FIG. 1

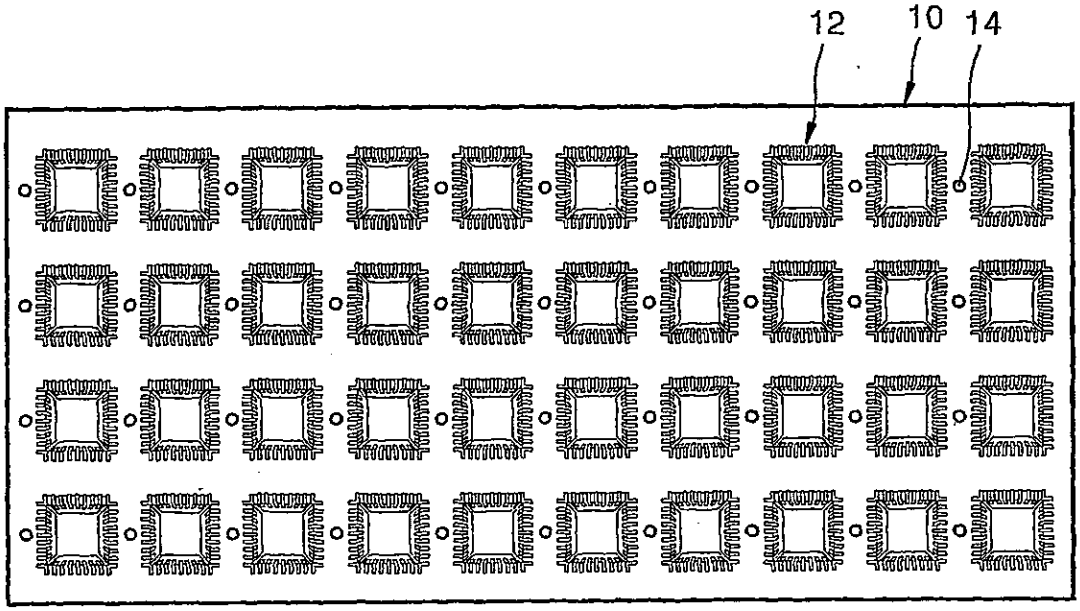


FIG. 2

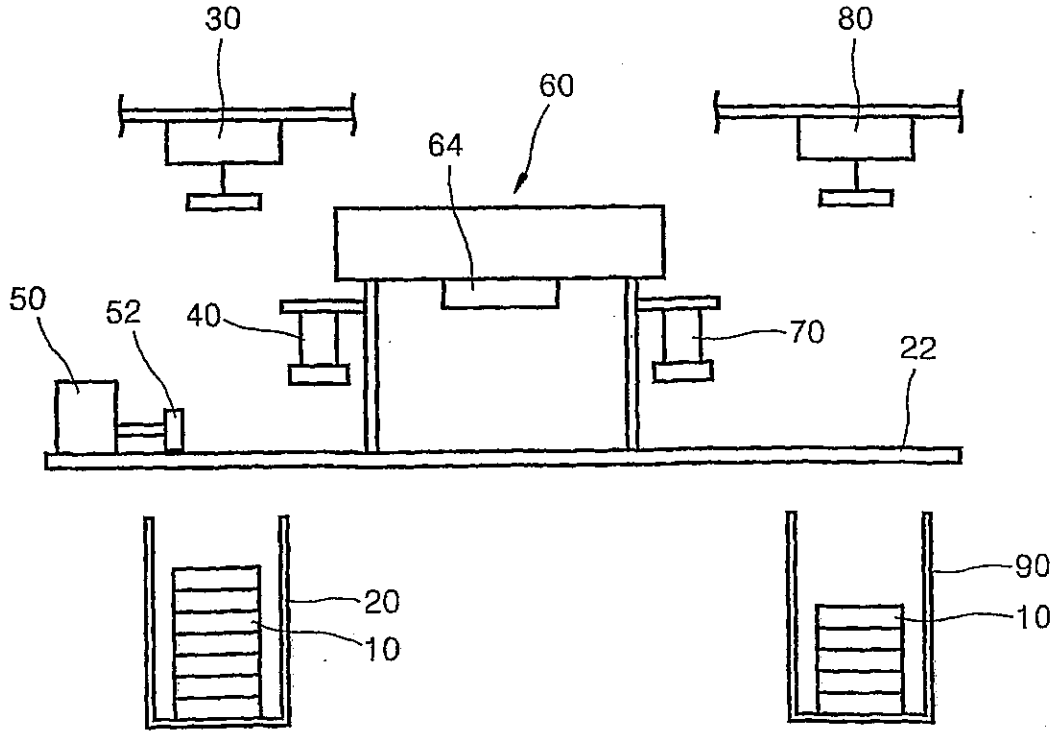


FIG. 3

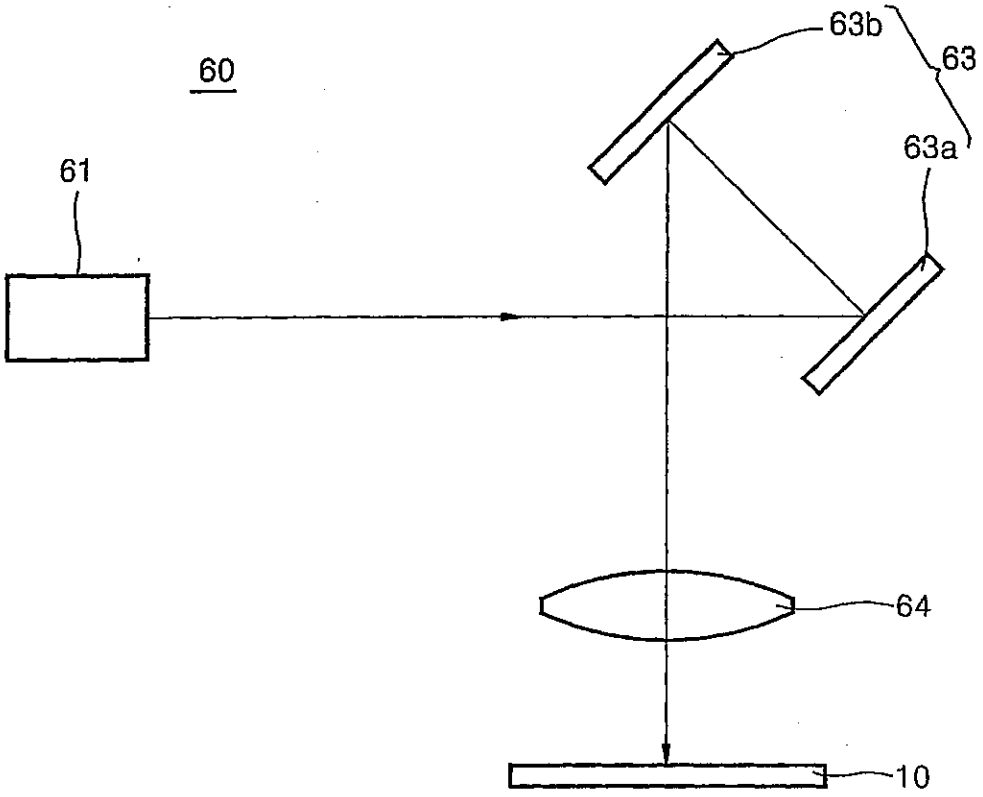


FIG. 4

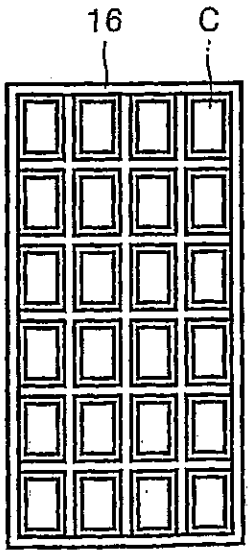


FIG. 5

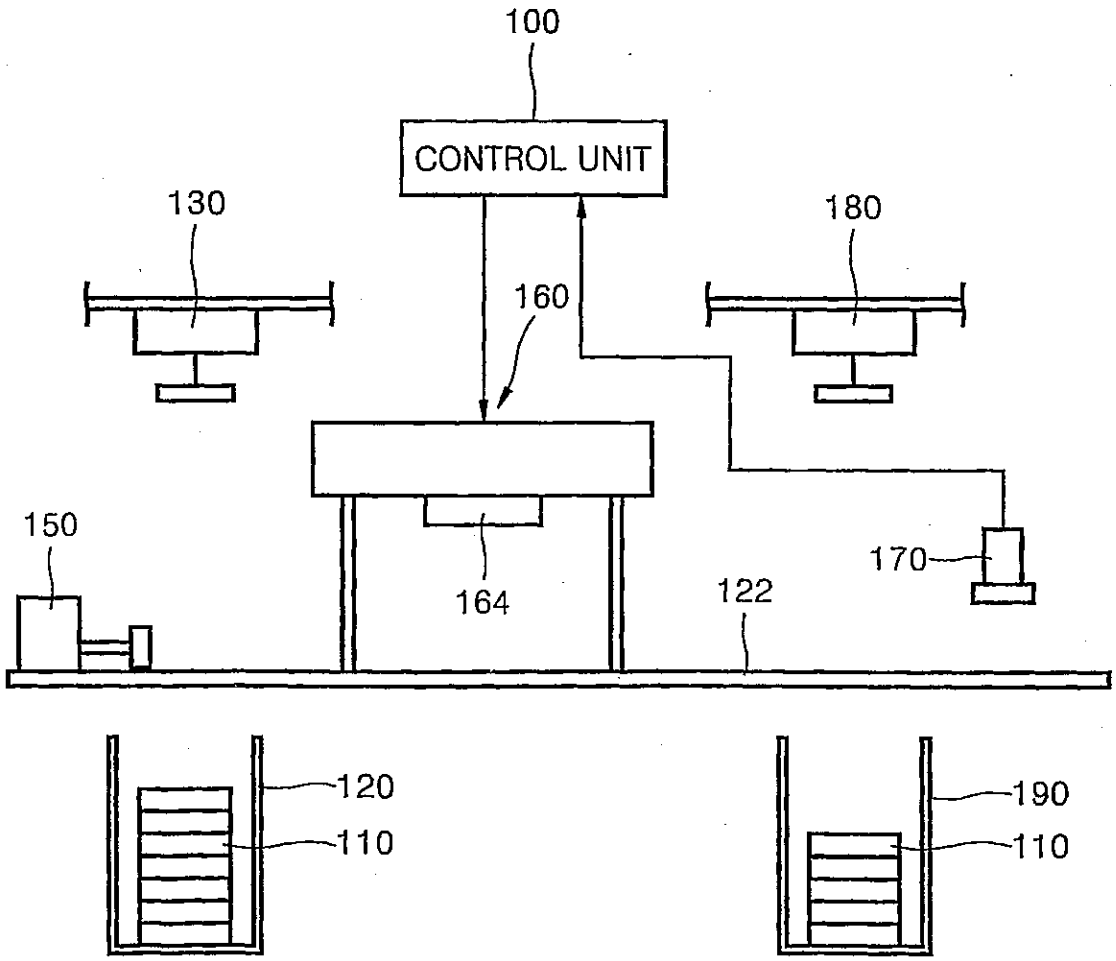


FIG. 6

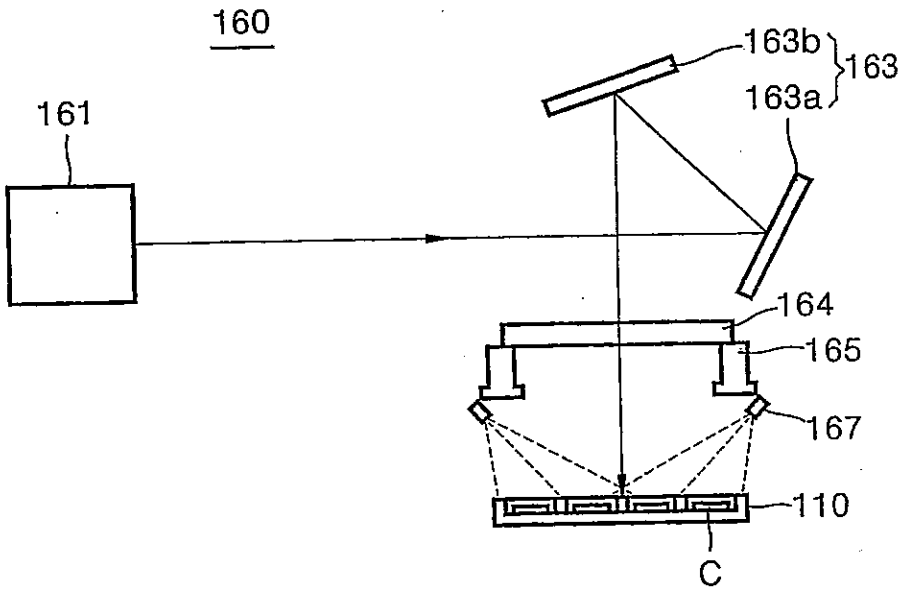


FIG. 7A

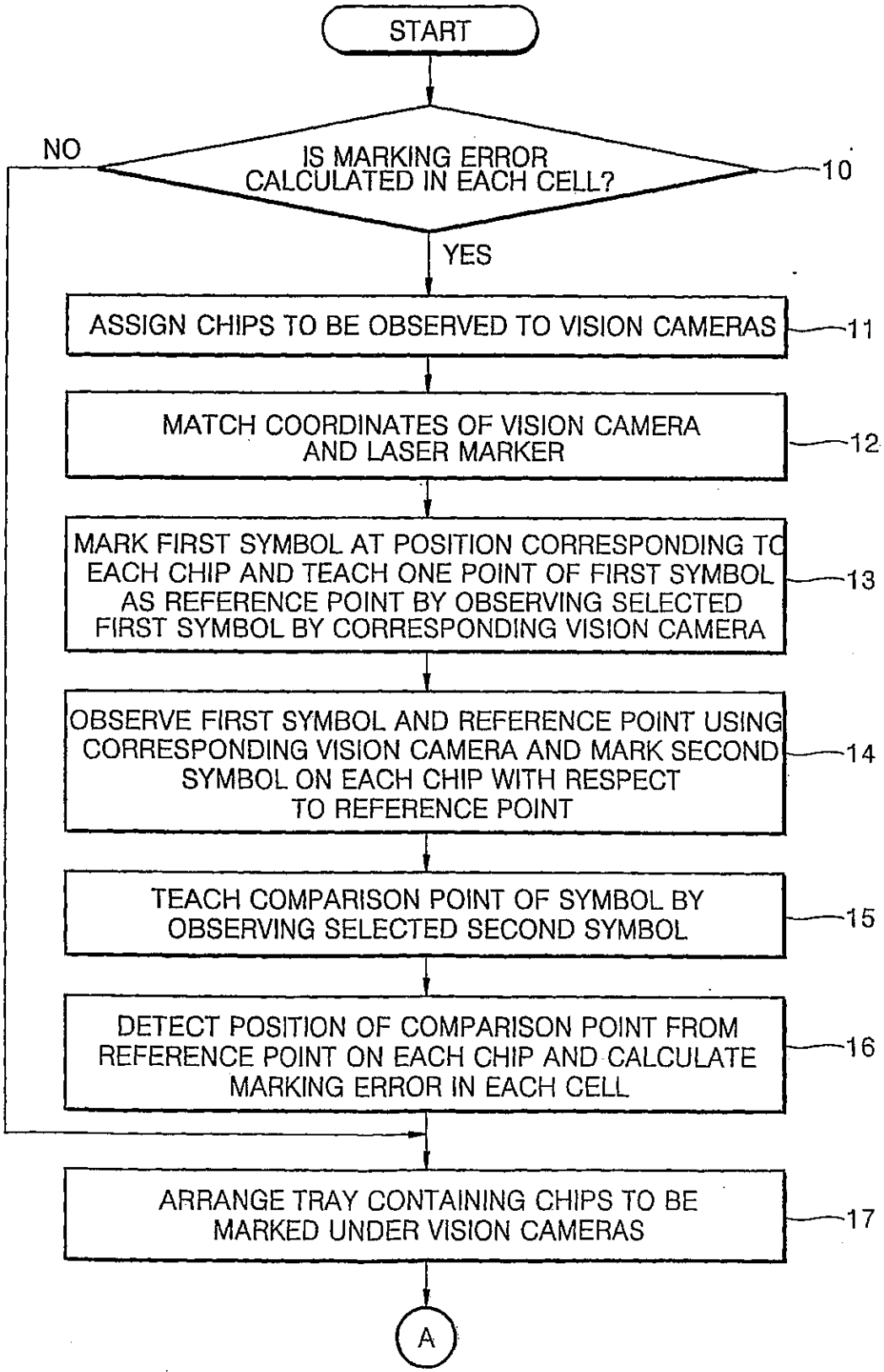

START
IS MARKING ERROR CALCULATED IN EACH CELL?
NO
YES
10
ASSIGN CHIPS TO BE OBSERVED TO VISION CAMERAS
11
MATCH COORDINATES OF VISION CAMERA AND LASER MARKER
12
MARK FIRST SYMBOL AT POSITION CORRESPONDING TO EACH CHIP AND TEACH ONE POINT OF FIRST SYMBOL AS REFERENCE POINT BY OBSERVING SELECTED FIRST SYMBOL BY CORRESPONDING VISION CAMERA
13
OBSERVE FIRST SYMBOL AND REFERENCE POINT USING CORRESPONDING VISION CAMERA AND MARK SECOND SYMBOL ON EACH CHIP WITH RESPECT TO REFERENCE POINT
14
TEACH COMPARISON POINT OF SYMBOL BY OBSERVING SELECTED SECOND SYMBOL
15
DETECT POSITION OF COMPARISON POINT FROM REFERENCE POINT ON EACH CHIP AND CALCULATE MARKING ERROR IN EACH CELL
16
ARRANGE TRAY CONTAINING CHIPS TO BE MARKED UNDER VISION CAMERAS
17
A

FIG. 7B

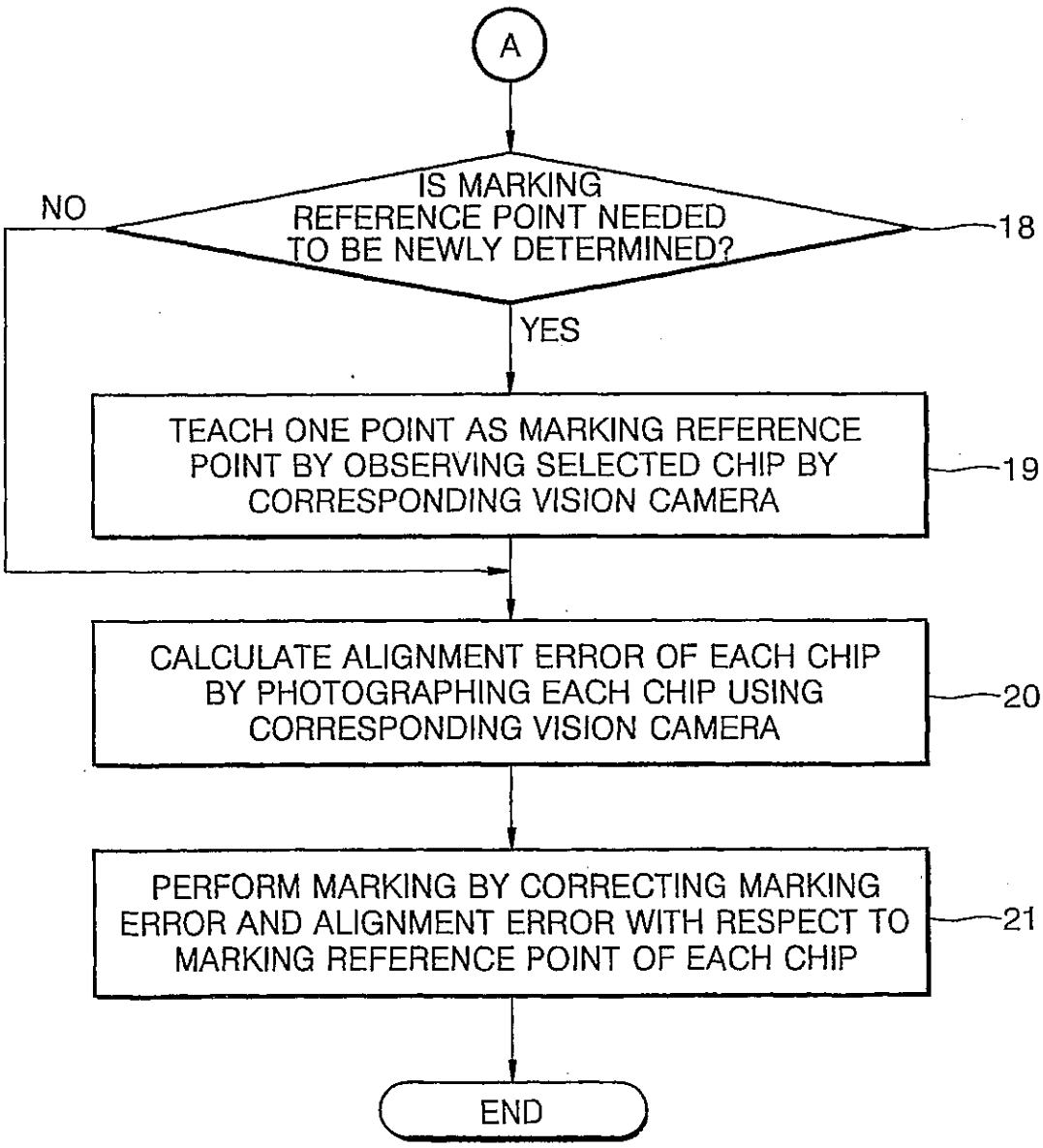

A
IS MARKING REFERENCE POINT NEEDED TO BE NEWLY DETERMINED?
18
NO
YES
TEACH ONE POINT AS MARKING REFERENCE POINT BY OBSERVING SELECTED CHIP BY CORRESPONDING VISION CAMERA
19
CALCULATE ALIGNMENT ERROR OF EACH CHIP BY PHOTOGRAPHING EACH CHIP USING CORRESPONDING VISION CAMERA
20
PERFORM MARKING BY CORRECTING MARKING ERROR AND ALIGNMENT ERROR WITH RESPECT TO MARKING REFERENCE POINT OF EACH CHIP
21
END

FIG. 8

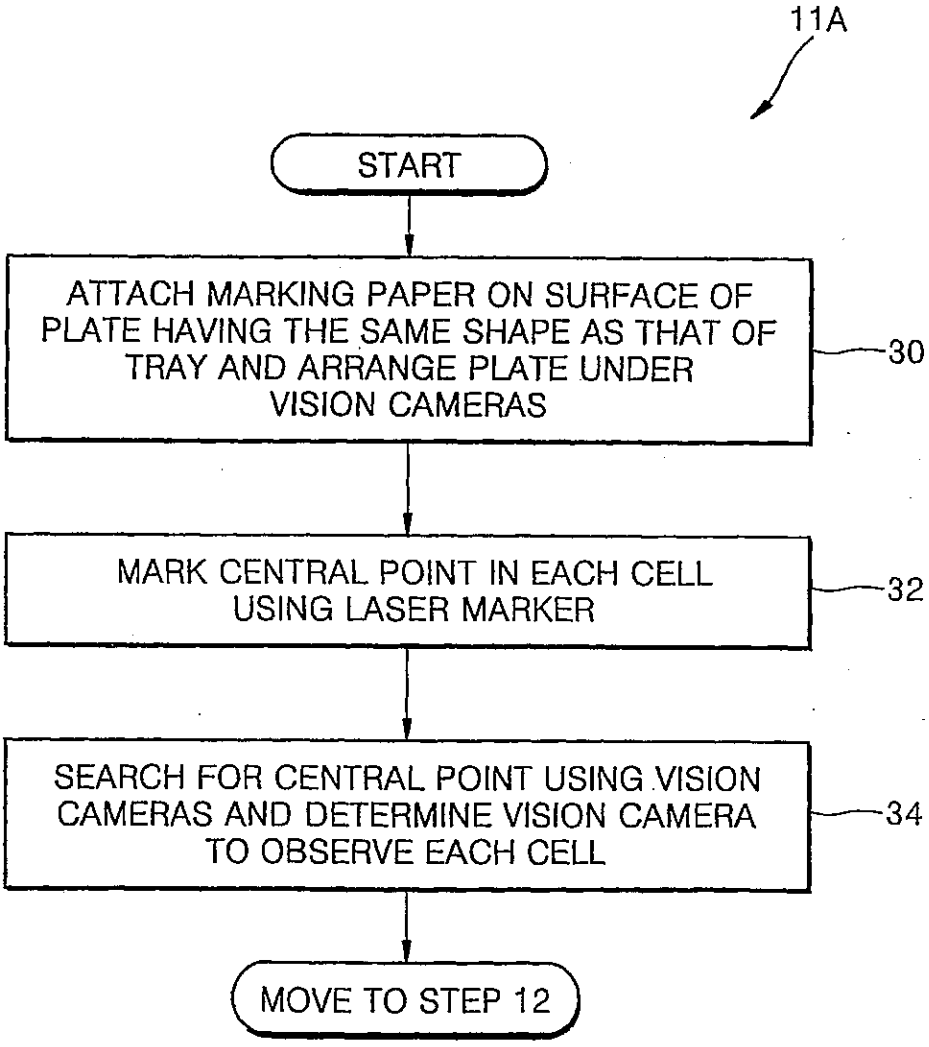

11A
START
ATTACH MARKING PAPER ON SURFACE OF PLATE HAVING THE SAME SHAPE AS THAT OF TRAY AND ARRANGE PLATE UNDER VISION CAMERAS
30
MARK CENTRAL POINT IN EACH CELL USING LASER MARKER
32
SEARCH FOR CENTRAL POINT USING VISION CAMERAS AND DETERMINE VISION CAMERA TO OBSERVE EACH CELL
34
MOVE TO STEP 12

FIG. 9

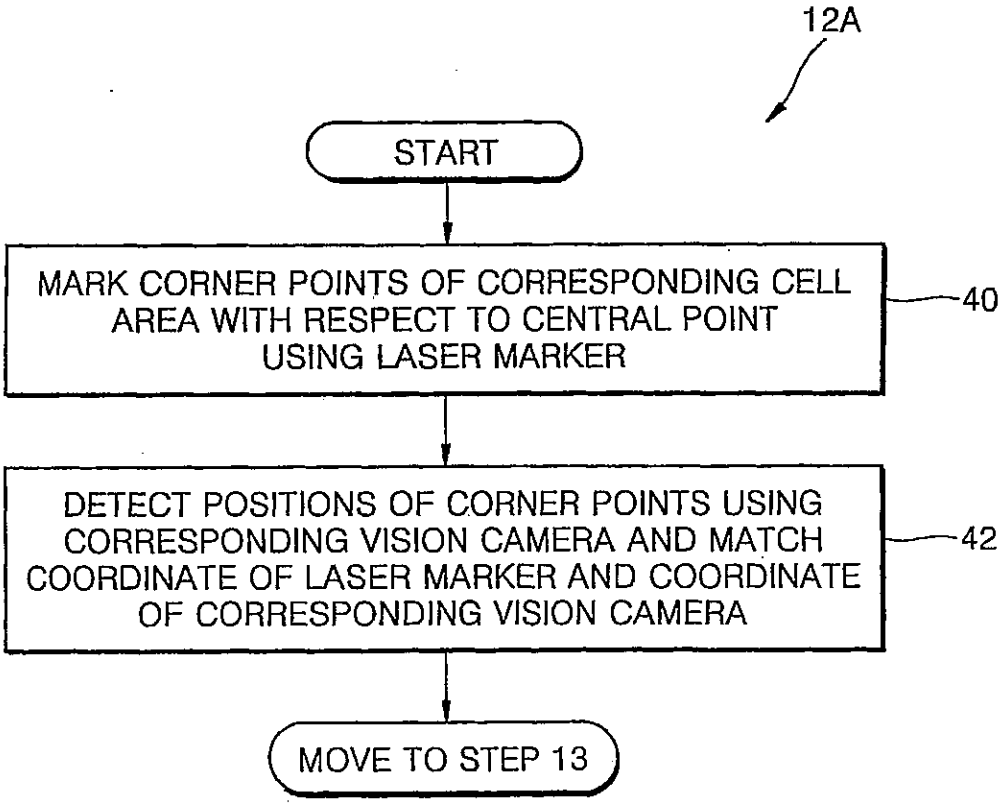

12A
START
MARK CORNER POINTS OF CORRESPONDING CELL AREA WITH RESPECT TO CENTRAL POINT USING LASER MARKER
40
DETECT POSITIONS OF CORNER POINTS USING CORRESPONDING VISION CAMERA AND MATCH COORDINATE OF LASER MARKER AND COORDINATE OF CORRESPONDING VISION CAMERA
42
MOVE TO STEP 13

FIG. 10

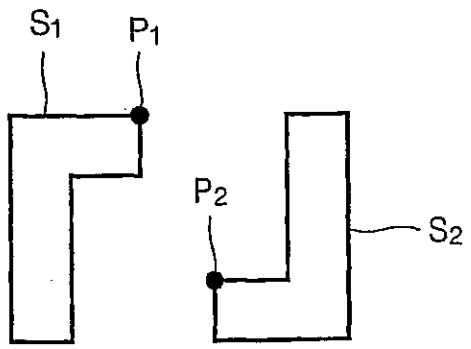

S1
P1
P2
S2

FIG. 11

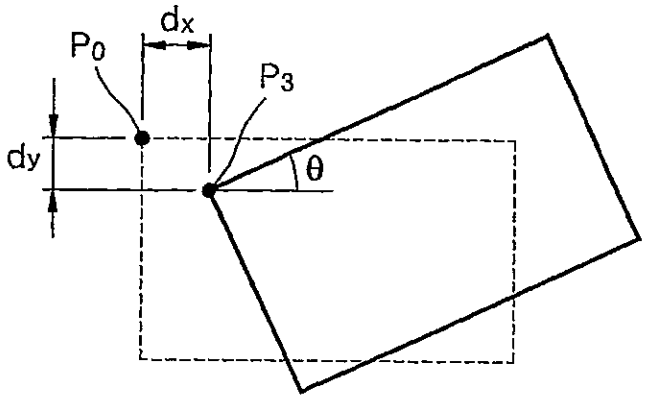
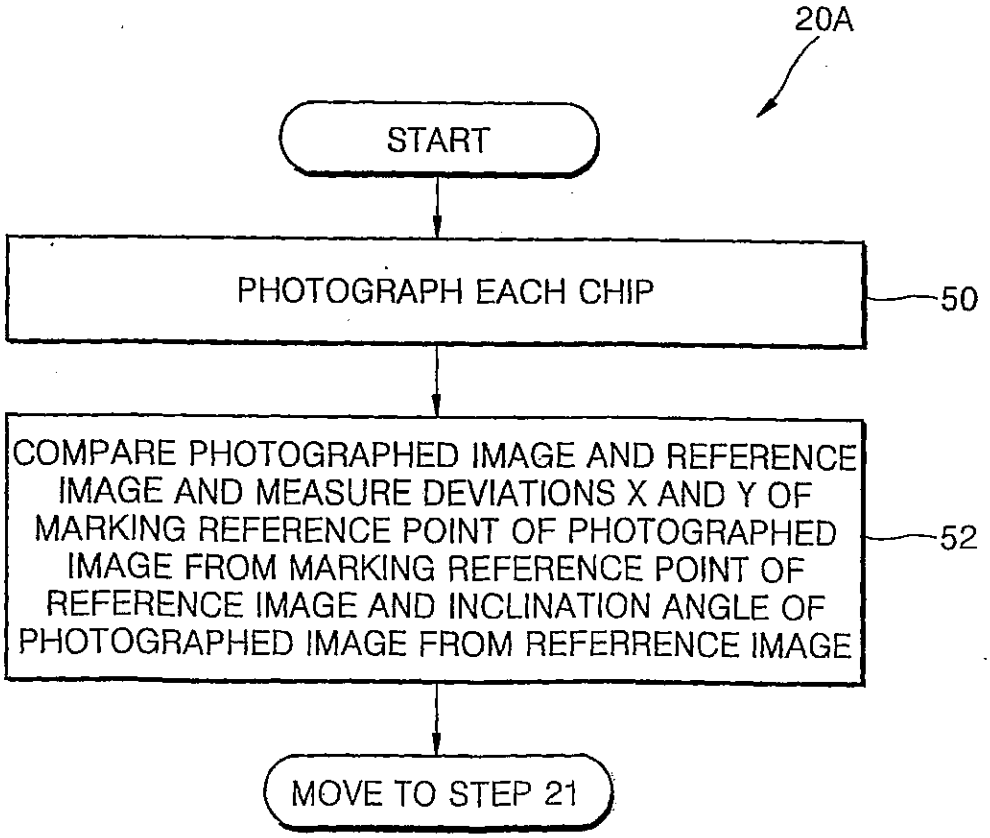

dx
P0
P3
dy
θ

FIG. 12


20A
START
PHOTOGRAPH EACH CHIP
50
COMPARE PHOTOGRAPHED IMAGE AND REFERENCE IMAGE AND MEASURE DEVIATIONS X AND Y OF MARKING REFERENCE POINT OF PHOTOGRAPHED IMAGE FROM MARKING REFERENCE POINT OF REFERENCE IMAGE AND INCLINATION ANGLE OF PHOTOGRAPHED IMAGE FROM REFERRENCE IMAGE
52
MOVE TO STEP 21