917)가 (911) 34 (917) (911) (941-2)가 (915)

33 , 가 (917)가
, (941 - 2) (943 - 2) (917)
(917)

, (943 - 2) (W)
, (917) 가 (W) 가
(917) (W) 가 (W)

(917) (W) 가 (917)
(917) , , (915) (W) 가 (917)
(915) , (917) 32
(W)

가

(57)

1.

;

가

2.

1

3.

1 ,

4.

3 ,

가 가 (air blower)

5.

1 ,

(tilting mechanism)

6.

7.

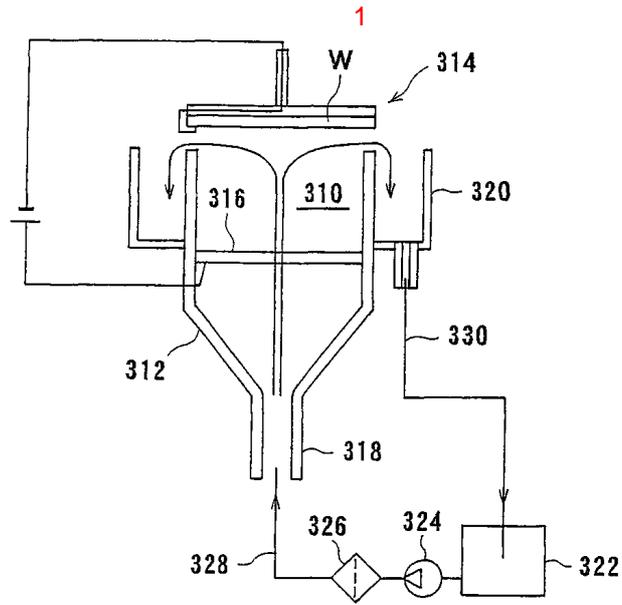
6 ,

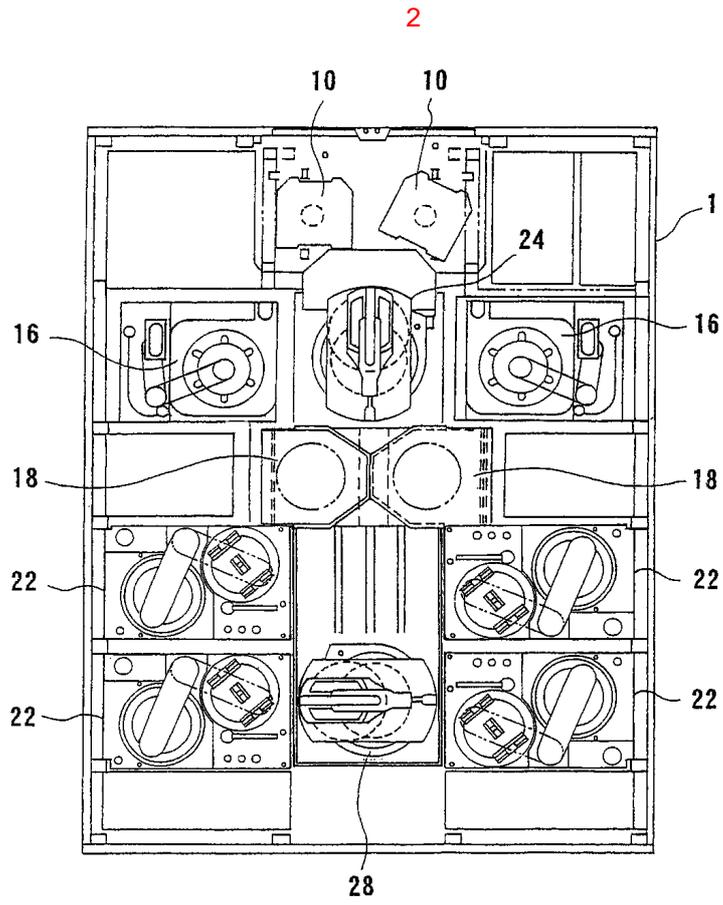
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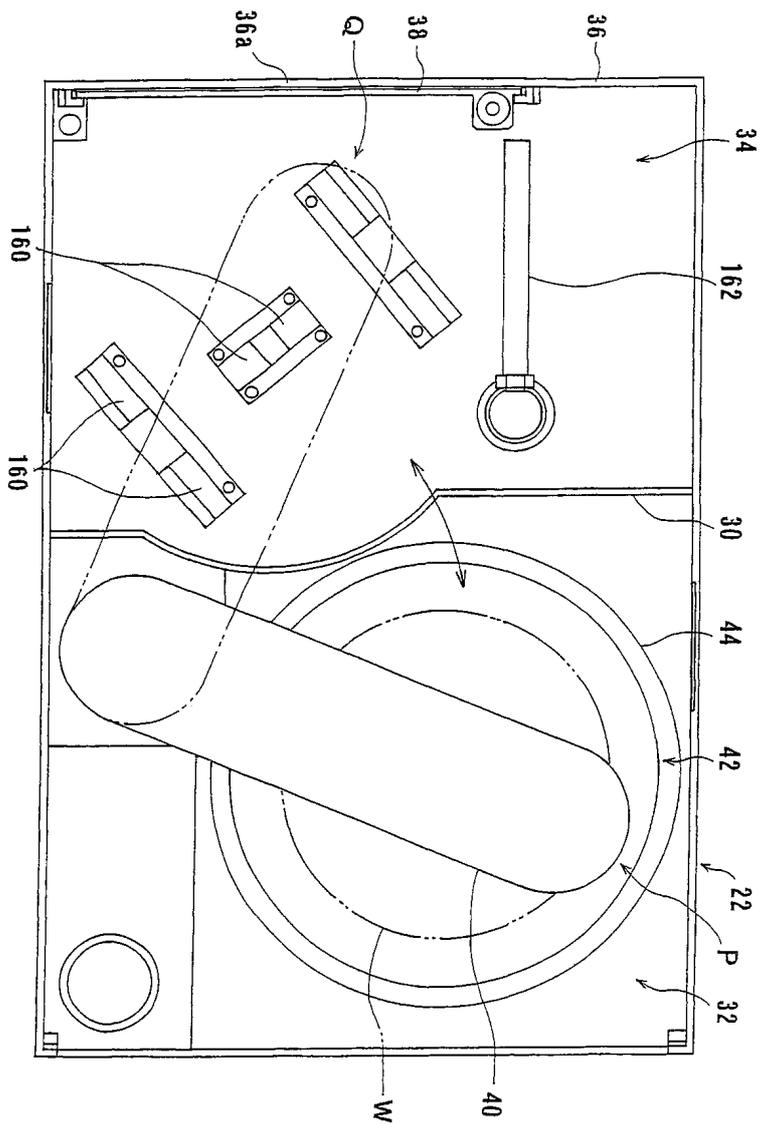
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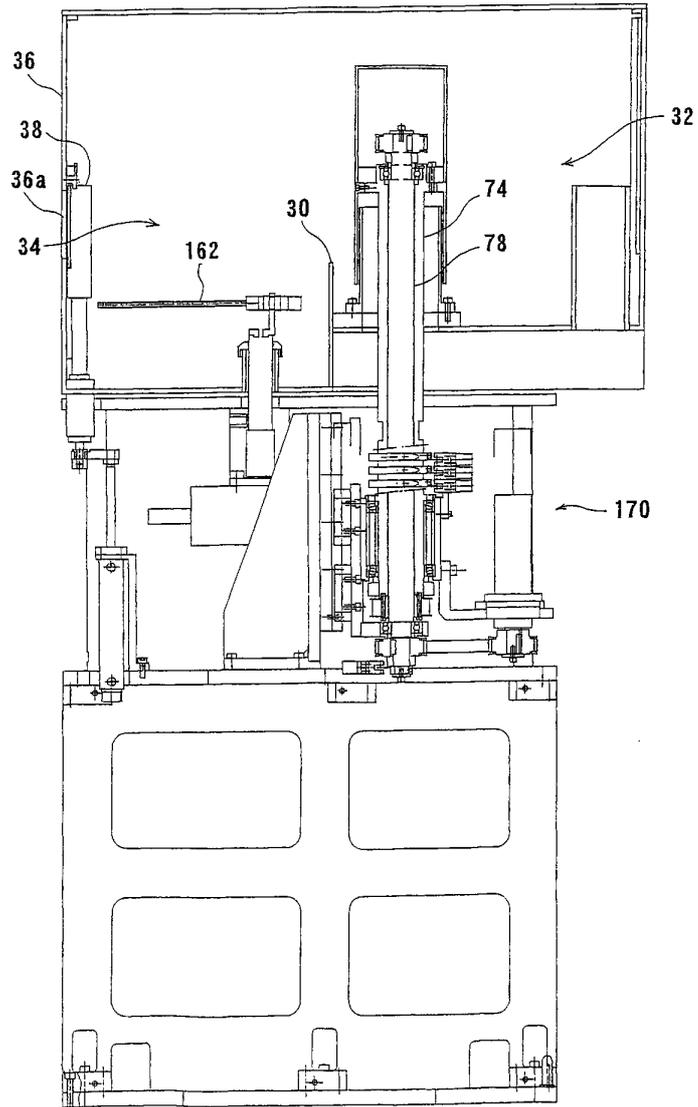




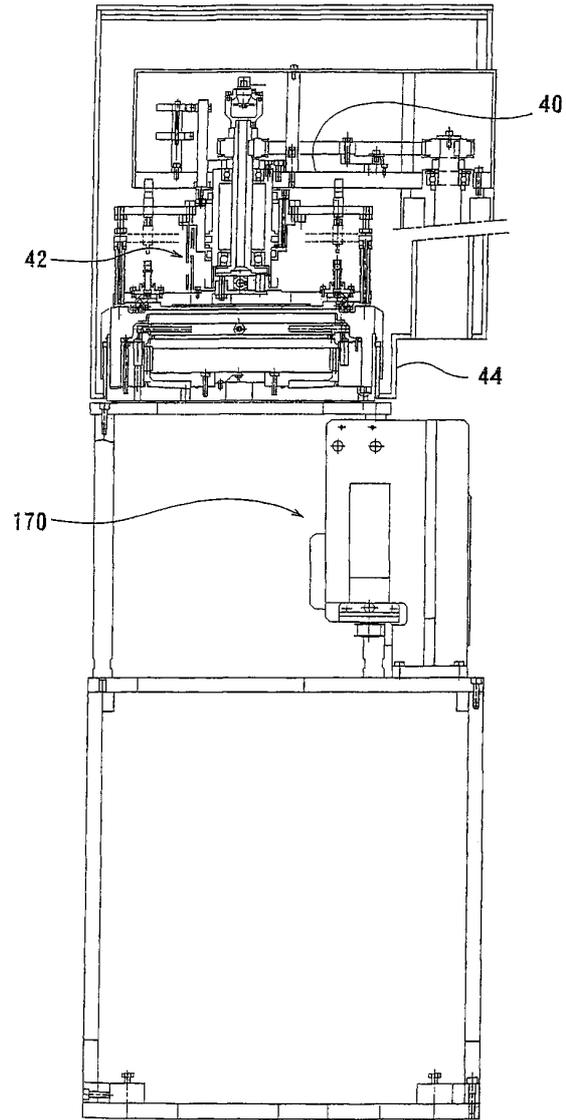
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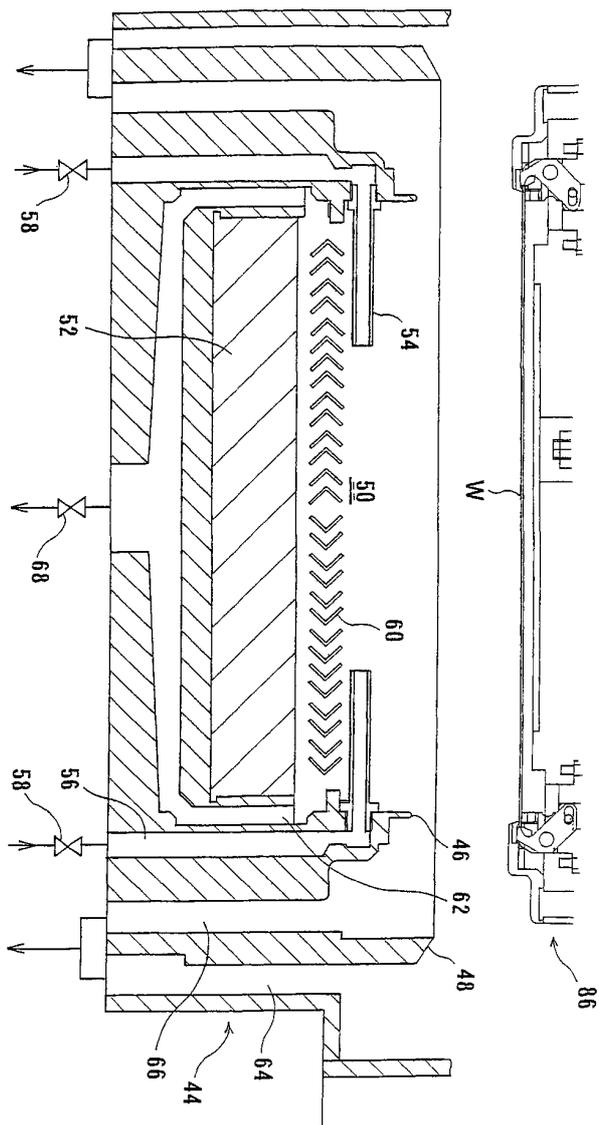
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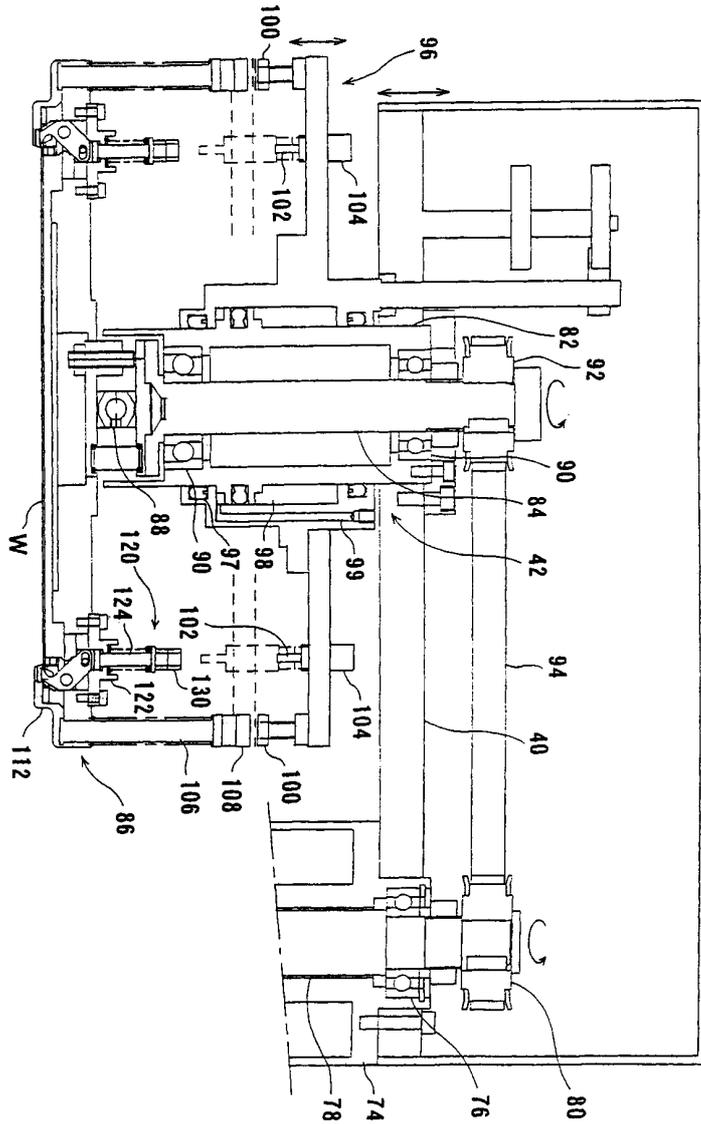
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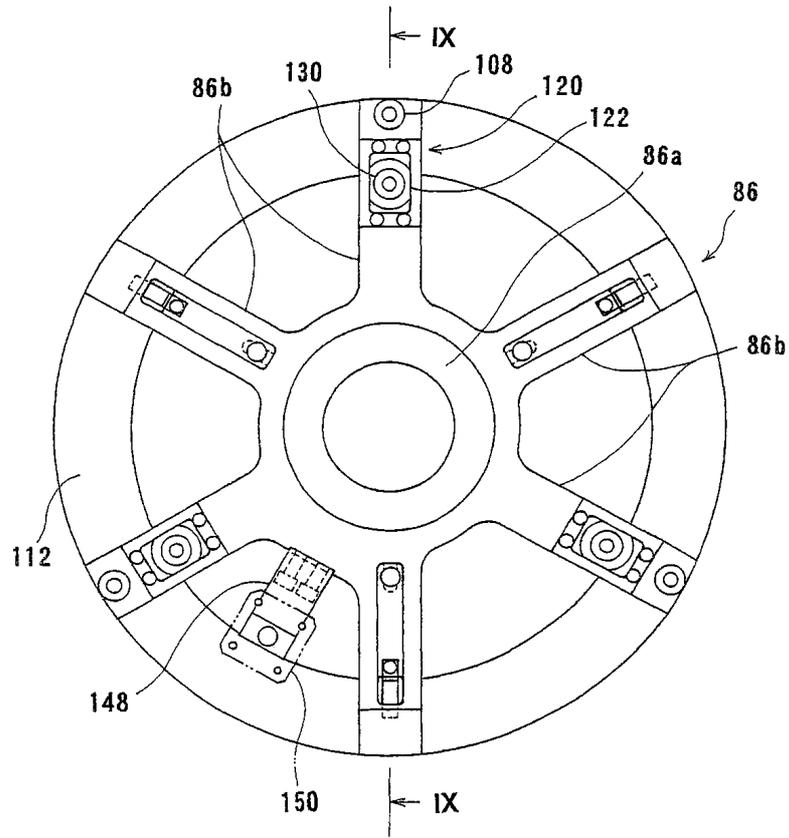
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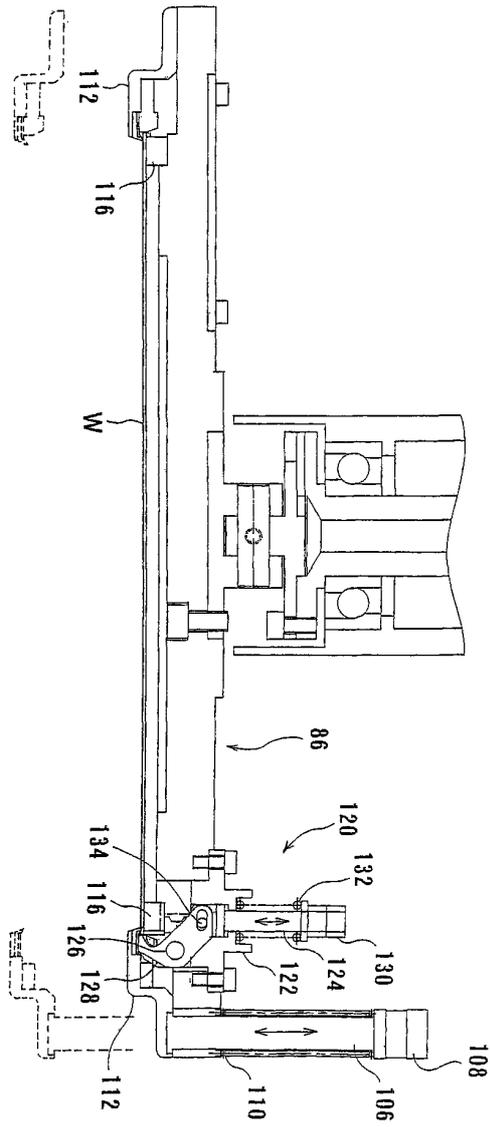
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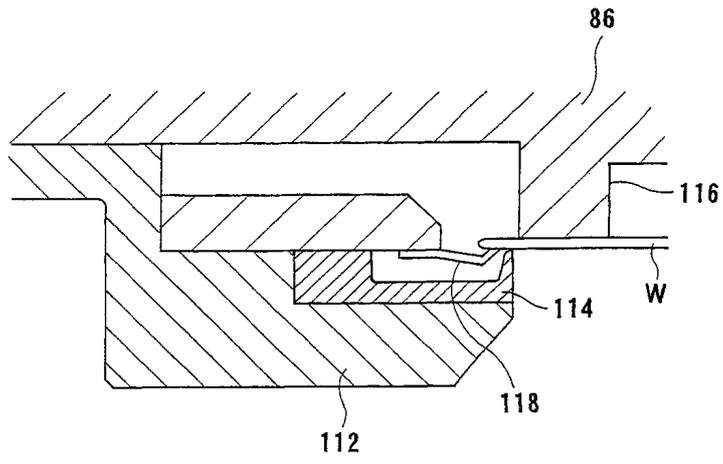
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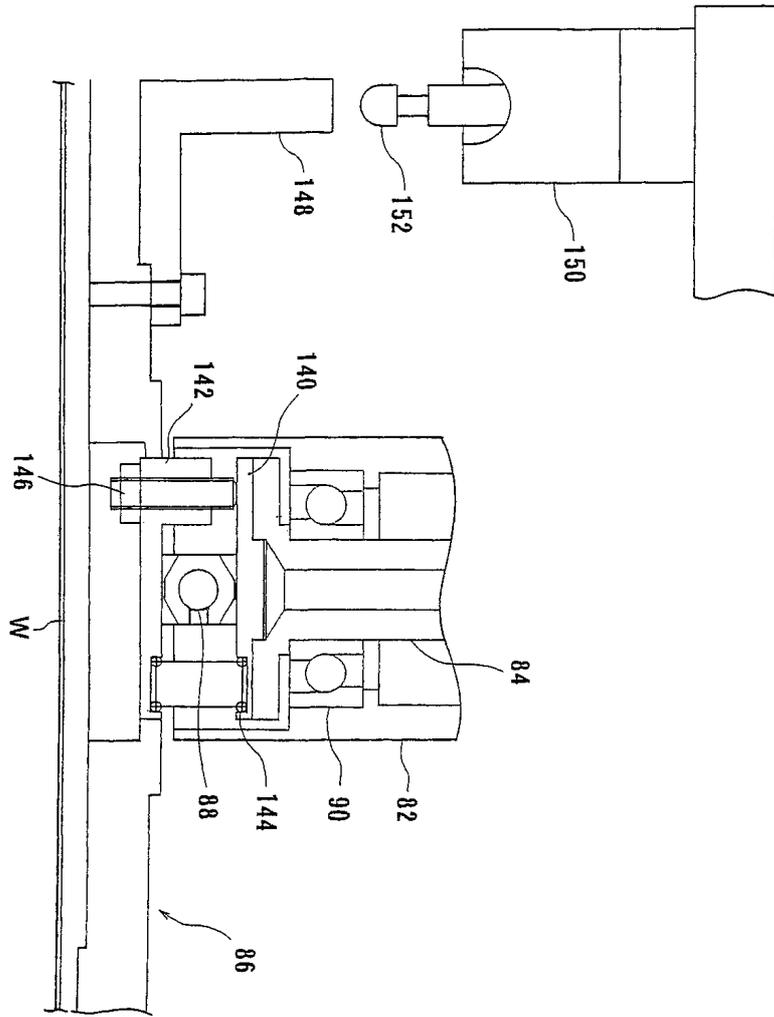
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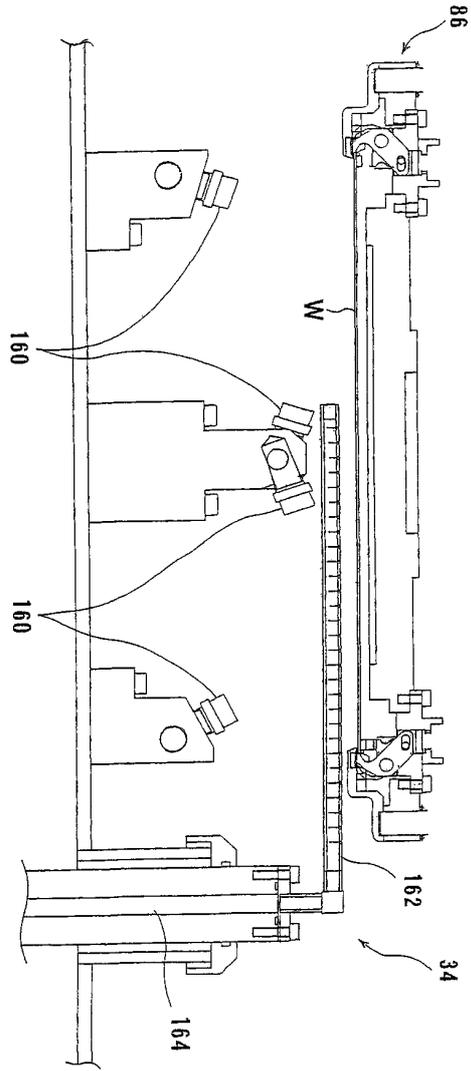
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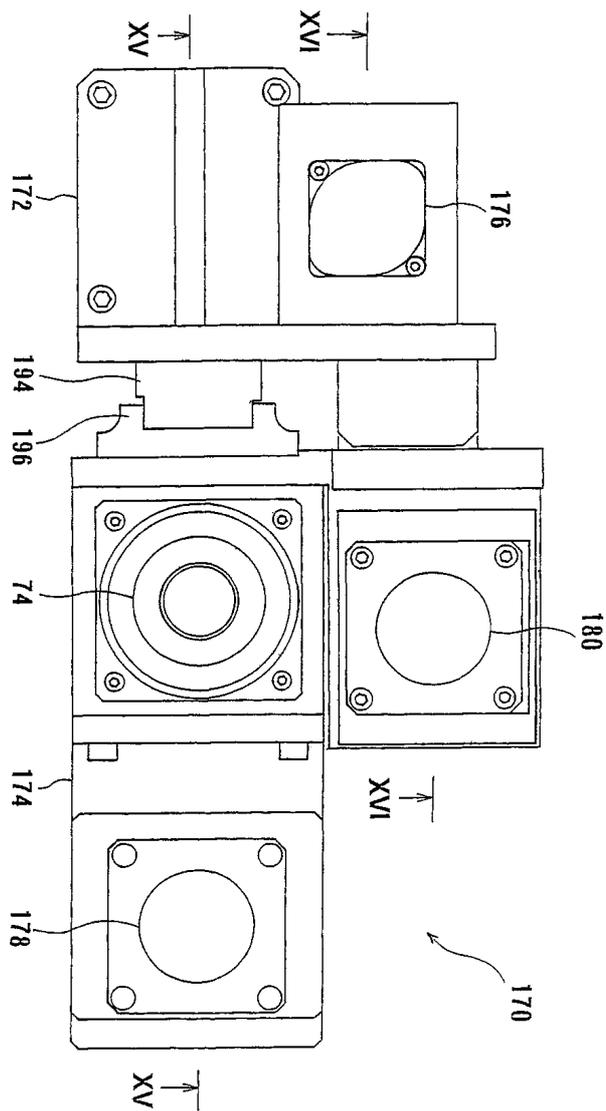
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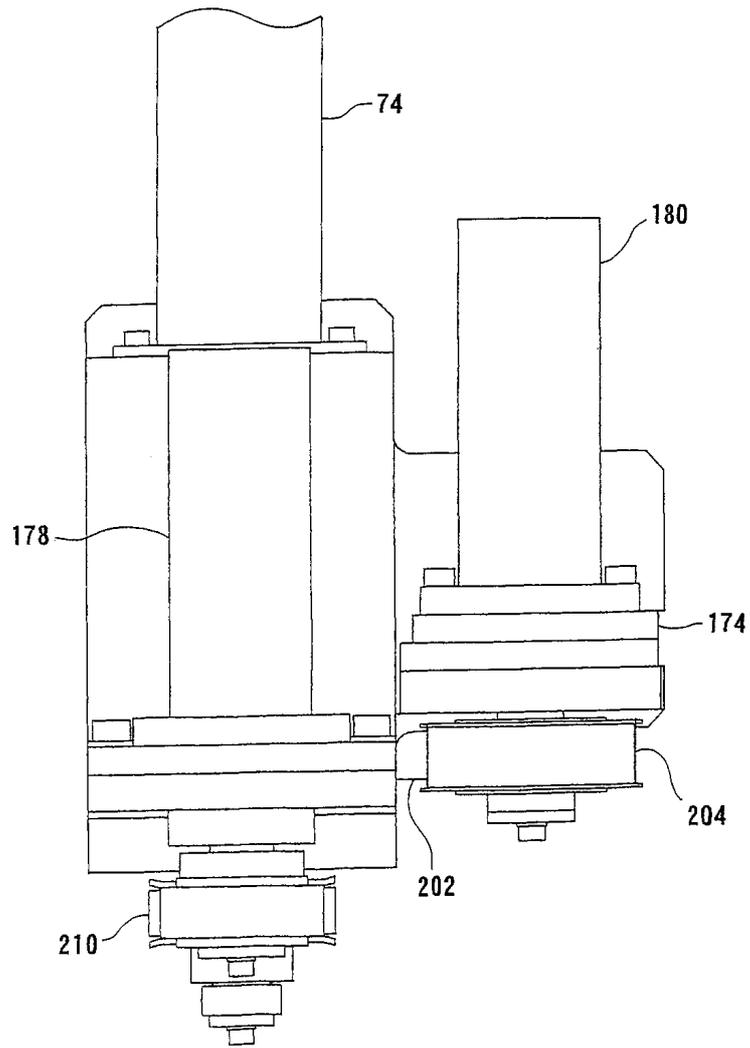
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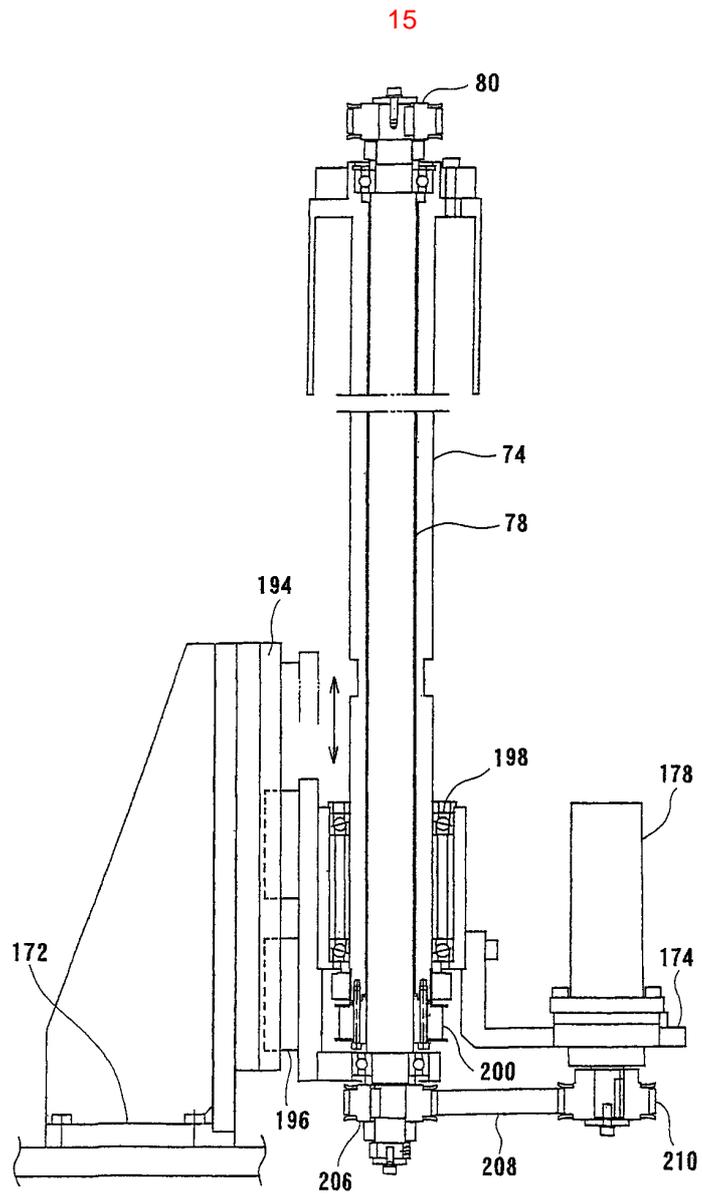


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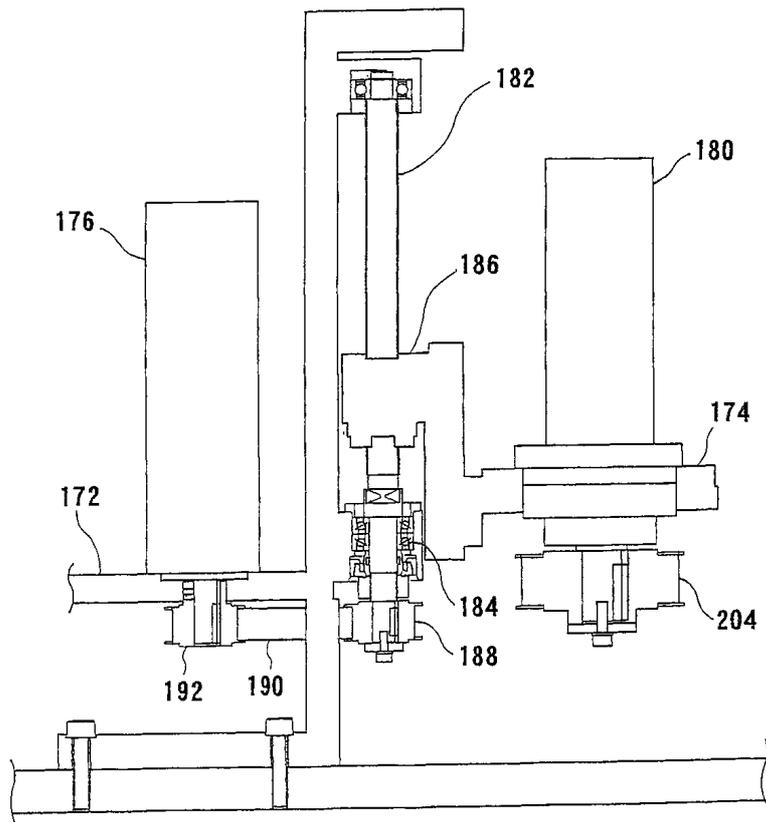


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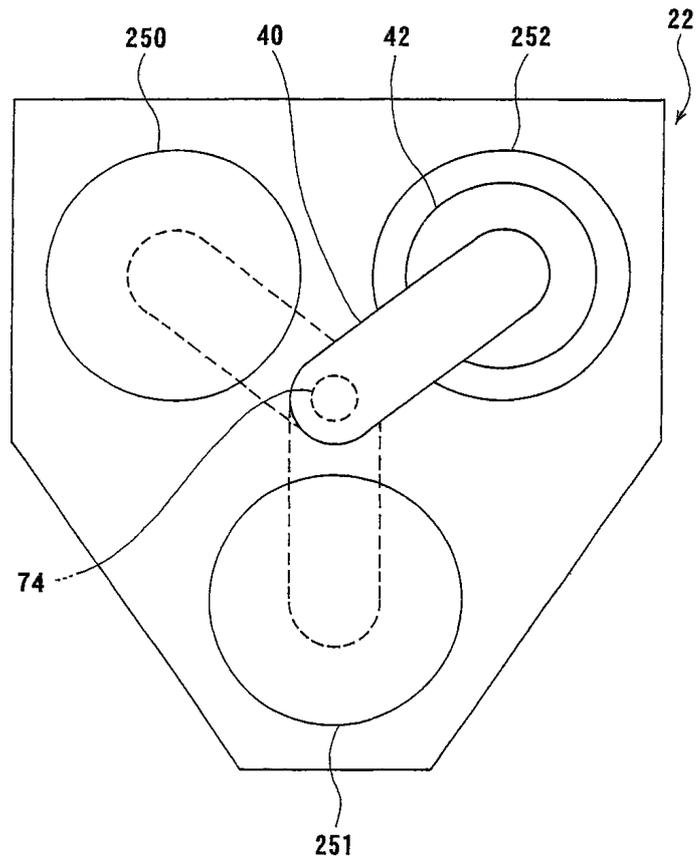




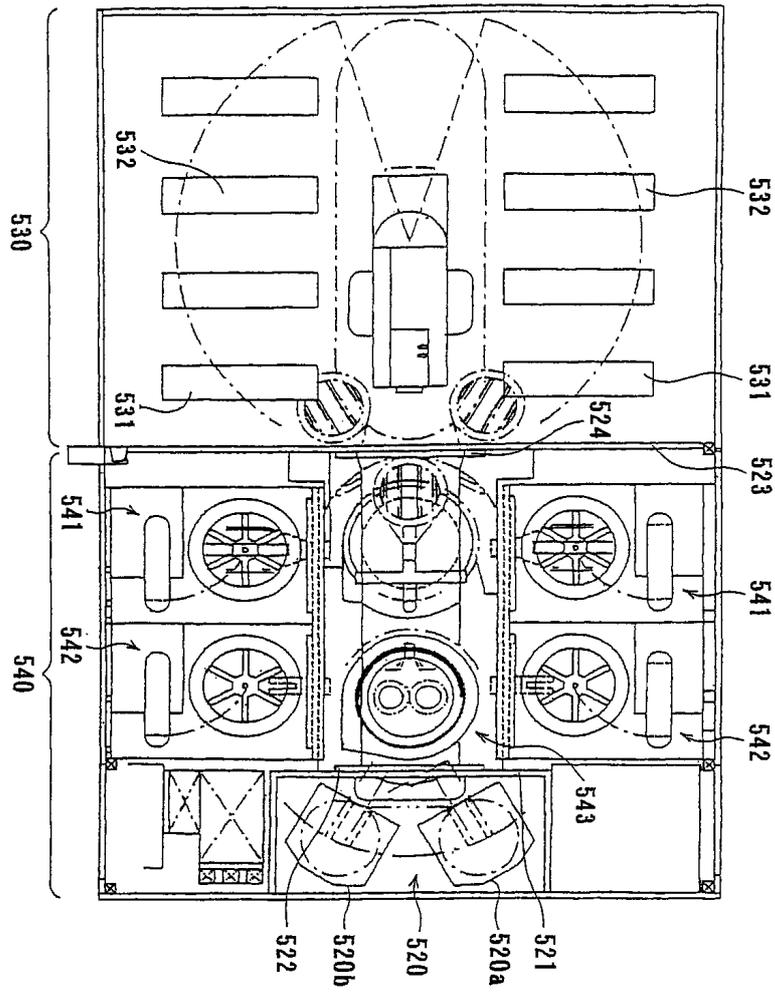
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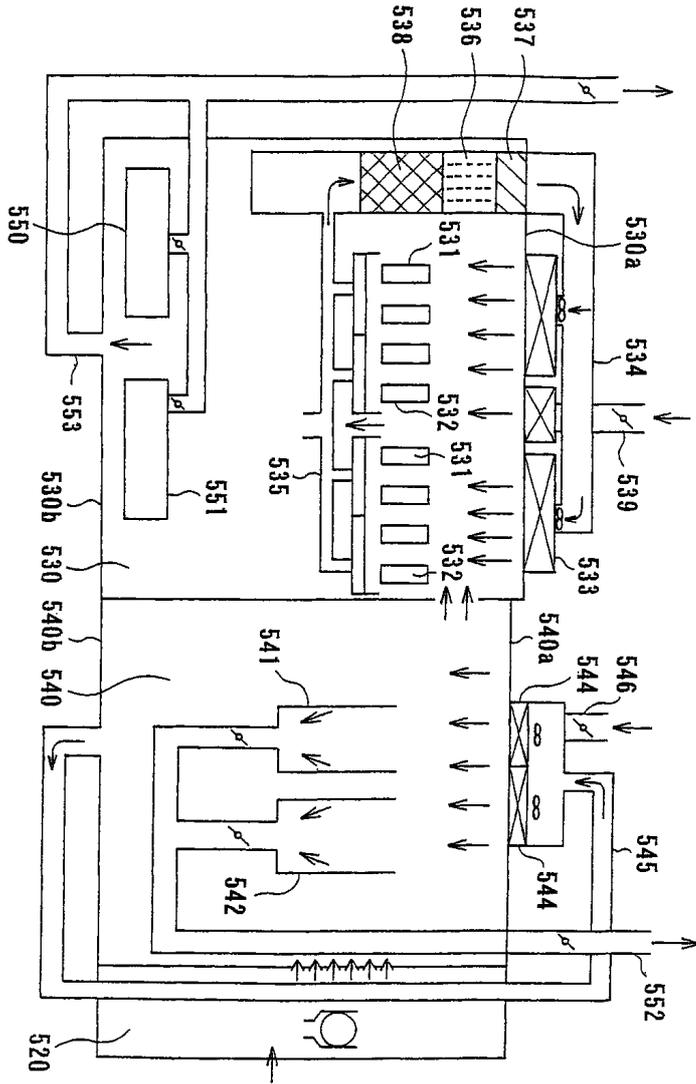
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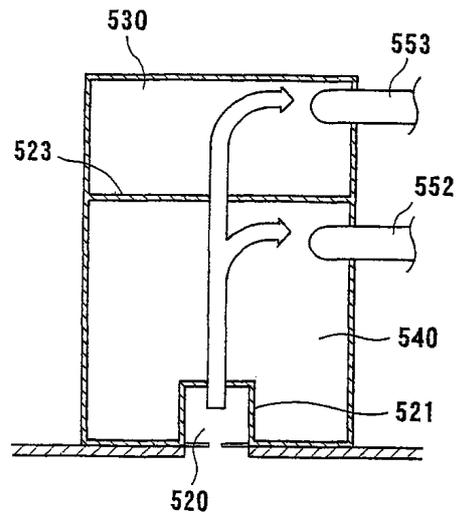
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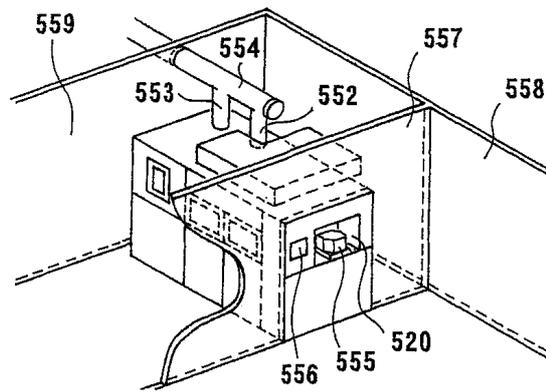
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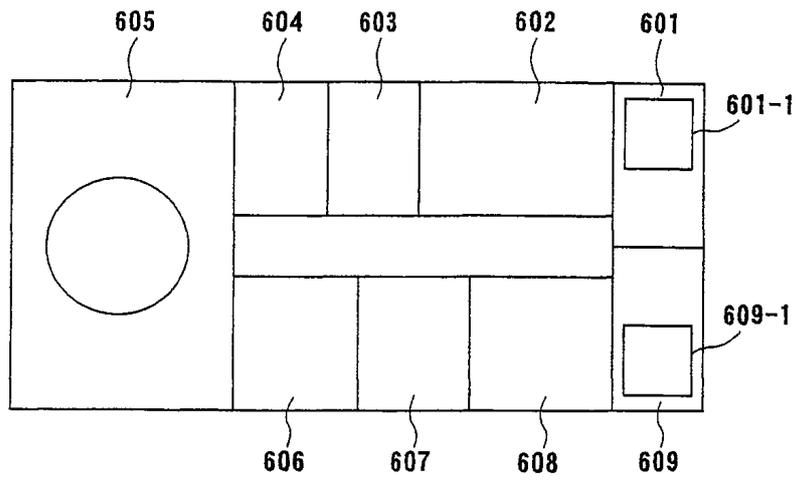
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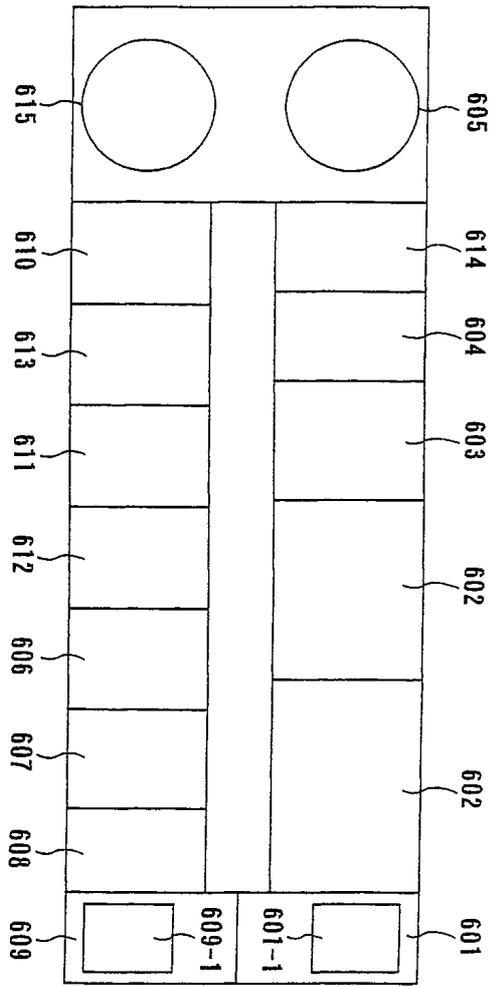


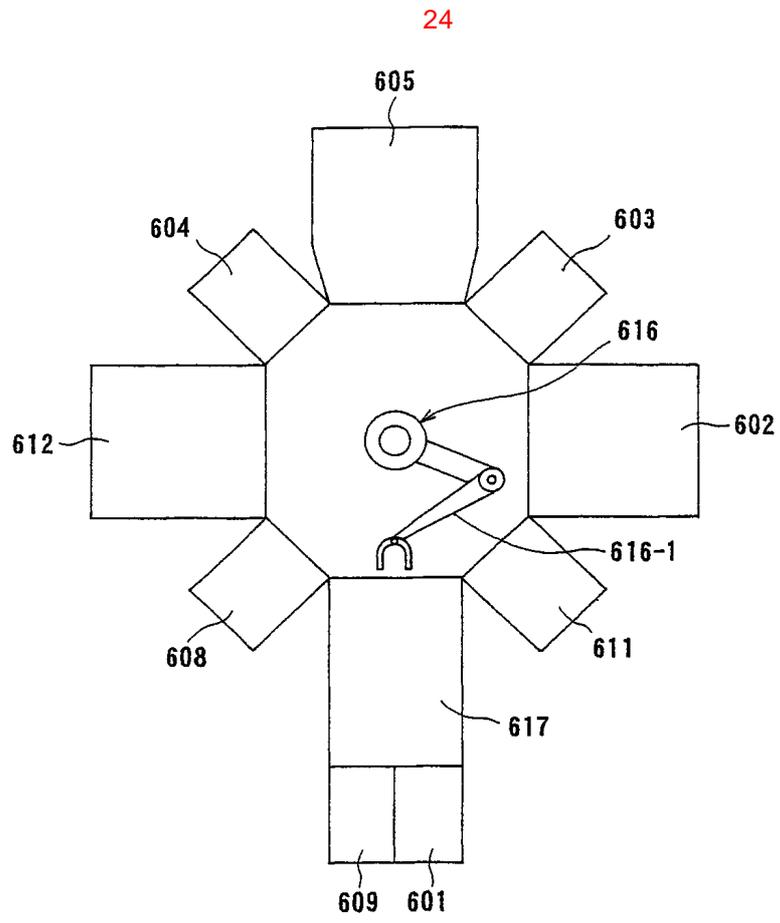
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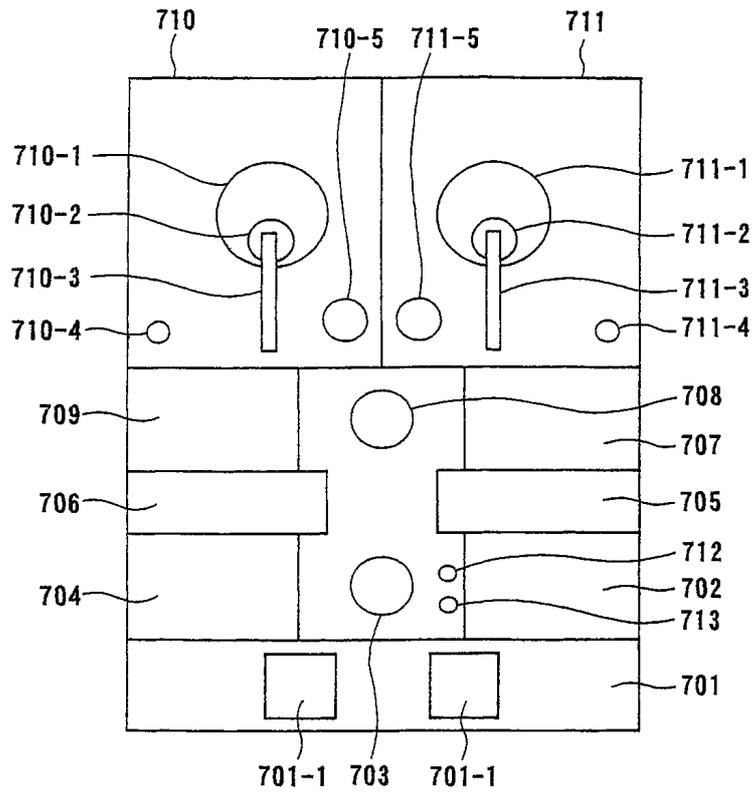
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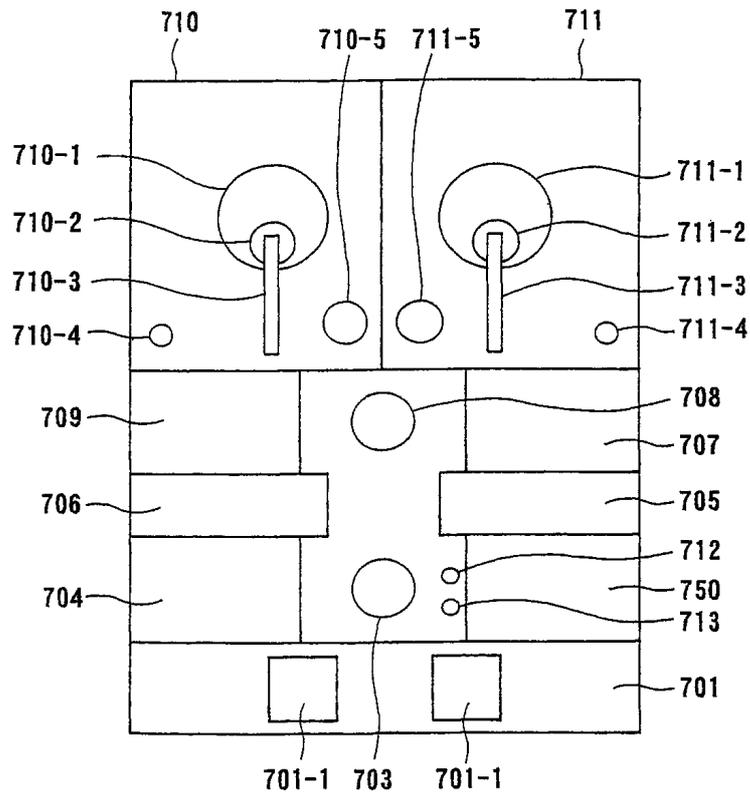




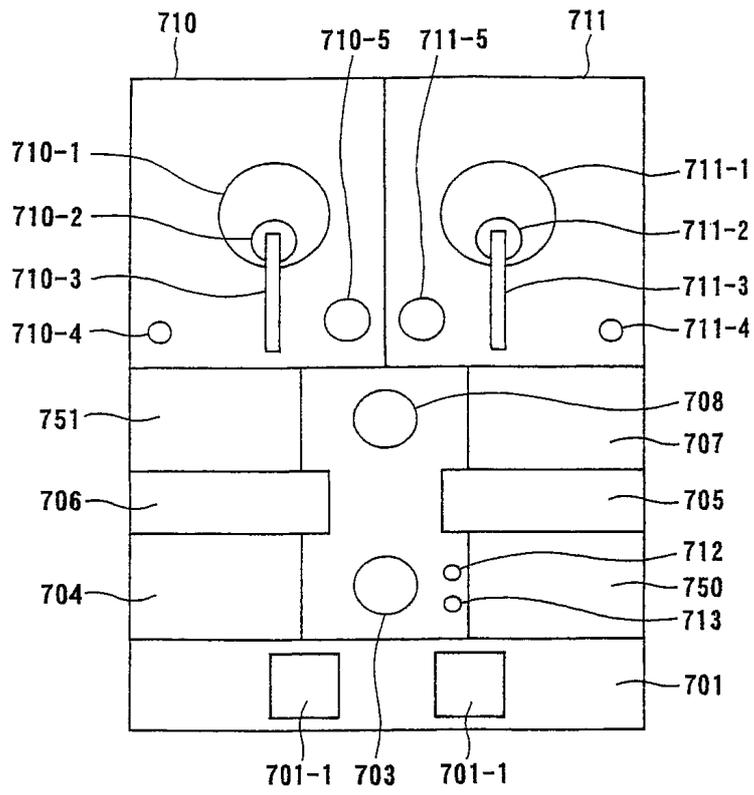
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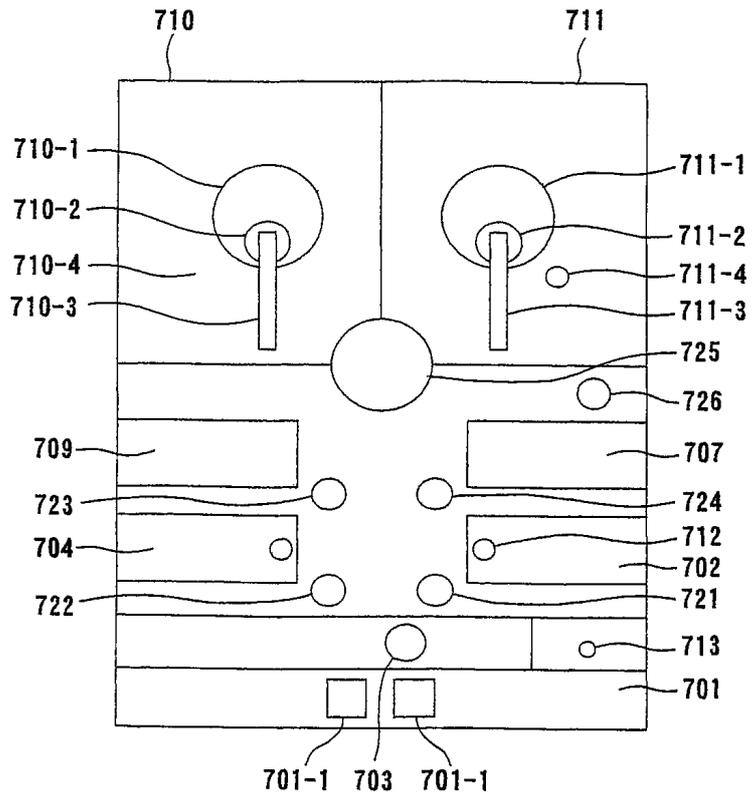


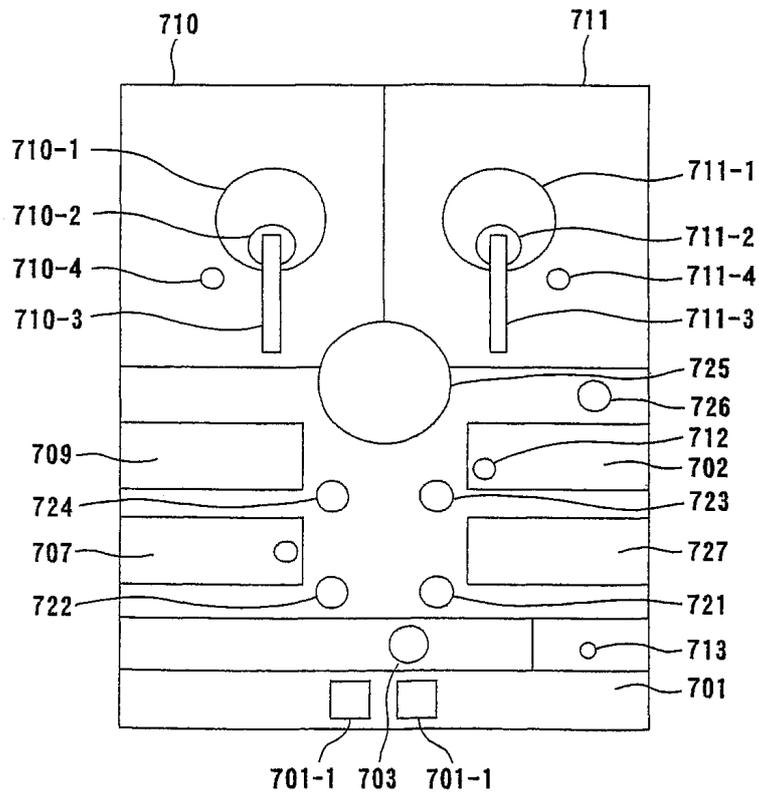
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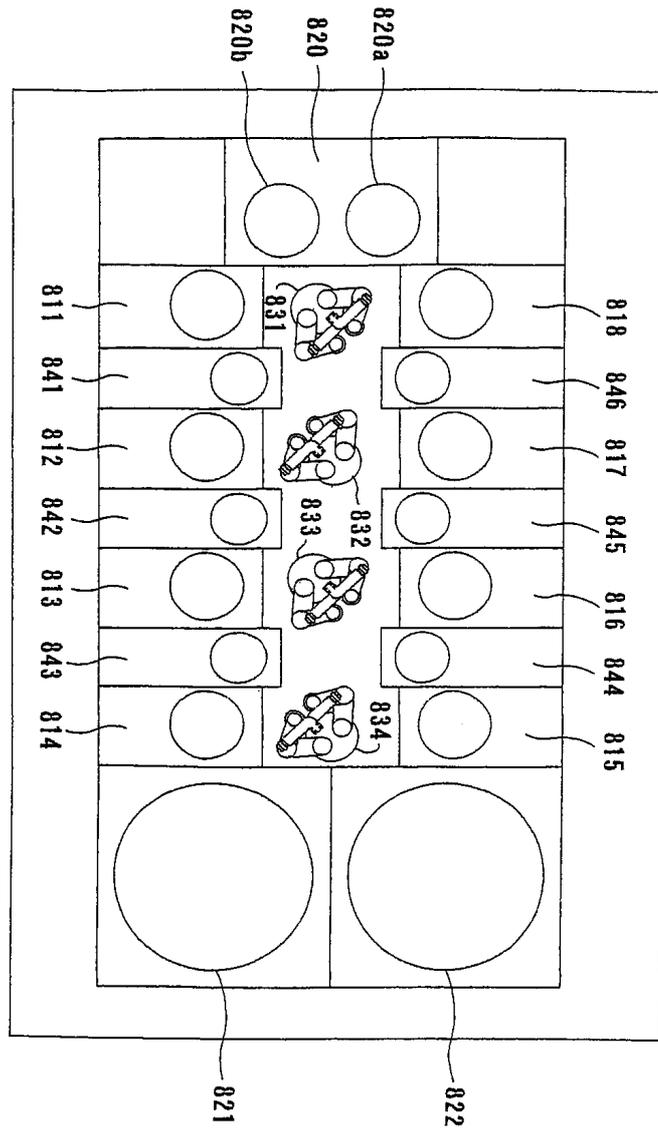
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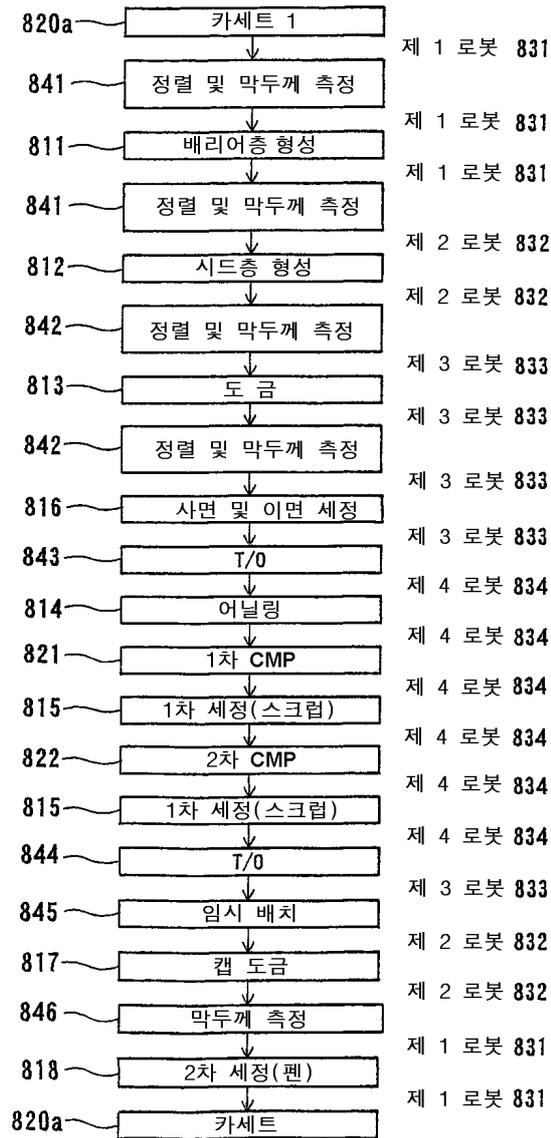




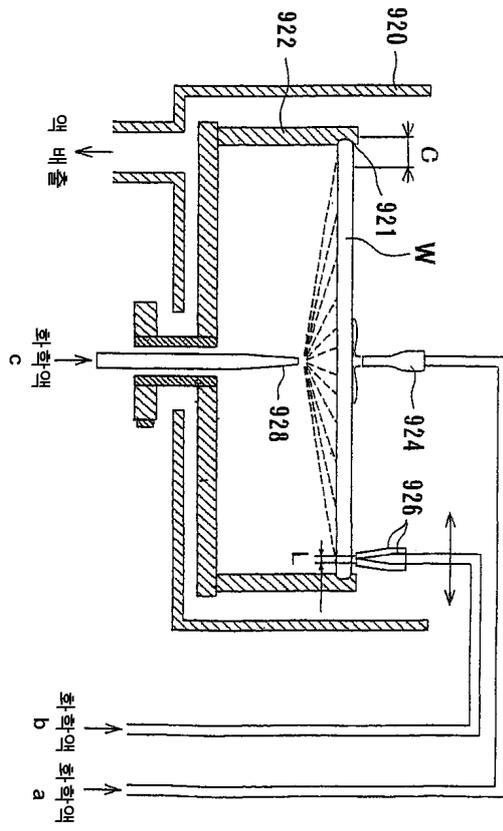


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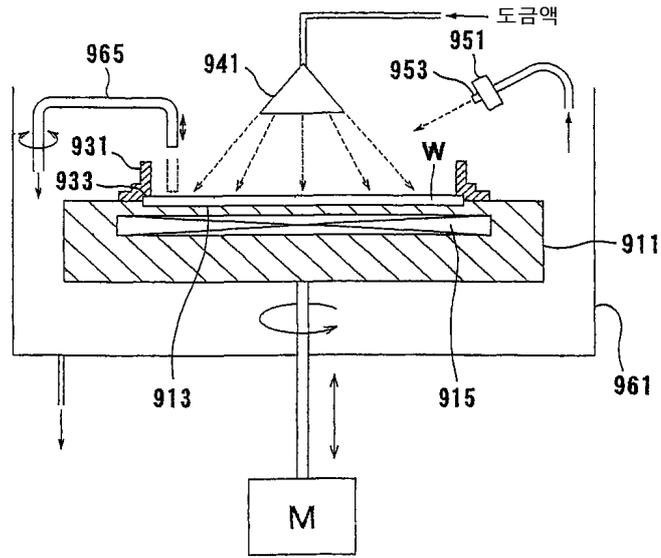




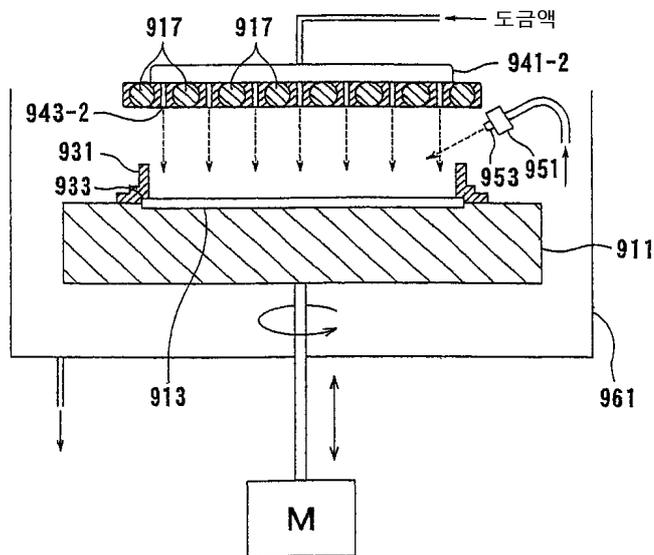
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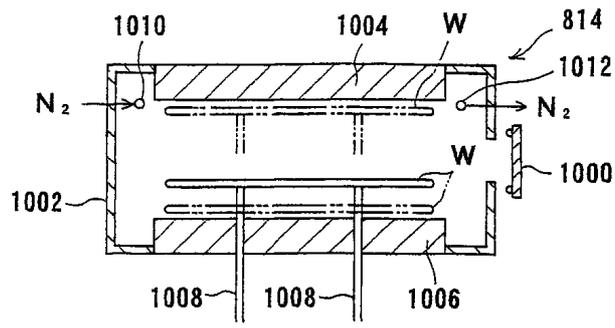
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