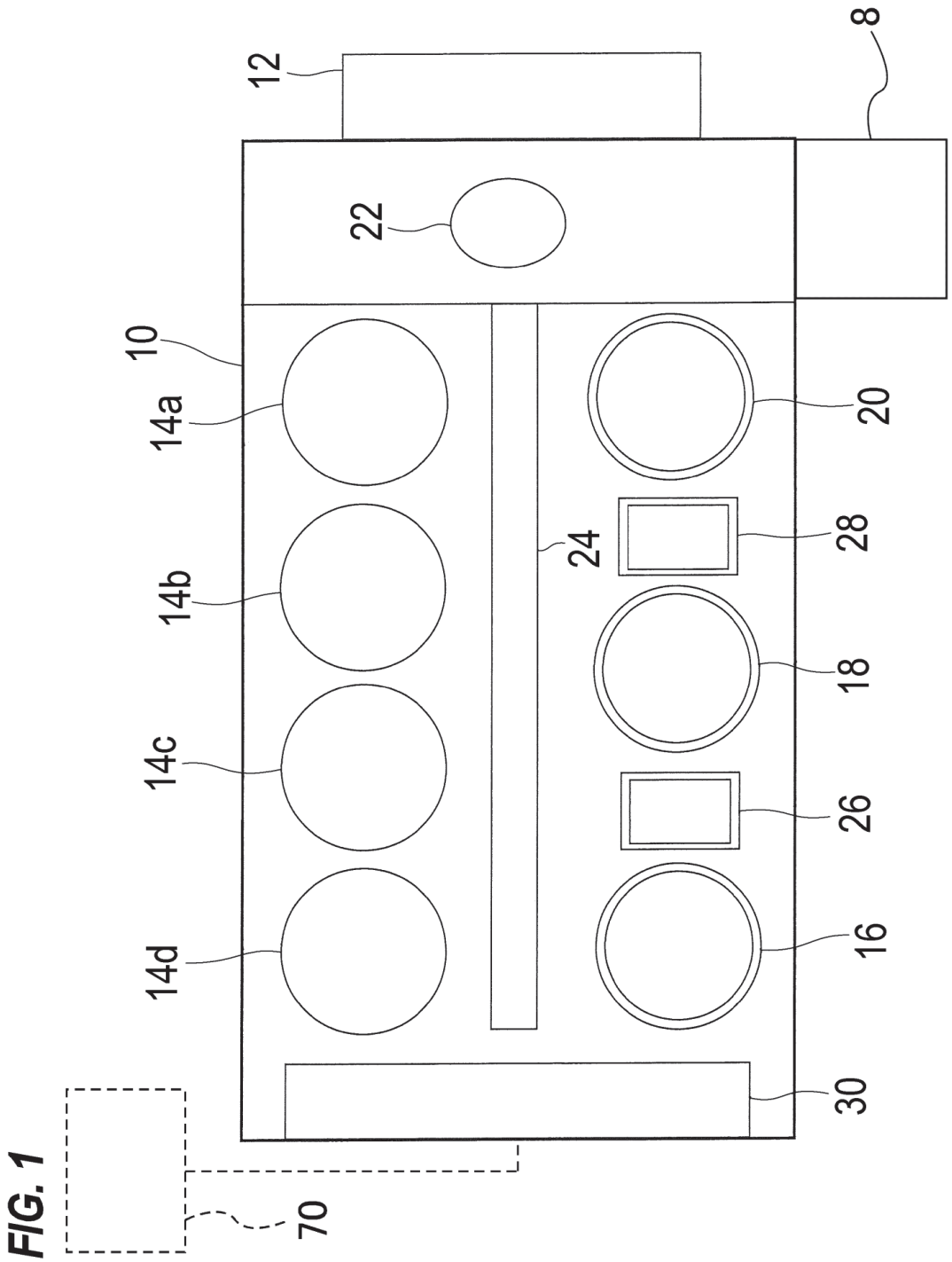


FIG. 1

FIG. 2

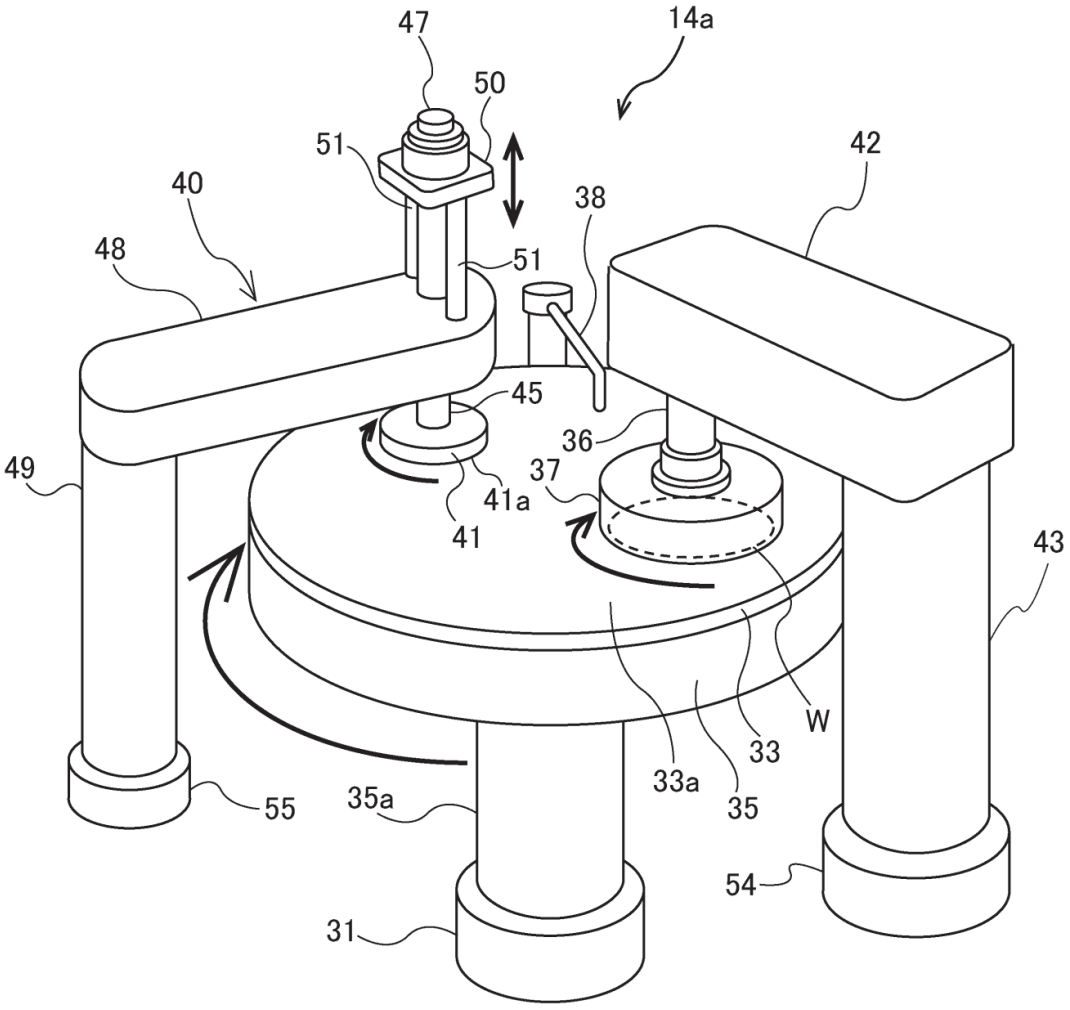

47
14a
50
51
42
40
38
48
51
45
36
49
37
41a
41
43
W
33
33a
35
35a
55
54
31

FIG. 3

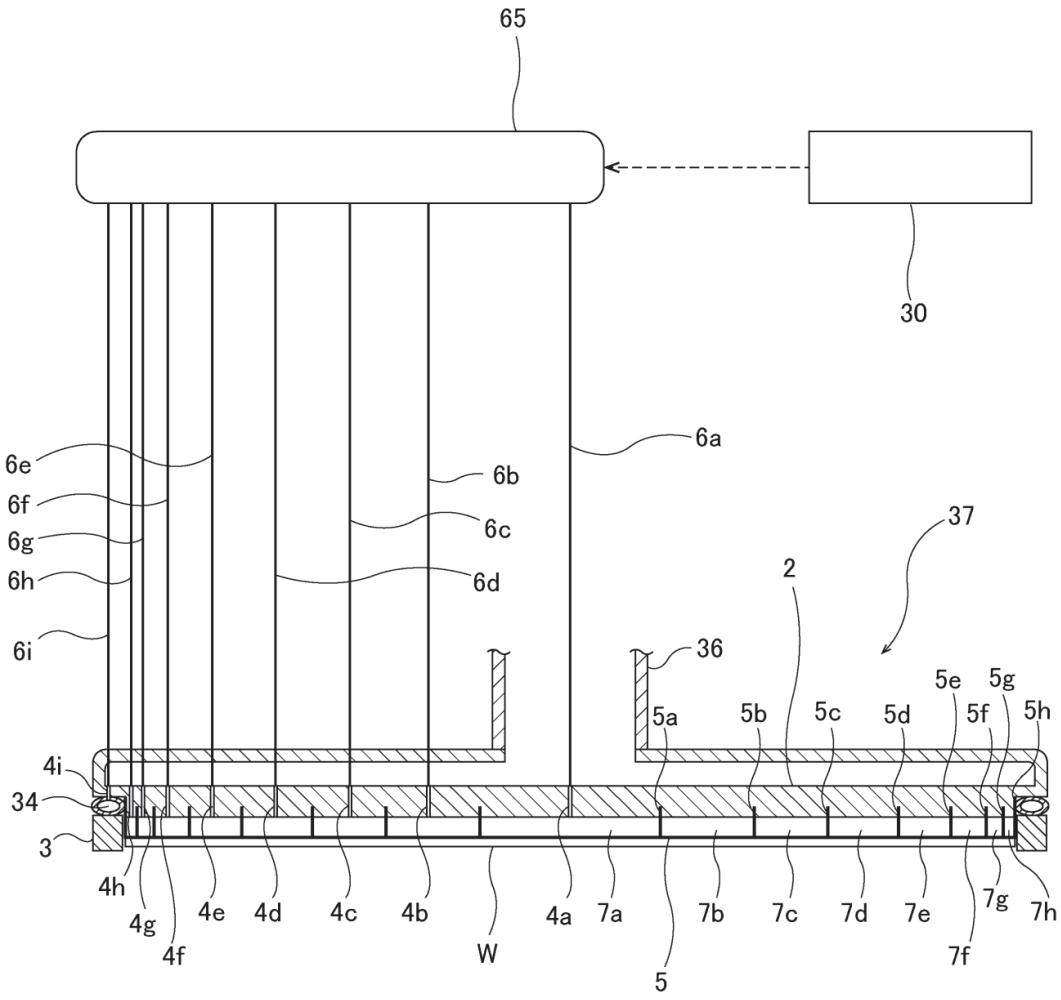

65
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6a
6b
6c
6d
6e
6f
6g
6h
6i
37
2
36
5a
5b
5c
5d
5e
5f
5g
5h
4i
34
3
4h
4g
4f
4e
4d
4c
4b
W
4a
7a
5
7b
7c
7d
7e
7f
7g
7h

FIG. 4

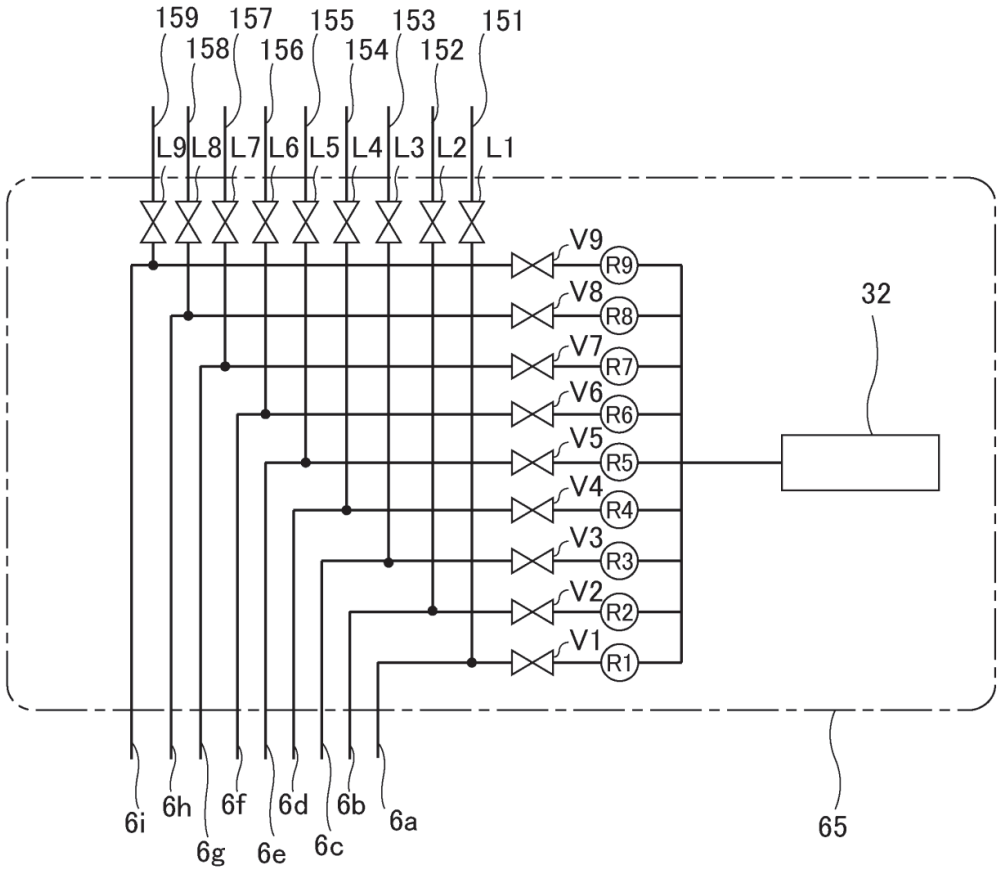

159
158
157
156
155
154
153
152
151
L9
L8
L7
L6
L5
L4
L3
L2
L1
V9
V8
V7
V6
V5
V4
V3
V2
V1
R9
R8
R7
R6
R5
R4
R3
R2
R1
32
6i
6h
6g
6f
6e
6d
6c
6b
6a
65

FIG. 5

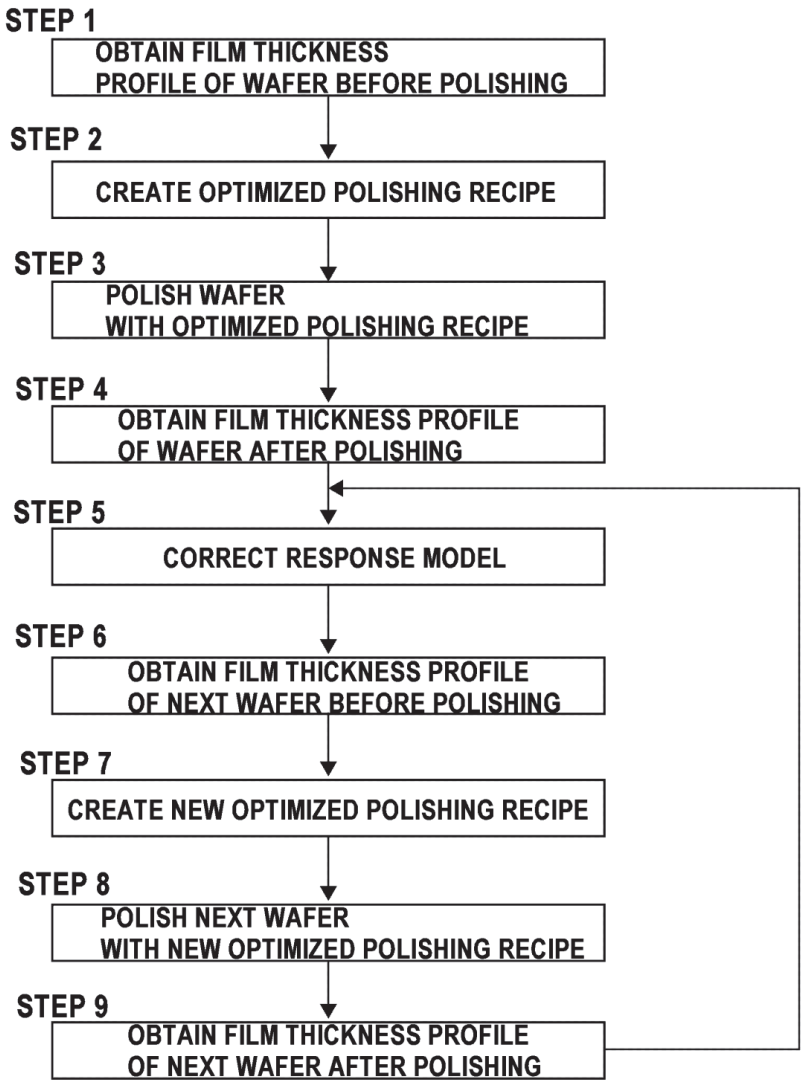

STEP 1
OBTAIN FILM THICKNESS PROFILE OF WAFER BEFORE POLISHING
STEP 2
CREATE OPTIMIZED POLISHING RECIPE
STEP 3
POLISH WAFER WITH OPTIMIZED POLISHING RECIPE
STEP 4
OBTAIN FILM THICKNESS PROFILE OF WAFER AFTER POLISHING
STEP 5
CORRECT RESPONSE MODEL
STEP 6
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER BEFORE POLISHING
STEP 7
CREATE NEW OPTIMIZED POLISHING RECIPE
STEP 8
POLISH NEXT WAFER WITH NEW OPTIMIZED POLISHING RECIPE
STEP 9
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER AFTER POLISHING

FIG. 6A

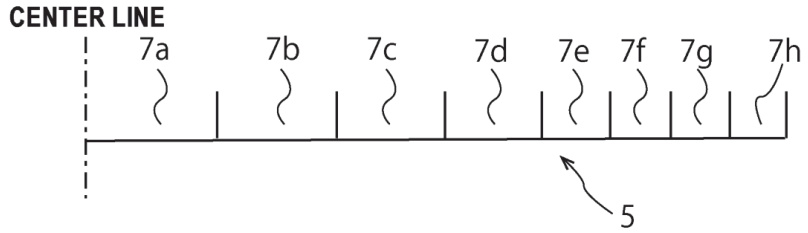


FIG. 6B

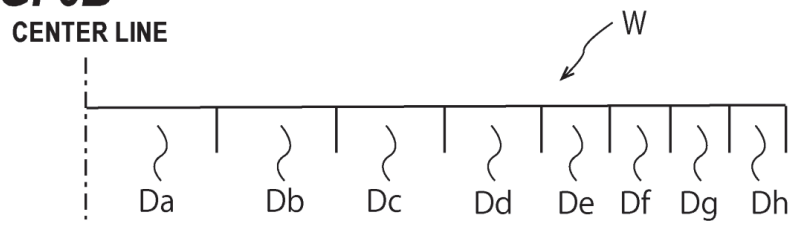


FIG. 6C

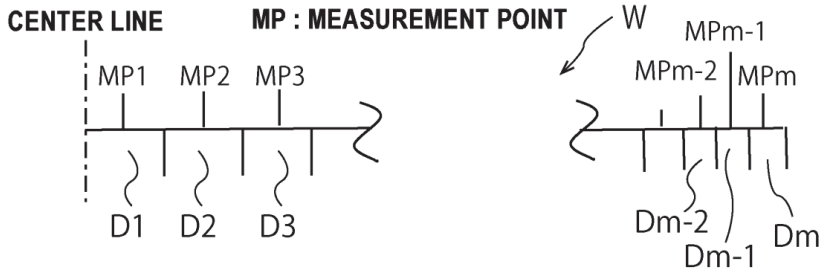


FIG. 6D

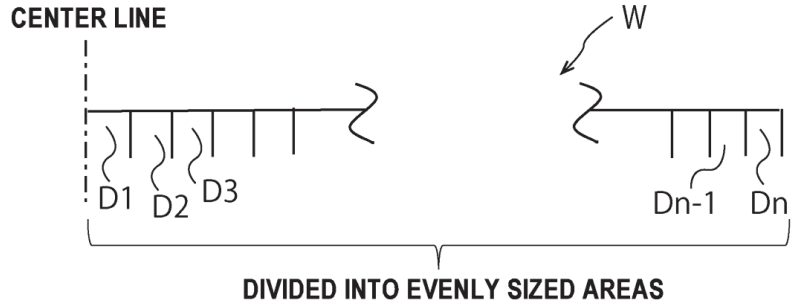


FIG. 6E

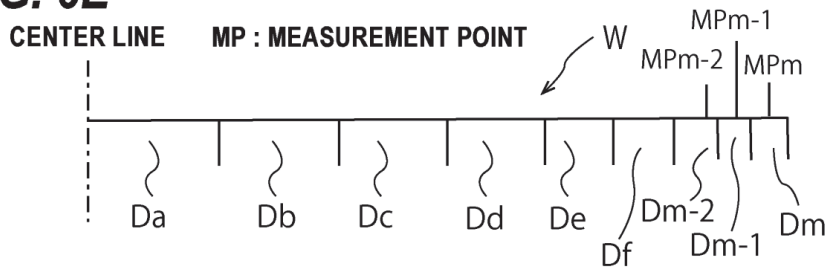


FIG. 7

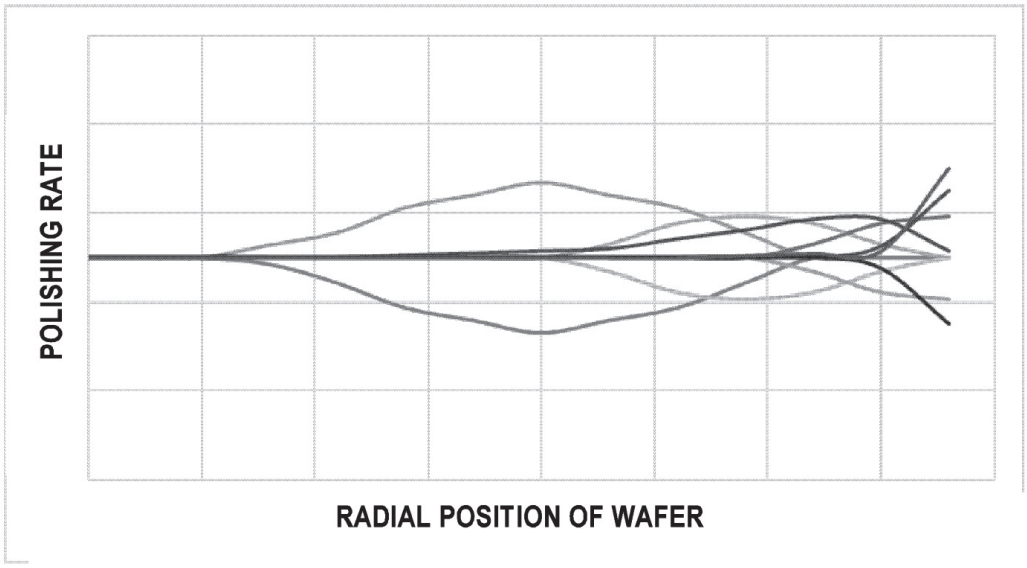

POLISHING RATE
RADIAL POSITION OF WAFER

FIG. 8

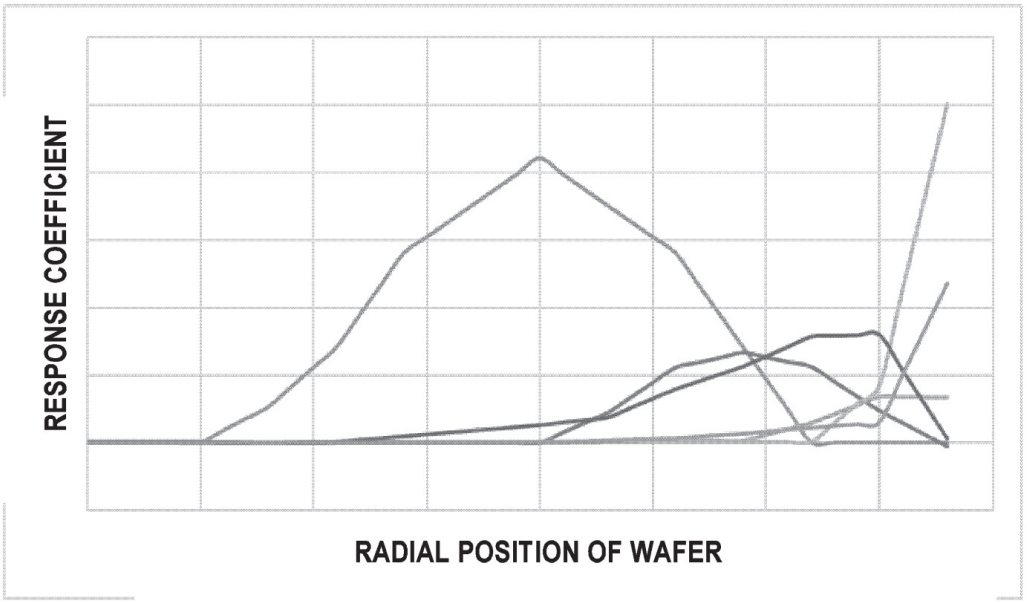

RESPONSE COEFFICIENT
RADIAL POSITION OF WAFER

FIG. 9

$$\mathrm{R} = \begin{bmatrix} R1 \\ R2 \\ R3 \\ \vdots \\ Rm \end{bmatrix}$$

$$\mathrm{C} = \begin{bmatrix} C1a & C1b & C1c & \dots & C1h \\ C2a & C2b & C2c & \dots & C2h \\ C3a & C3b & C3c & \dots & C3h \\ \vdots & \vdots & \vdots & \dots & \vdots \\ Cma & Cmb & Cmc & \dots & Cmh \end{bmatrix}$$

$$\mathrm{D} = \begin{bmatrix} D1 \\ D2 \\ D3 \\ \vdots \\ Dm \end{bmatrix}$$

$$\mathrm{X} = \begin{bmatrix} Pa \\ Pb \\ Pc \\ \vdots \\ Ph \end{bmatrix}$$

FIG. 10

$$C' = \begin{bmatrix} C1a & C1b & C1c & \dots & C1h & C1i \\ C2a & C2b & C2c & \dots & C2h & C2i \\ C3a & C3b & C3c & \dots & C3h & C3i \\ \vdots & \vdots & \vdots & \dots & \vdots & \vdots \\ Cma & Cmb & Cmc & \dots & Cmh & Cmi \end{bmatrix}$$

$$X' = \begin{bmatrix} Pa \\ Pb \\ Pc \\ \vdots \\ Ph \\ Pi \end{bmatrix}$$

FIG. 11

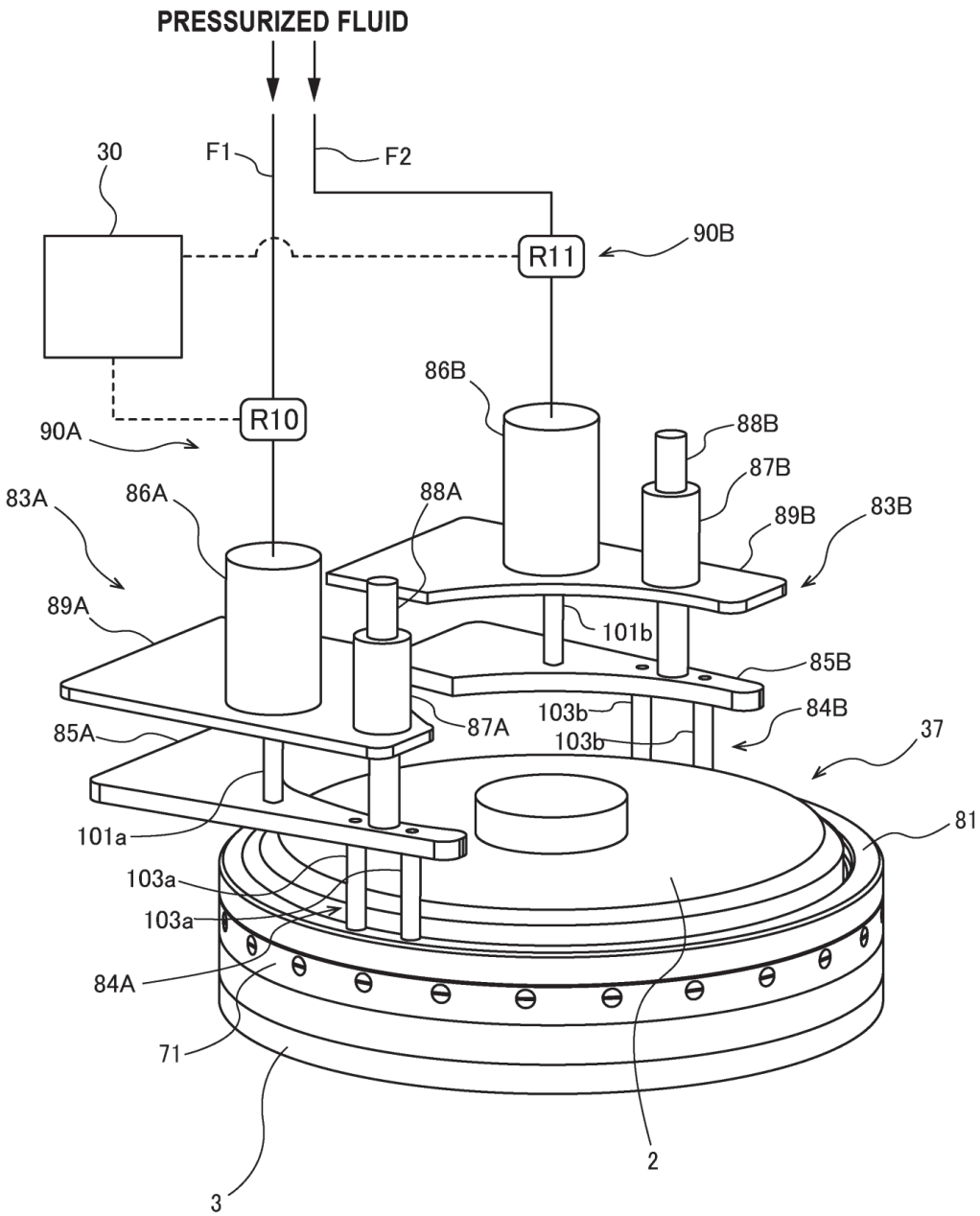

PRESSURIZED FLUID
30
F1
F2
90B
R11
86B
88B
87B
89B
83B
90A
R10
83A
86A
88A
89A
101b
85B
103b
84B
37
85A
87A
103b
101a
81
103a
103a
84A
71
3
2

FIG. 12

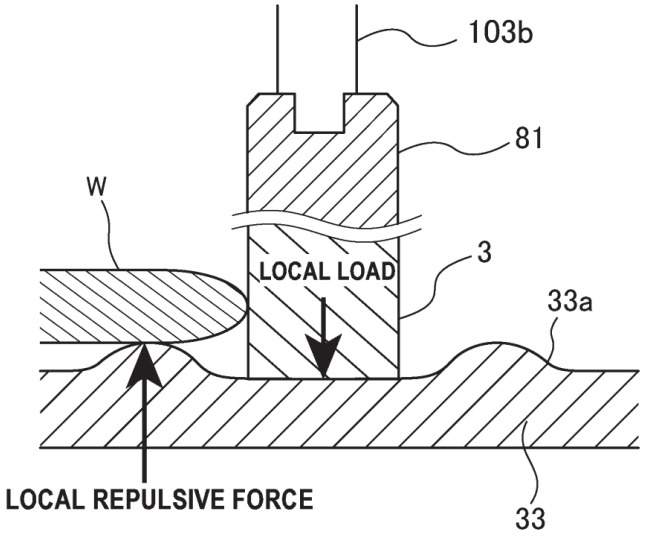

103b
81
W
3
LOCAL LOAD
33a
LOCAL REPULSIVE FORCE
33

FIG. 13

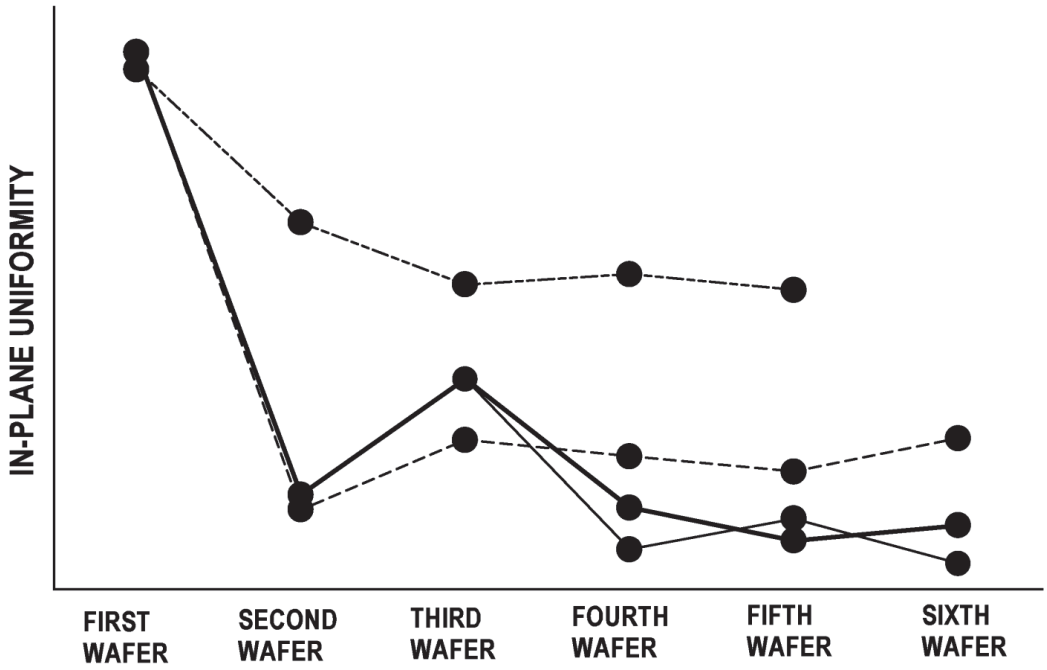

IN-PLANE UNIFORMITY
FIRST WAFER
SECOND WAFER
THIRD WAFER
FOURTH WAFER
FIFTH WAFER
SIXTH WAFER

FIG. 14

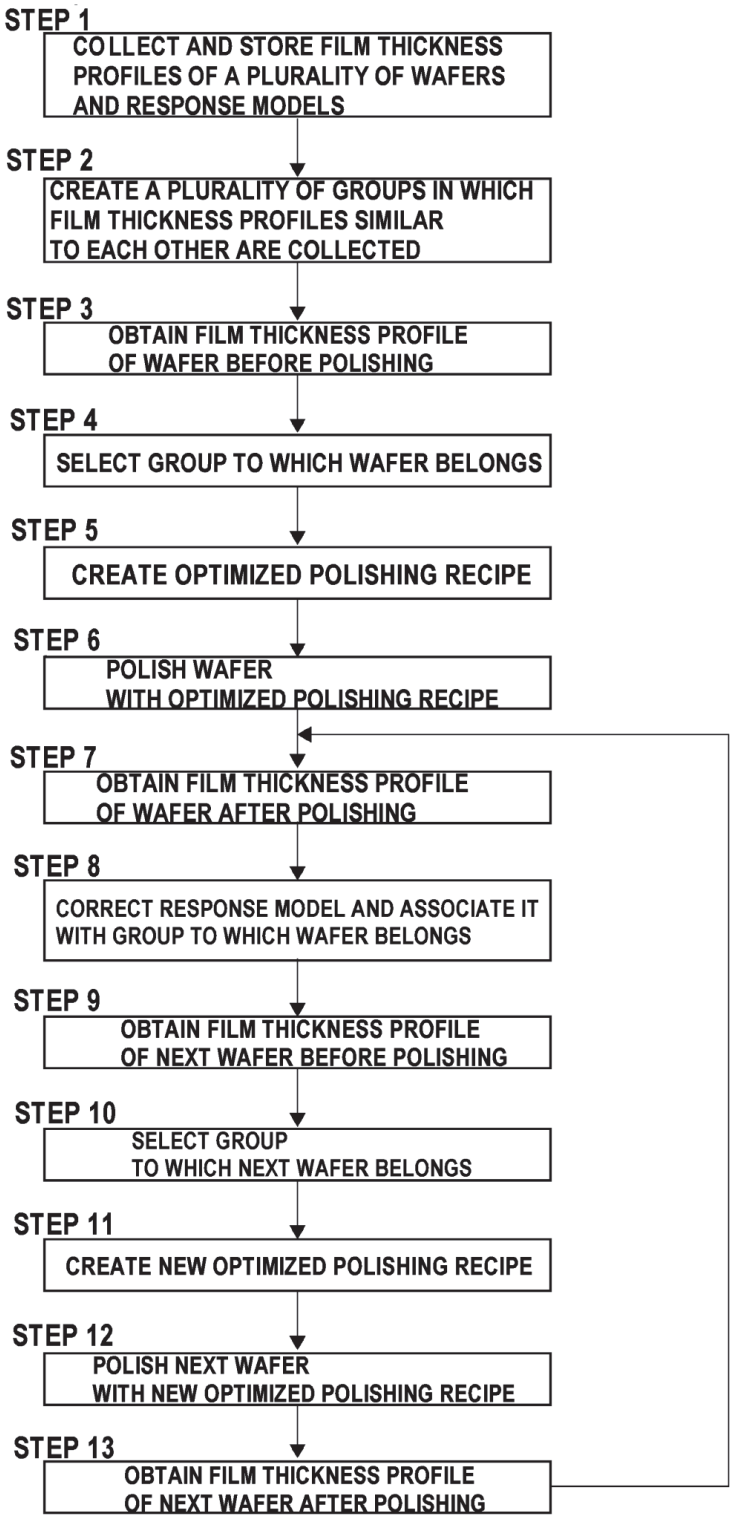

STEP 1
COLLECT AND STORE FILM THICKNESS PROFILES OF A PLURALITY OF WAFERS AND RESPONSE MODELS
STEP 2
CREATE A PLURALITY OF GROUPS IN WHICH FILM THICKNESS PROFILES SIMILAR TO EACH OTHER ARE COLLECTED
STEP 3
OBTAIN FILM THICKNESS PROFILE OF WAFER BEFORE POLISHING
STEP 4
SELECT GROUP TO WHICH WAFER BELONGS
STEP 5
CREATE OPTIMIZED POLISHING RECIPE
STEP 6
POLISH WAFER WITH OPTIMIZED POLISHING RECIPE
STEP 7
OBTAIN FILM THICKNESS PROFILE OF WAFER AFTER POLISHING
STEP 8
CORRECT RESPONSE MODEL AND ASSOCIATE IT WITH GROUP TO WHICH WAFER BELONGS
STEP 9
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER BEFORE POLISHING
STEP 10
SELECT GROUP TO WHICH NEXT WAFER BELONGS
STEP 11
CREATE NEW OPTIMIZED POLISHING RECIPE
STEP 12
POLISH NEXT WAFER WITH NEW OPTIMIZED POLISHING RECIPE
STEP 13
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER AFTER POLISHING

FIG. 15

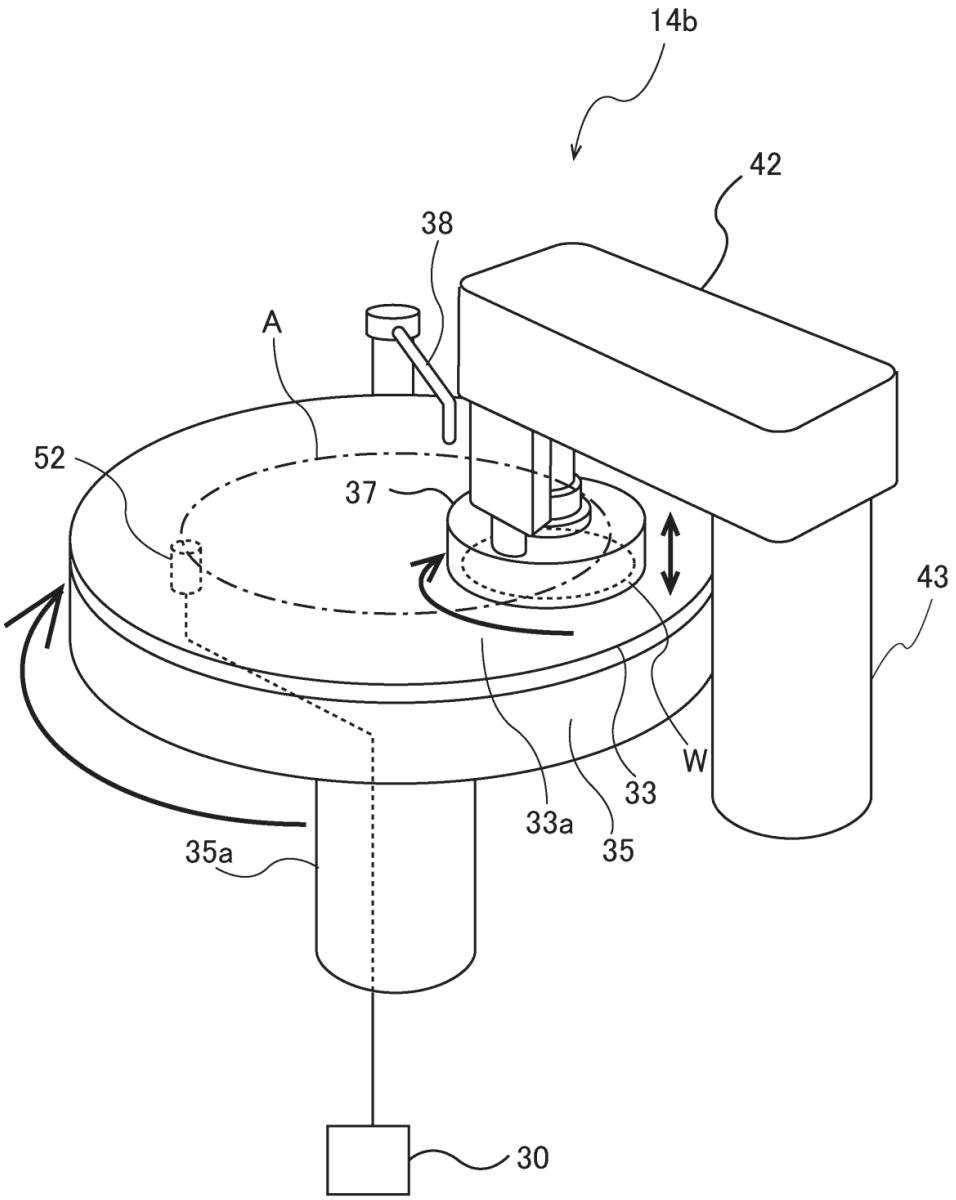


FIG. 16

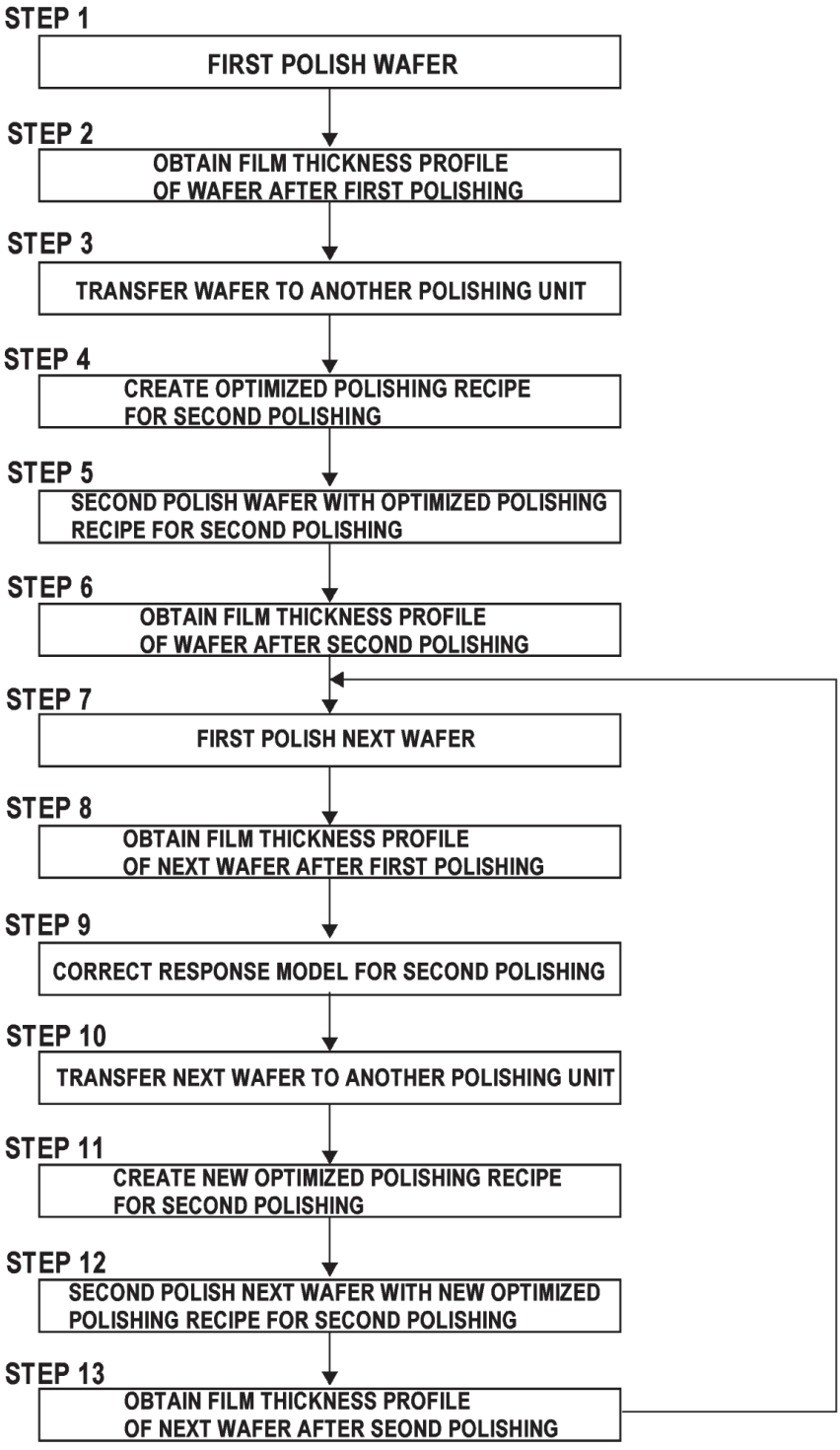

STEP 1
FIRST POLISH WAFER
STEP 2
OBTAIN FILM THICKNESS PROFILE OF WAFER AFTER FIRST POLISHING
STEP 3
TRANSFER WAFER TO ANOTHER POLISHING UNIT
STEP 4
CREATE OPTIMIZED POLISHING RECIPE FOR SECOND POLISHING
STEP 5
SECOND POLISH WAFER WITH OPTIMIZED POLISHING RECIPE FOR SECOND POLISHING
STEP 6
OBTAIN FILM THICKNESS PROFILE OF WAFER AFTER SECOND POLISHING
STEP 7
FIRST POLISH NEXT WAFER
STEP 8
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER AFTER FIRST POLISHING
STEP 9
CORRECT RESPONSE MODEL FOR SECOND POLISHING
STEP 10
TRANSFER NEXT WAFER TO ANOTHER POLISHING UNIT
STEP 11
CREATE NEW OPTIMIZED POLISHING RECIPE FOR SECOND POLISHING
STEP 12
SECOND POLISH NEXT WAFER WITH NEW OPTIMIZED POLISHING RECIPE FOR SECOND POLISHING
STEP 13
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER AFTER SEOND POLISHING

FIG. 17

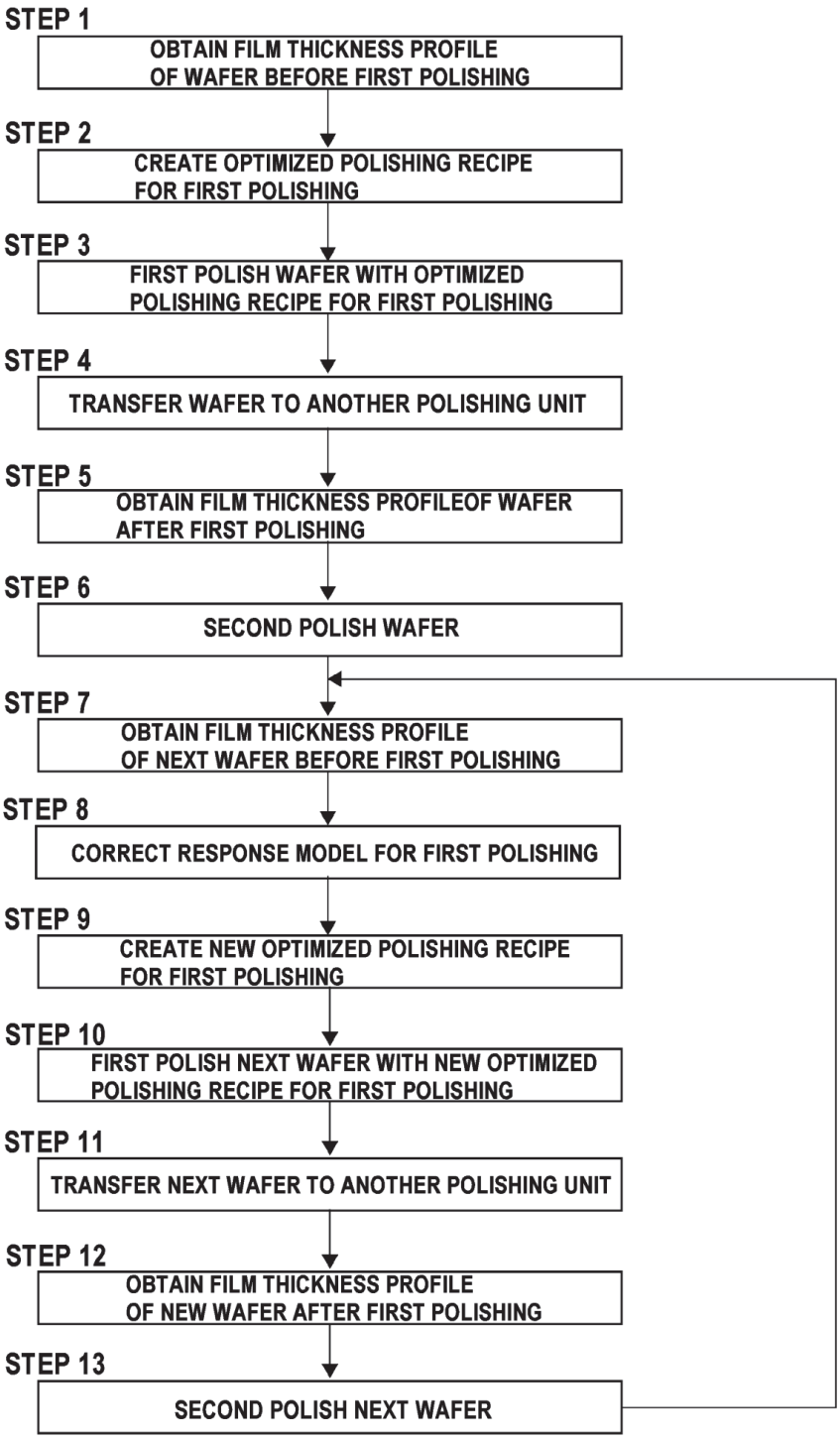

STEP 1
OBTAIN FILM THICKNESS PROFILE OF WAFER BEFORE FIRST POLISHING
STEP 2
CREATE OPTIMIZED POLISHING RECIPE FOR FIRST POLISHING
STEP 3
FIRST POLISH WAFER WITH OPTIMIZED POLISHING RECIPE FOR FIRST POLISHING
STEP 4
TRANSFER WAFER TO ANOTHER POLISHING UNIT
STEP 5
OBTAIN FILM THICKNESS PROFILEOF WAFER AFTER FIRST POLISHING
STEP 6
SECOND POLISH WAFER
STEP 7
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER BEFORE FIRST POLISHING
STEP 8
CORRECT RESPONSE MODEL FOR FIRST POLISHING
STEP 9
CREATE NEW OPTIMIZED POLISHING RECIPE FOR FIRST POLISHING
STEP 10
FIRST POLISH NEXT WAFER WITH NEW OPTIMIZED POLISHING RECIPE FOR FIRST POLISHING
STEP 11
TRANSFER NEXT WAFER TO ANOTHER POLISHING UNIT
STEP 12
OBTAIN FILM THICKNESS PROFILE OF NEW WAFER AFTER FIRST POLISHING
STEP 13
SECOND POLISH NEXT WAFER

FIG. 18

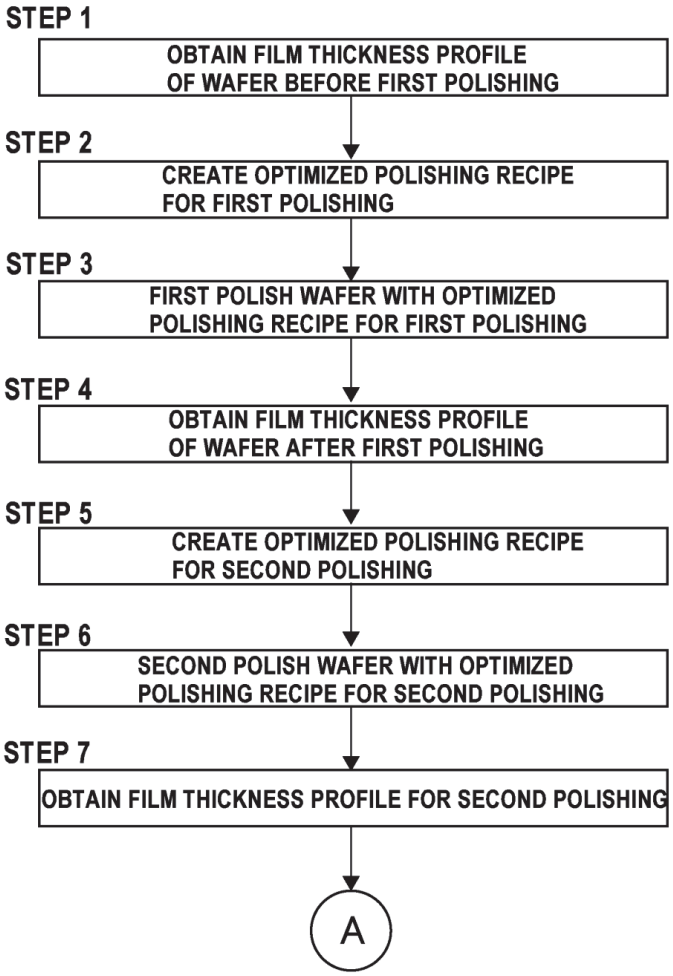
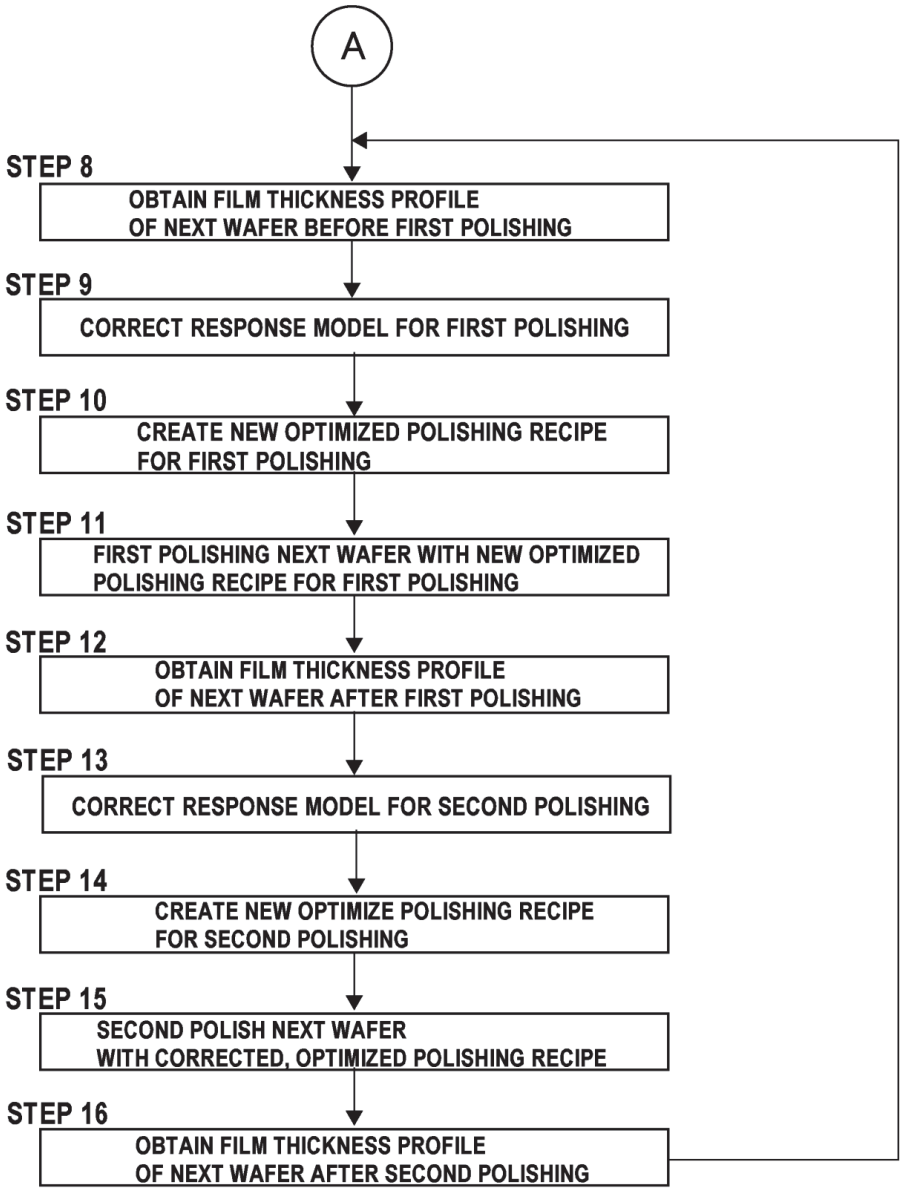

STEP 1
OBTAIN FILM THICKNESS PROFILE OF WAFER BEFORE FIRST POLISHING
STEP 2
CREATE OPTIMIZED POLISHING RECIPE FOR FIRST POLISHING
STEP 3
FIRST POLISH WAFER WITH OPTIMIZED POLISHING RECIPE FOR FIRST POLISHING
STEP 4
OBTAIN FILM THICKNESS PROFILE OF WAFER AFTER FIRST POLISHING
STEP 5
CREATE OPTIMIZED POLISHING RECIPE FOR SECOND POLISHING
STEP 6
SECOND POLISH WAFER WITH OPTIMIZED POLISHING RECIPE FOR SECOND POLISHING
STEP 7
OBTAIN FILM THICKNESS PROFILE FOR SECOND POLISHING
A

FIG. 19


A
STEP 8
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER BEFORE FIRST POLISHING
STEP 9
CORRECT RESPONSE MODEL FOR FIRST POLISHING
STEP 10
CREATE NEW OPTIMIZED POLISHING RECIPE FOR FIRST POLISHING
STEP 11
FIRST POLISHING NEXT WAFER WITH NEW OPTIMIZED POLISHING RECIPE FOR FIRST POLISHING
STEP 12
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER AFTER FIRST POLISHING
STEP 13
CORRECT RESPONSE MODEL FOR SECOND POLISHING
STEP 14
CREATE NEW OPTIMIZE POLISHING RECIPE FOR SECOND POLISHING
STEP 15
SECOND POLISH NEXT WAFER WITH CORRECTED, OPTIMIZED POLISHING RECIPE
STEP 16
OBTAIN FILM THICKNESS PROFILE OF NEXT WAFER AFTER SECOND POLISHING