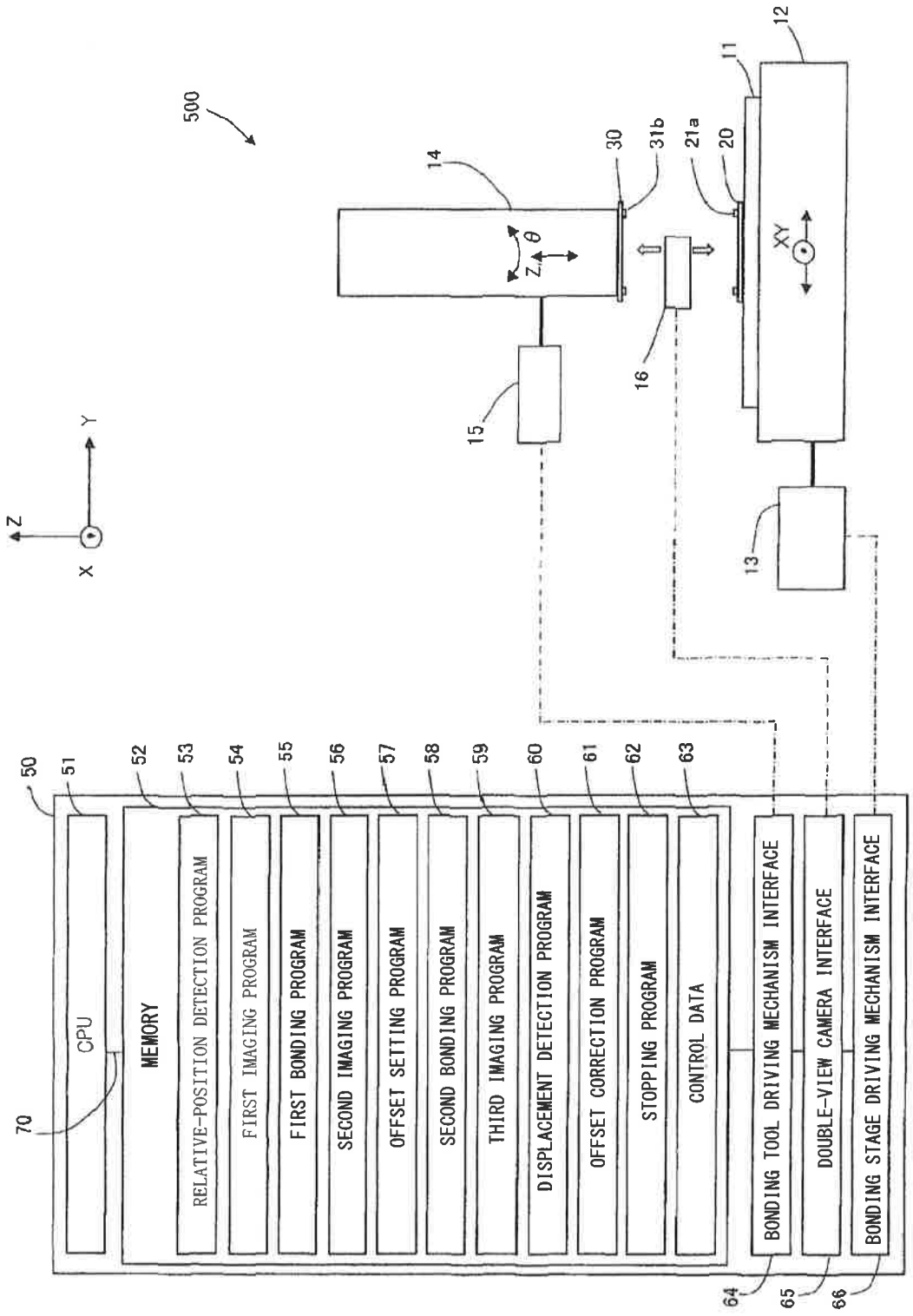

500
14
30
31b
21a
20
11
12
XY
Z
θ
16
15
13
Y
Z
X
50
51
52
53
54
55
56
57
58
59
60
61
62
63
70
CPU
MEMORY
RELATIVE-POSITION DETECTION PROGRAM
FIRST IMAGING PROGRAM
FIRST BONDING PROGRAM
SECOND IMAGING PROGRAM
OFFSET SETTING PROGRAM
SECOND BONDING PROGRAM
THIRD IMAGING PROGRAM
DISPLACEMENT DETECTION PROGRAM
OFFSET CORRECTION PROGRAM
STOPPING PROGRAM
CONTROL DATA
BONDING TOOL DRIVING MECHANISM INTERFACE
DOUBLE-VIEW CAMERA INTERFACE
BONDING STAGE DRIVING MECHANISM INTERFACE
64
65
66

FIG. 1

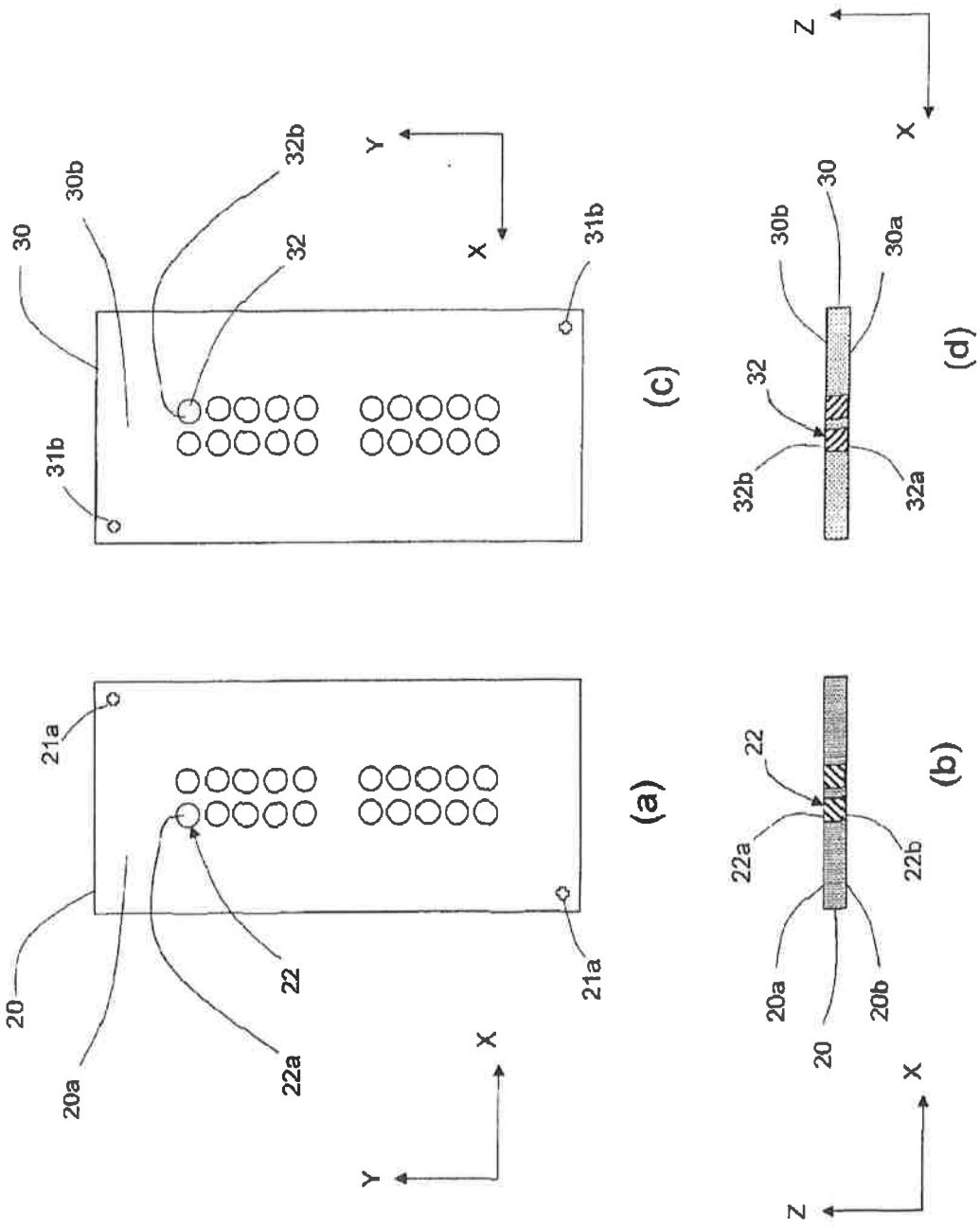

21a
20
22
20a
22a
21a
X
Y
(a)
22
22a
22b
20a
20b
20
X
Z
(b)
30
30b
30a
32
32b
32a
Z
X
(d)
30
30b
32b
32
31b
32a
31b
Y
X
(c)

FIG. 2

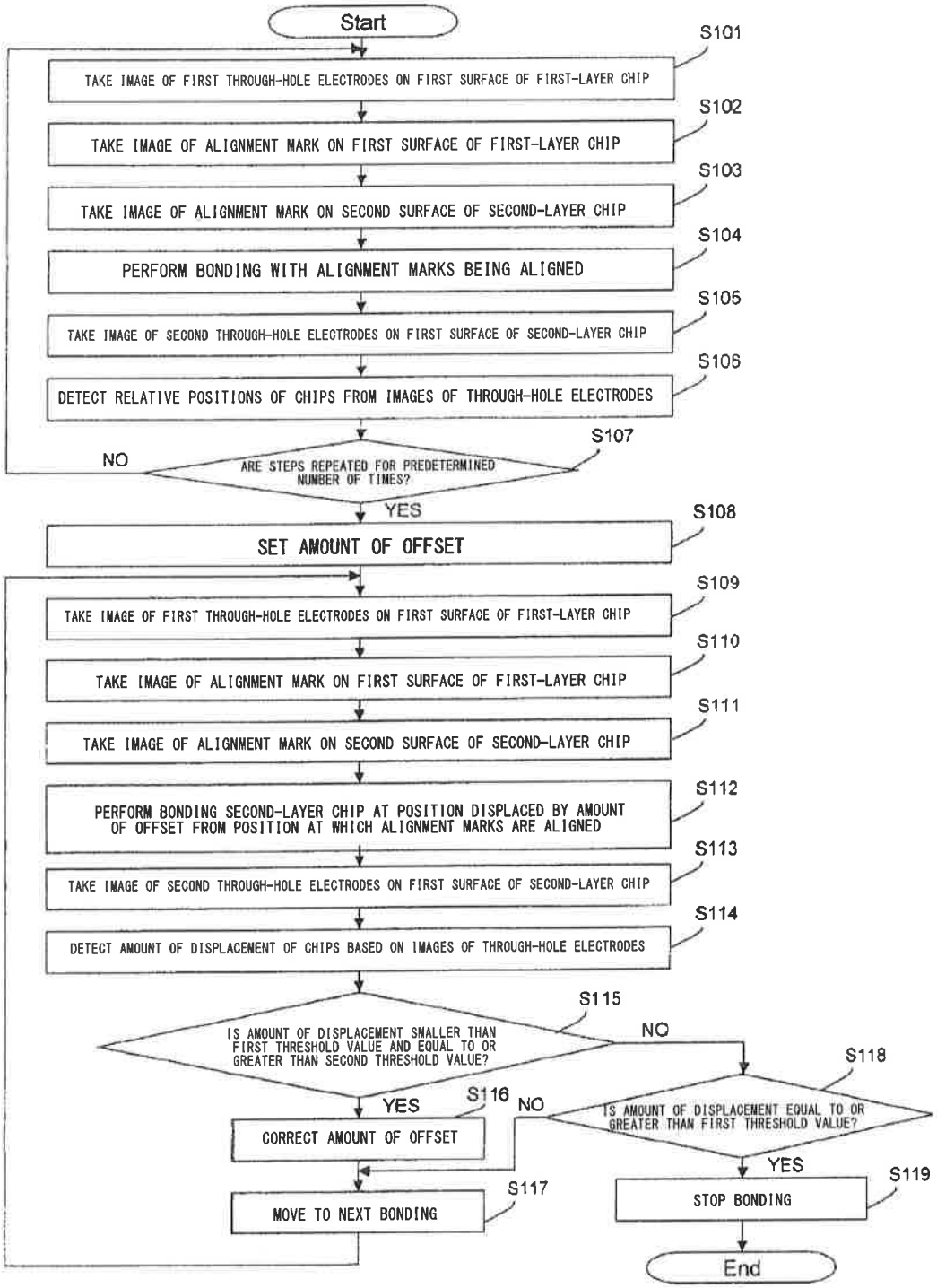

Start
S101
TAKE IMAGE OF FIRST THROUGH-HOLE ELECTRODES ON FIRST SURFACE OF FIRST-LAYER CHIP
S102
TAKE IMAGE OF ALIGNMENT MARK ON FIRST SURFACE OF FIRST-LAYER CHIP
S103
TAKE IMAGE OF ALIGNMENT MARK ON SECOND SURFACE OF SECOND-LAYER CHIP
S104
PERFORM BONDING WITH ALIGNMENT MARKS BEING ALIGNED
S105
TAKE IMAGE OF SECOND THROUGH-HOLE ELECTRODES ON FIRST SURFACE OF SECOND-LAYER CHIP
S106
DETECT RELATIVE POSITIONS OF CHIPS FROM IMAGES OF THROUGH-HOLE ELECTRODES
S107
ARE STEPS REPEATED FOR PREDETERMINED NUMBER OF TIMES?
NO
YES
S108
SET AMOUNT OF OFFSET
S109
TAKE IMAGE OF FIRST THROUGH-HOLE ELECTRODES ON FIRST SURFACE OF FIRST-LAYER CHIP
S110
TAKE IMAGE OF ALIGNMENT MARK ON FIRST SURFACE OF FIRST-LAYER CHIP
S111
TAKE IMAGE OF ALIGNMENT MARK ON SECOND SURFACE OF SECOND-LAYER CHIP
S112
PERFORM BONDING SECOND-LAYER CHIP AT POSITION DISPLACED BY AMOUNT OF OFFSET FROM POSITION AT WHICH ALIGNMENT MARKS ARE ALIGNED
S113
TAKE IMAGE OF SECOND THROUGH-HOLE ELECTRODES ON FIRST SURFACE OF SECOND-LAYER CHIP
S114
DETECT AMOUNT OF DISPLACEMENT OF CHIPS BASED ON IMAGES OF THROUGH-HOLE ELECTRODES
S115
IS AMOUNT OF DISPLACEMENT SMALLER THAN FIRST THRESHOLD VALUE AND EQUAL TO OR GREATER THAN SECOND THRESHOLD VALUE?
NO
YES
S116
CORRECT AMOUNT OF OFFSET
S117
MOVE TO NEXT BONDING
S118
IS AMOUNT OF DISPLACEMENT EQUAL TO OR GREATER THAN FIRST THRESHOLD VALUE?
NO
YES
S119
STOP BONDING
End

FIG. 3

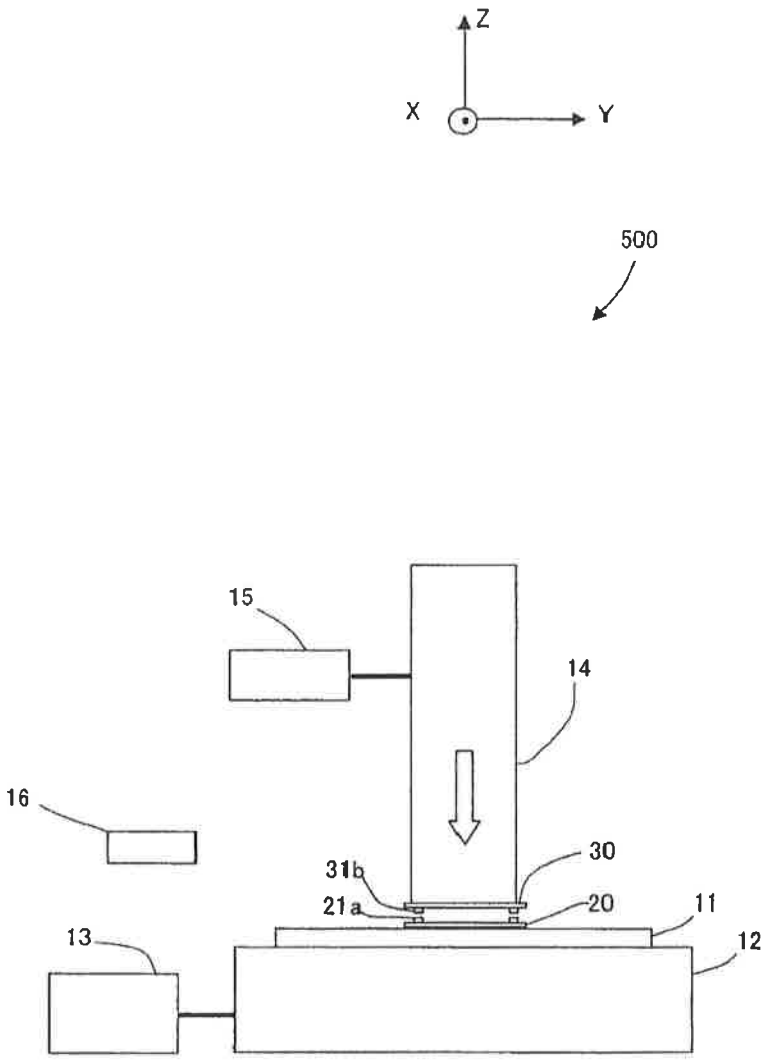


FIG. 4

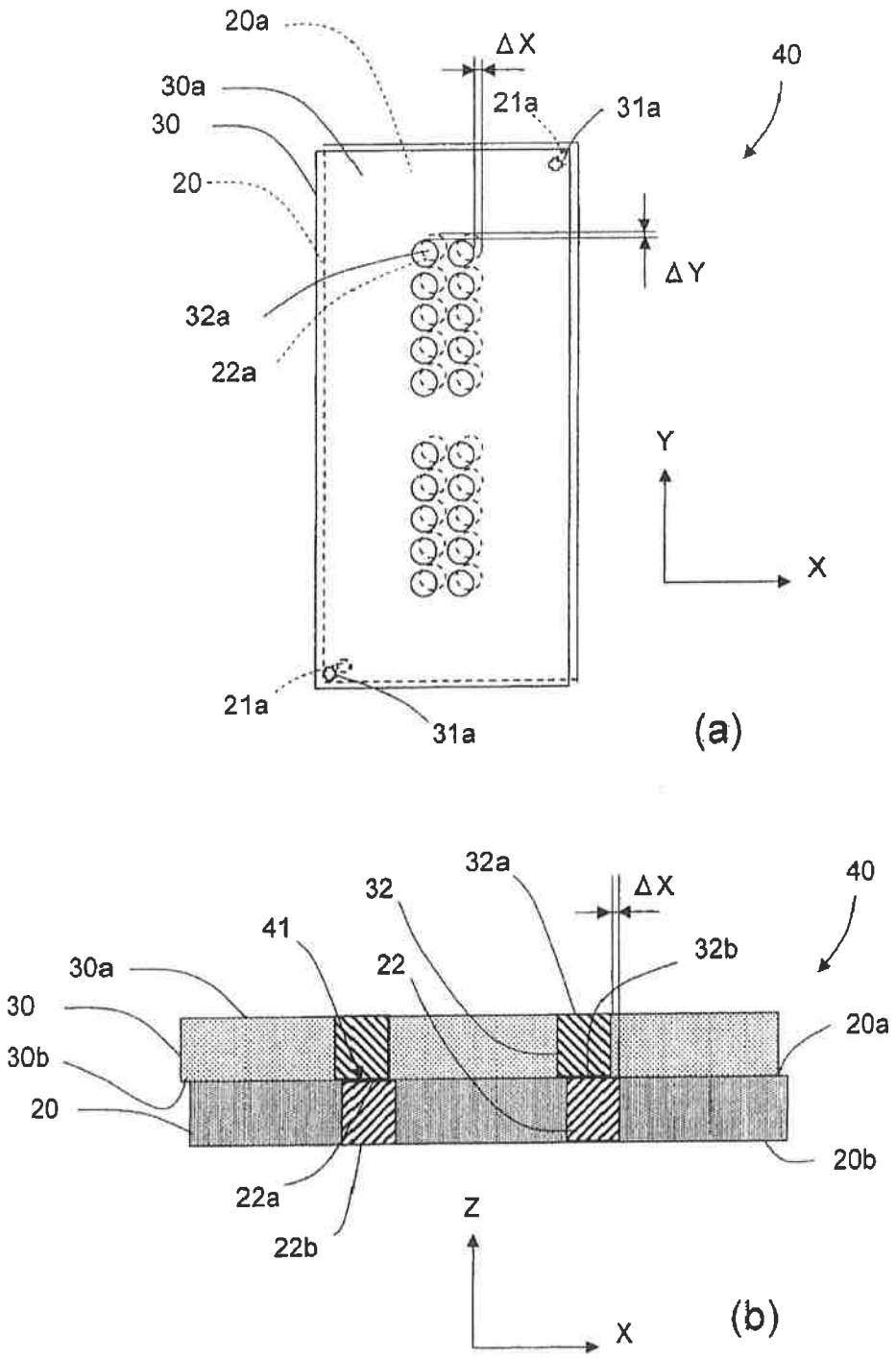

20a
ΔX
40
30a
21a
31a
30
20
ΔY
32a
22a
Y
X
21a
31a
(a)
32a
ΔX
40
32
41
32b
22
30a
30
20a
30b
20
20b
22a
22b
Z
X
(b)

FIG. 5

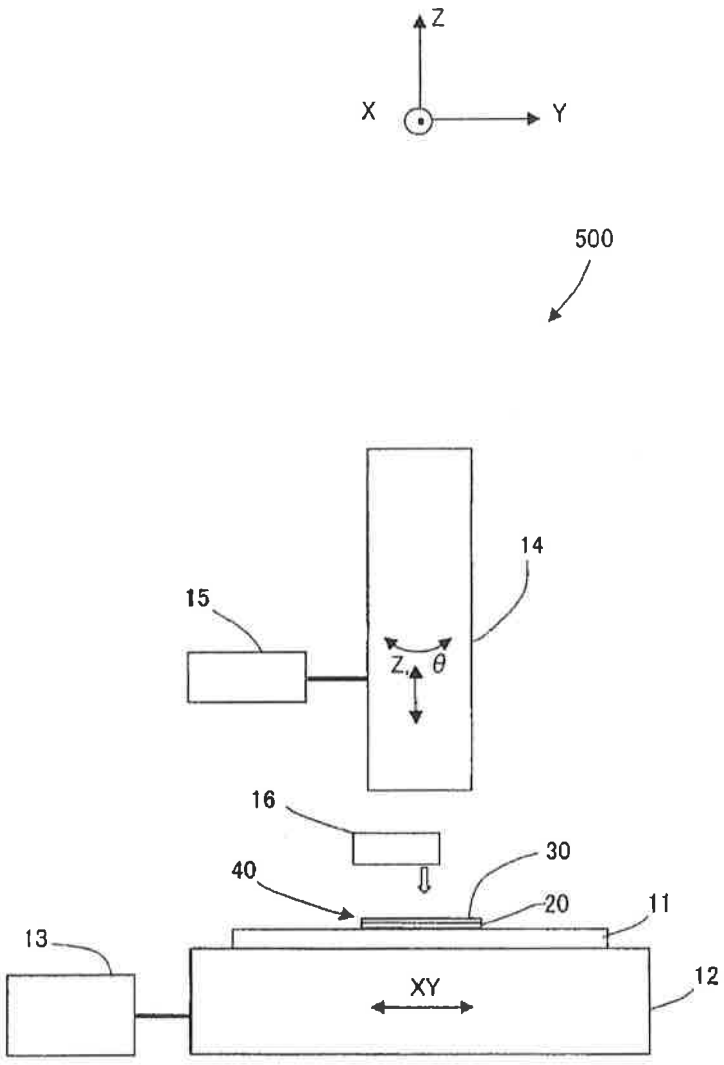


FIG. 6

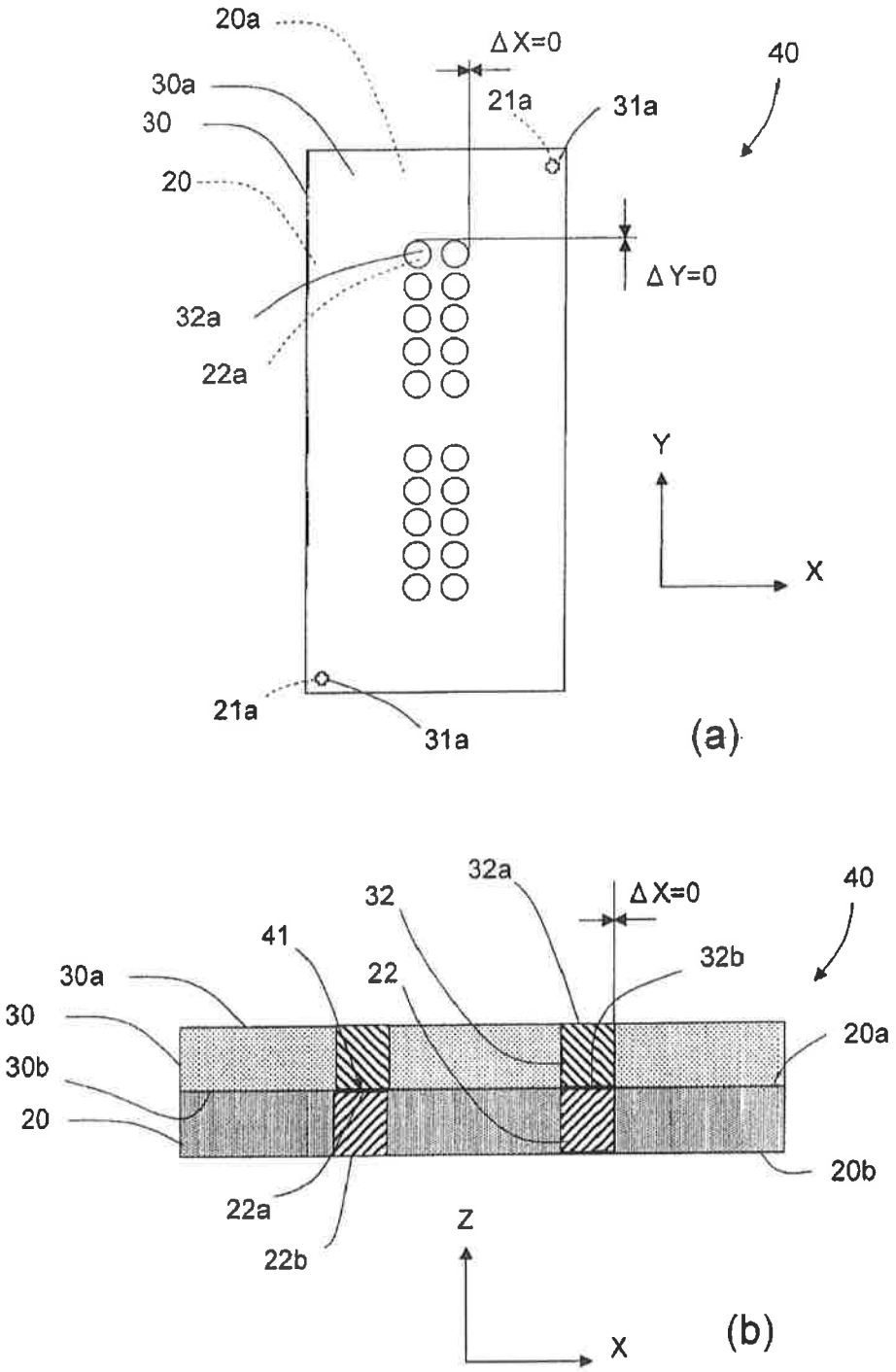

20a
ΔX=0
40
30a
21a
31a
30
20
ΔY=0
32a
22a
Y
X
21a
31a
(a)
32a
32
ΔX=0
40
41
32b
30a
22
30
20a
30b
20
20b
22a
22b
Z
X
(b)

FIG. 7

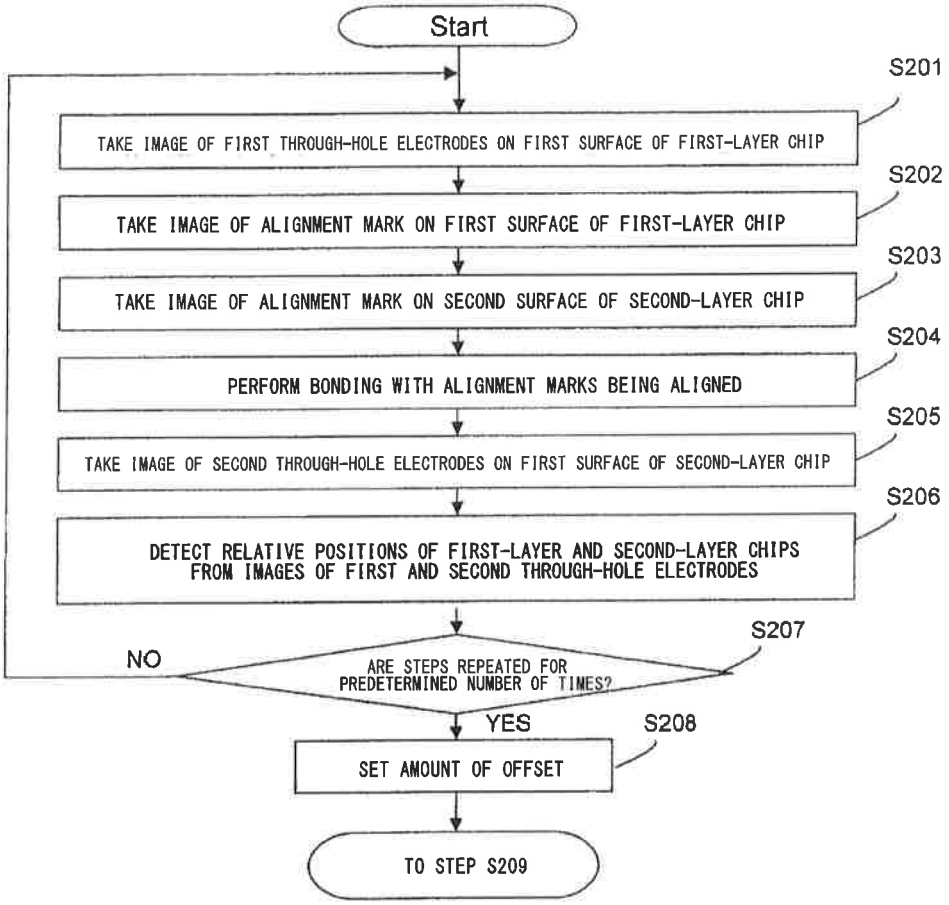

Start
S201
TAKE IMAGE OF FIRST THROUGH-HOLE ELECTRODES ON FIRST SURFACE OF FIRST-LAYER CHIP
S202
TAKE IMAGE OF ALIGNMENT MARK ON FIRST SURFACE OF FIRST-LAYER CHIP
S203
TAKE IMAGE OF ALIGNMENT MARK ON SECOND SURFACE OF SECOND-LAYER CHIP
S204
PERFORM BONDING WITH ALIGNMENT MARKS BEING ALIGNED
S205
TAKE IMAGE OF SECOND THROUGH-HOLE ELECTRODES ON FIRST SURFACE OF SECOND-LAYER CHIP
S206
DETECT RELATIVE POSITIONS OF FIRST-LAYER AND SECOND-LAYER CHIPS FROM IMAGES OF FIRST AND SECOND THROUGH-HOLE ELECTRODES
S207
ARE STEPS REPEATED FOR PREDETERMINED NUMBER OF TIMES?
NO
YES
S208
SET AMOUNT OF OFFSET
TO STEP S209

FIG. 8

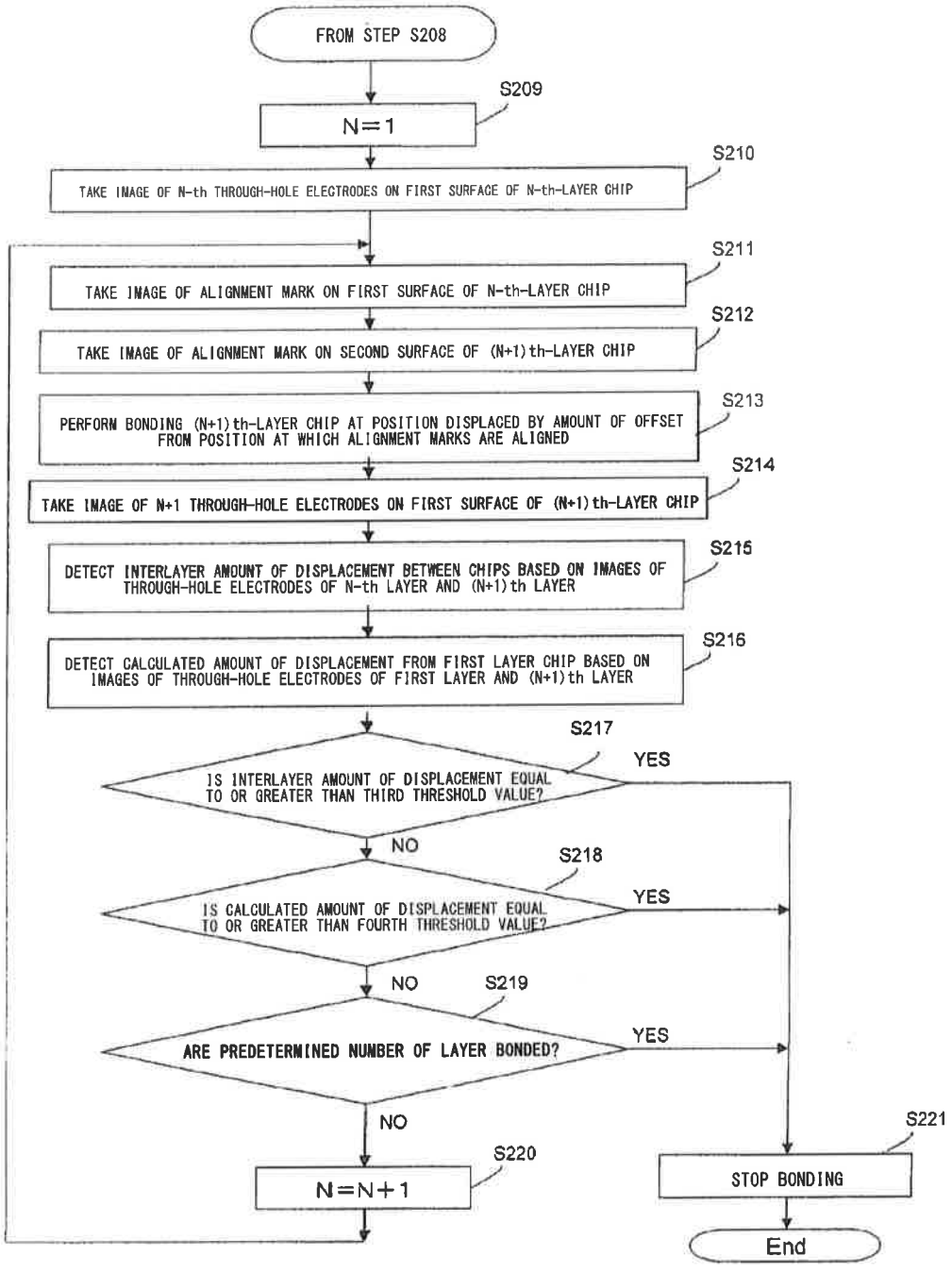

FROM STEP S208
S209
N=1
S210
TAKE IMAGE OF N-th THROUGH-HOLE ELECTRODES ON FIRST SURFACE OF N-th-LAYER CHIP
S211
TAKE IMAGE OF ALIGNMENT MARK ON FIRST SURFACE OF N-th-LAYER CHIP
S212
TAKE IMAGE OF ALIGNMENT MARK ON SECOND SURFACE OF (N+1)th-LAYER CHIP
S213
PERFORM BONDING (N+1)th-LAYER CHIP AT POSITION DISPLACED BY AMOUNT OF OFFSET FROM POSITION AT WHICH ALIGNMENT MARKS ARE ALIGNED
S214
TAKE IMAGE OF N+1 THROUGH-HOLE ELECTRODES ON FIRST SURFACE OF (N+1)th-LAYER CHIP
S215
DETECT INTERLAYER AMOUNT OF DISPLACEMENT BETWEEN CHIPS BASED ON IMAGES OF THROUGH-HOLE ELECTRODES OF N-th LAYER AND (N+1)th LAYER
S216
DETECT CALCULATED AMOUNT OF DISPLACEMENT FROM FIRST LAYER CHIP BASED ON IMAGES OF THROUGH-HOLE ELECTRODES OF FIRST LAYER AND (N+1)th LAYER
S217
IS INTERLAYER AMOUNT OF DISPLACEMENT EQUAL TO OR GREATER THAN THIRD THRESHOLD VALUE?
YES
NO
S218
IS CALCULATED AMOUNT OF DISPLACEMENT EQUAL TO OR GREATER THAN FOURTH THRESHOLD VALUE?
YES
NO
S219
ARE PREDETERMINED NUMBER OF LAYER BONDED?
YES
NO
S220
N=N+1
S221
STOP BONDING
End

FIG. 9

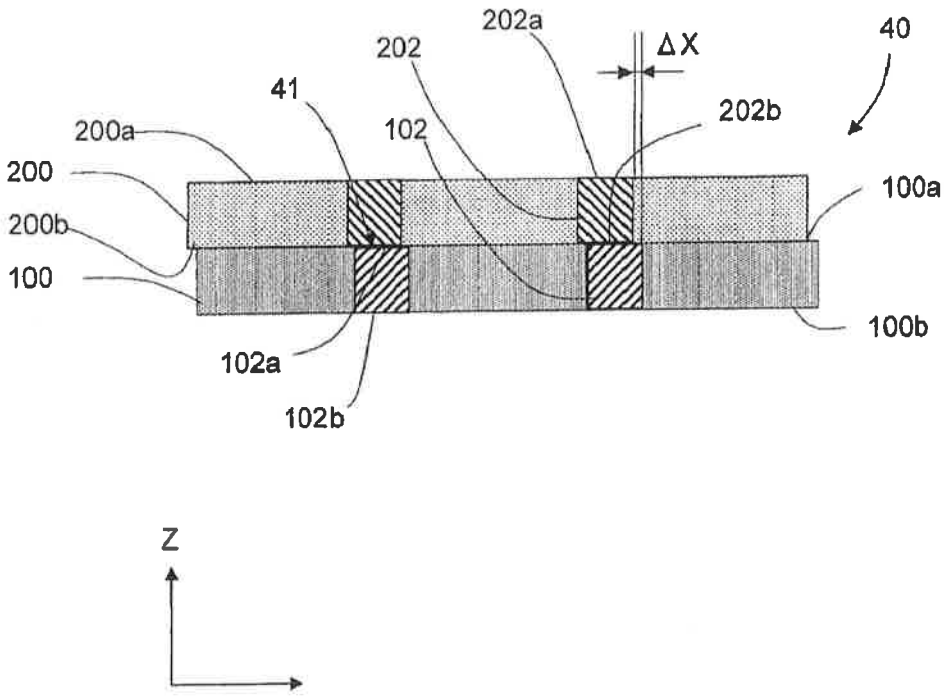
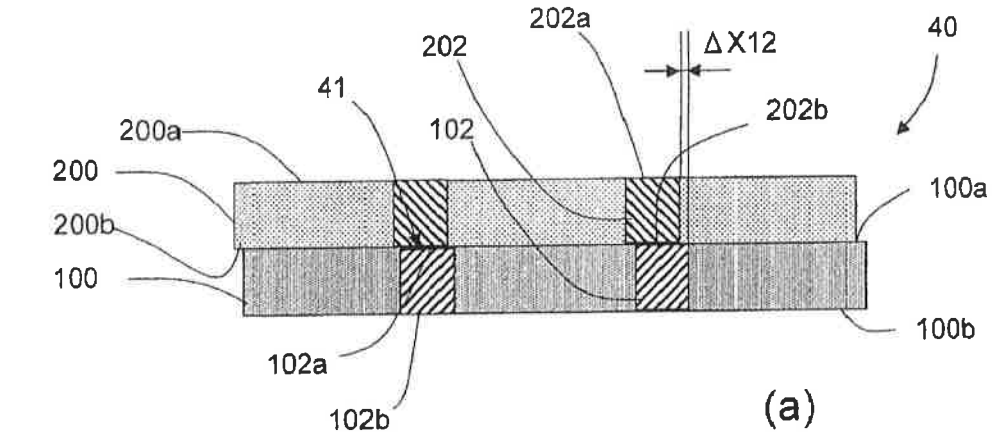

202a
ΔX
40
202
41
202b
102
200a
200
100a
200b
100
100b
102a
102b
Z

FIG. 10


202a
ΔX12
40
202
41
202b
102
200a
200
100a
200b
100
100b
102a
102b
(a)

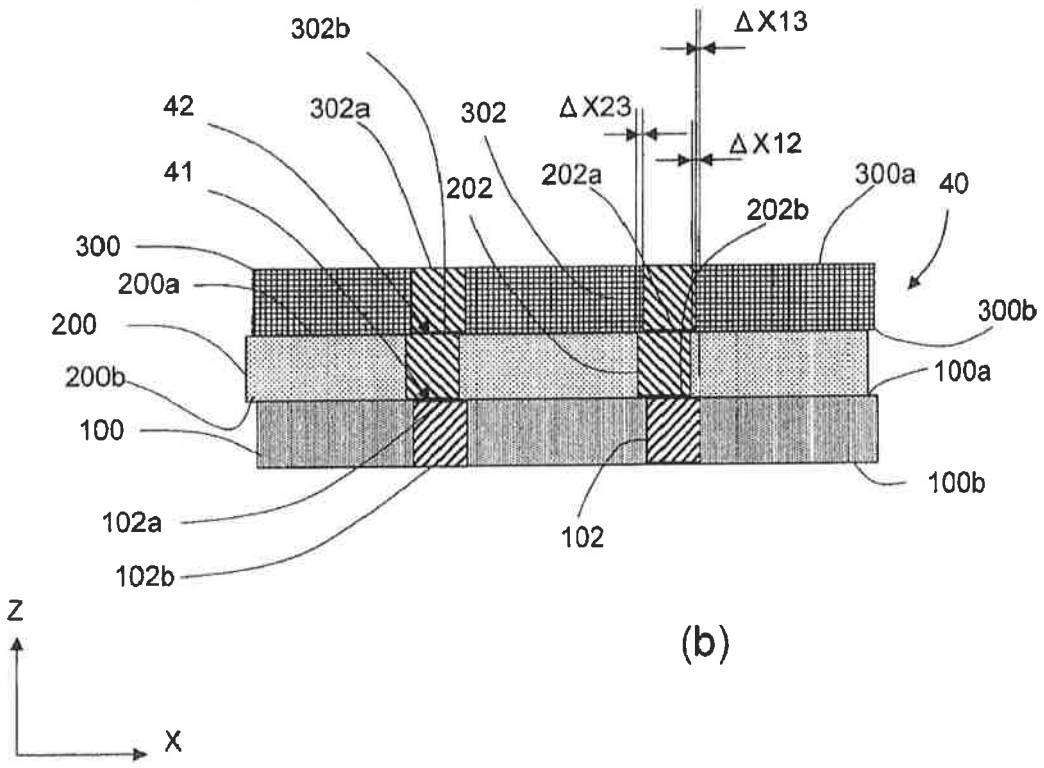

302b
ΔX13
42
302a
302
ΔX23
ΔX12
41
202a
300a
40
202
202b
300
200a
300b
200
200b
100a
100
100b
102a
102
102b
Z
X
(b)

FIG. 11