FIG.1

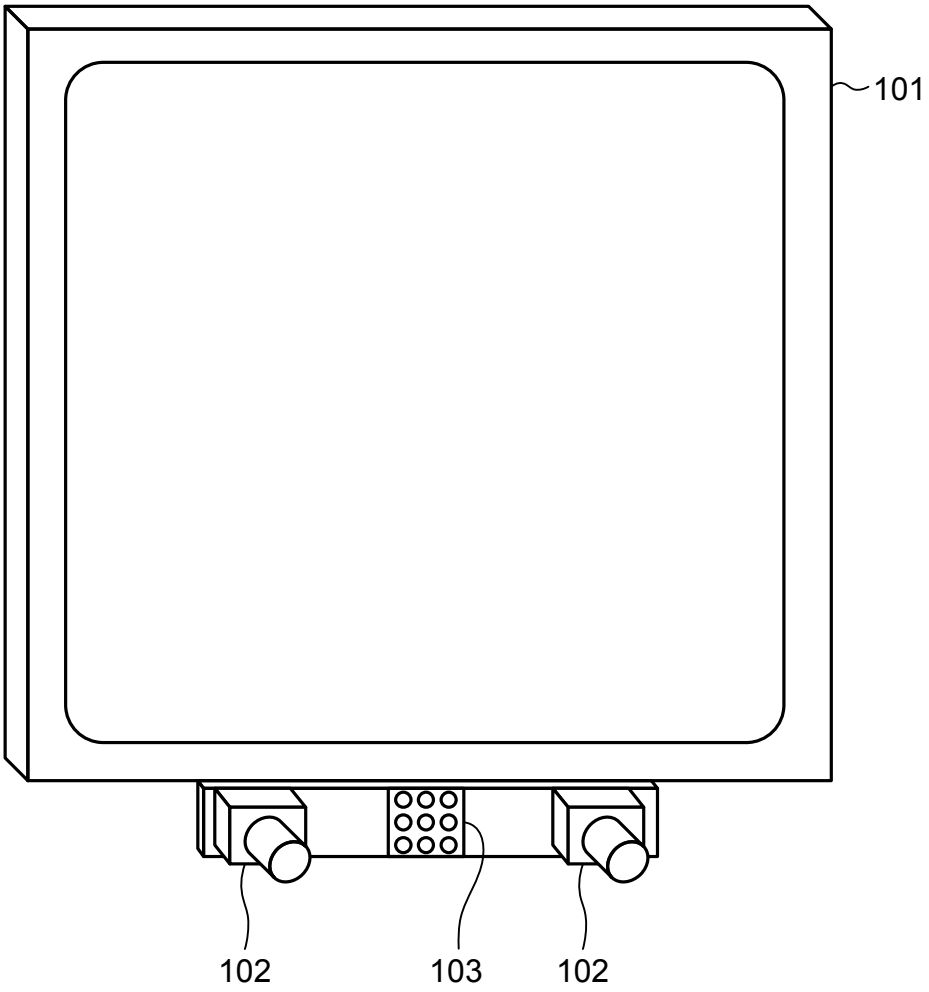


FIG.2

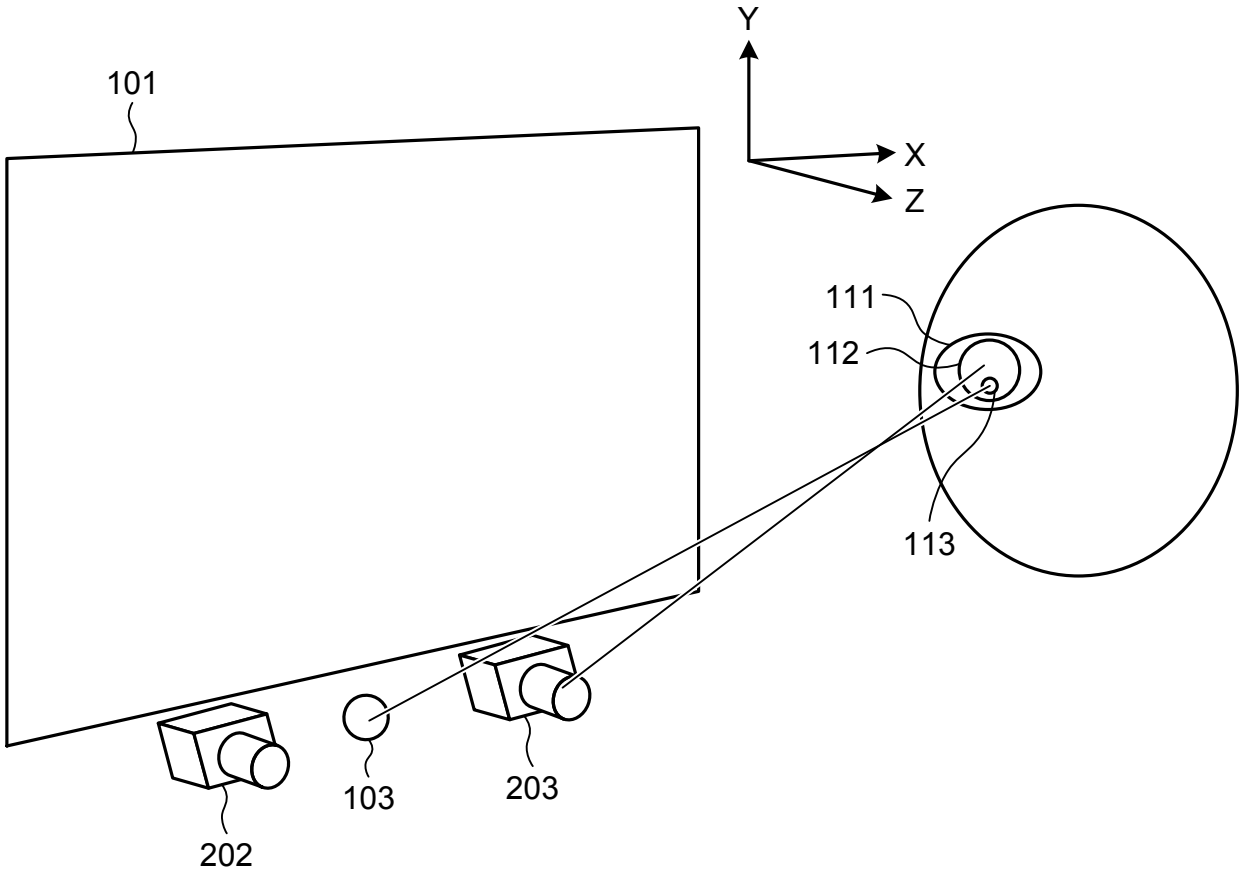


FIG.3

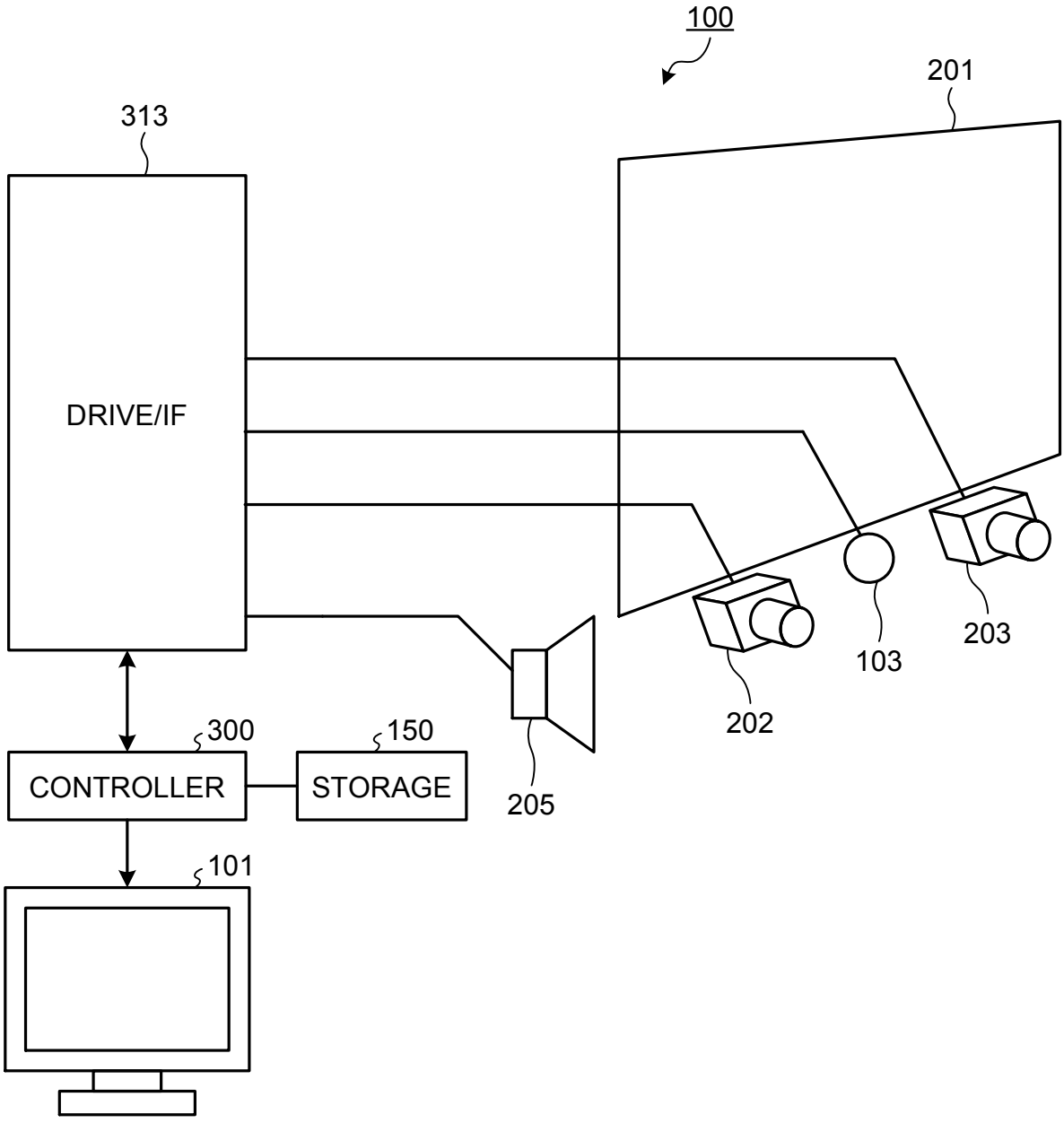

100
201
313
DRIVE/IF
202
103
203
205
300
150
CONTROLLER
STORAGE
101

FIG.4

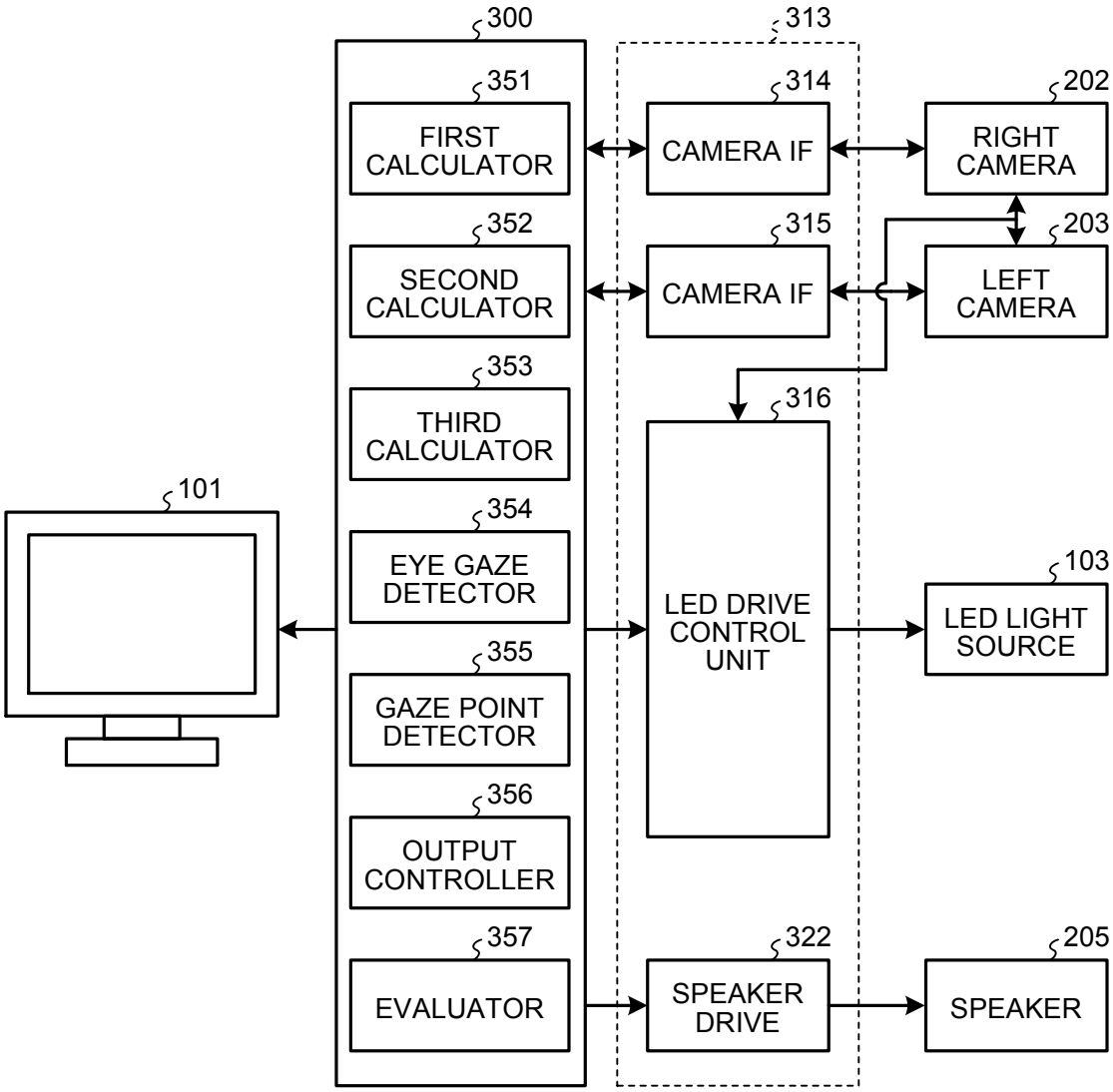

300
313
351
FIRST CALCULATOR
314
CAMERA IF
202
RIGHT CAMERA
352
SECOND CALCULATOR
315
CAMERA IF
203
LEFT CAMERA
353
THIRD CALCULATOR
316
101
354
EYE GAZE DETECTOR
LED DRIVE CONTROL UNIT
103
LED LIGHT SOURCE
355
GAZE POINT DETECTOR
356
OUTPUT CONTROLLER
357
EVALUATOR
322
SPEAKER DRIVE
205
SPEAKER

FIG.5

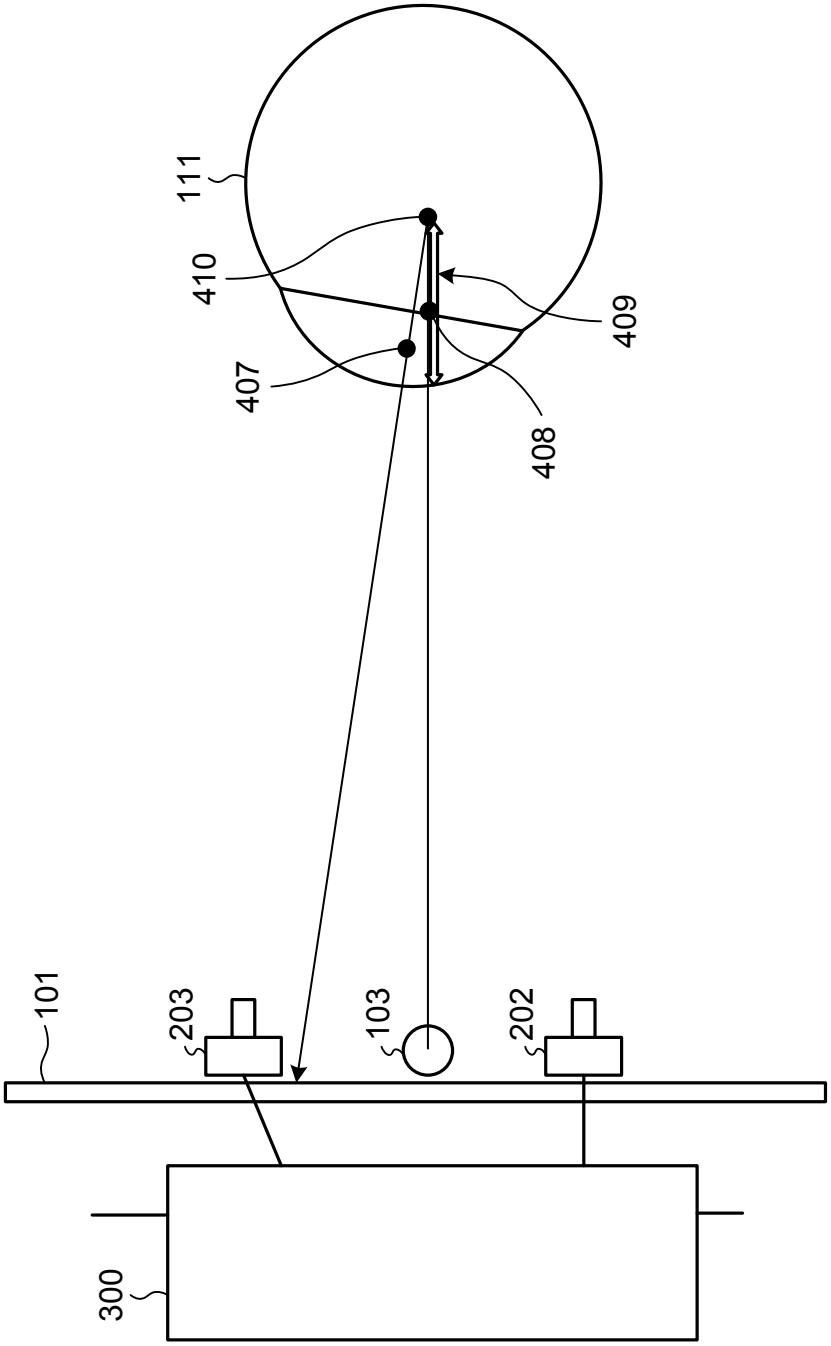


FIG.6

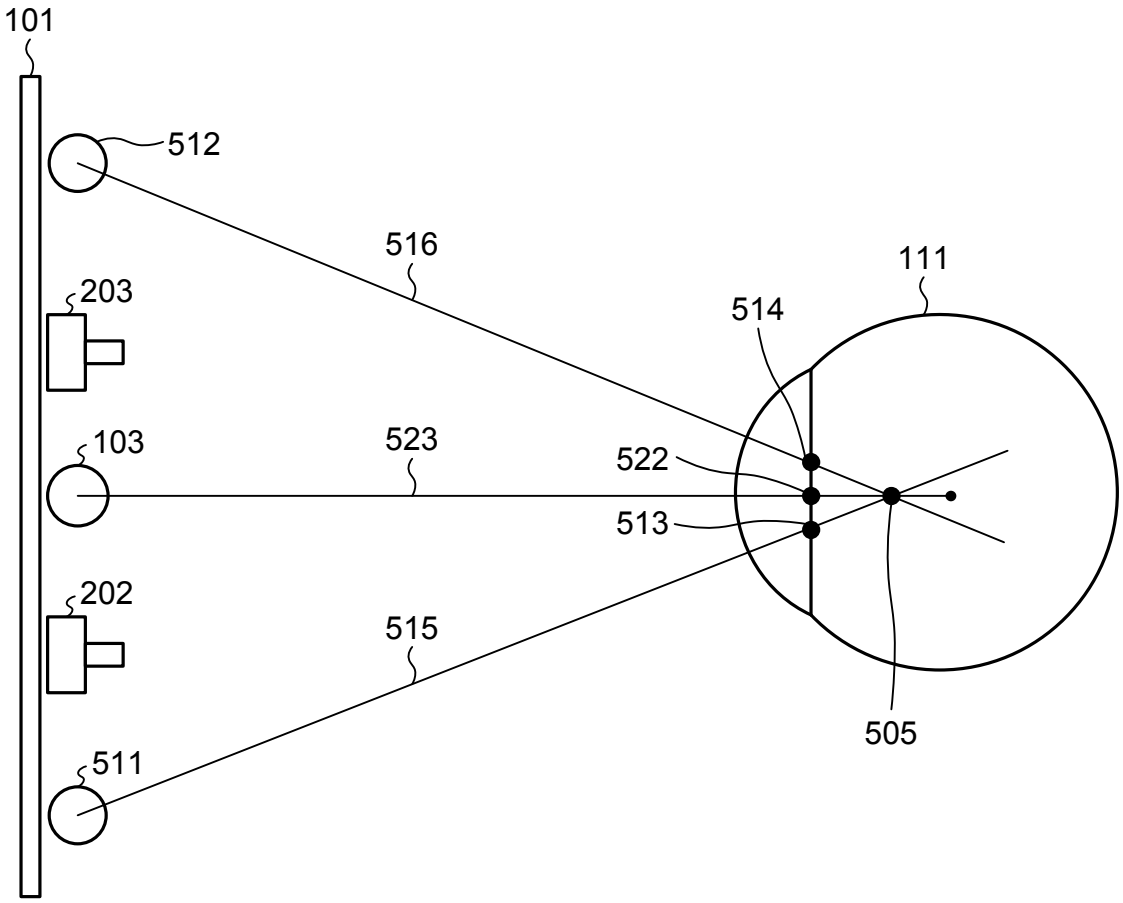


FIG.7

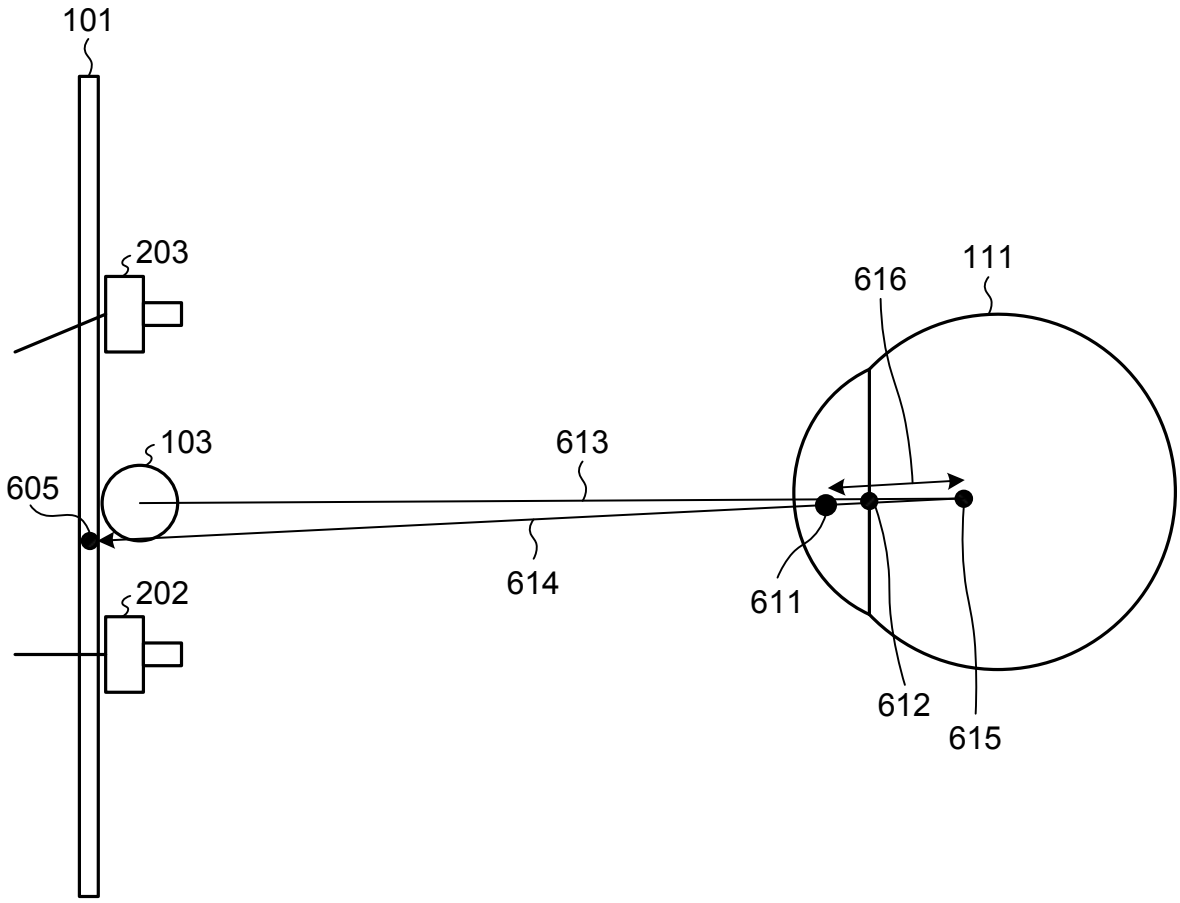


FIG.8

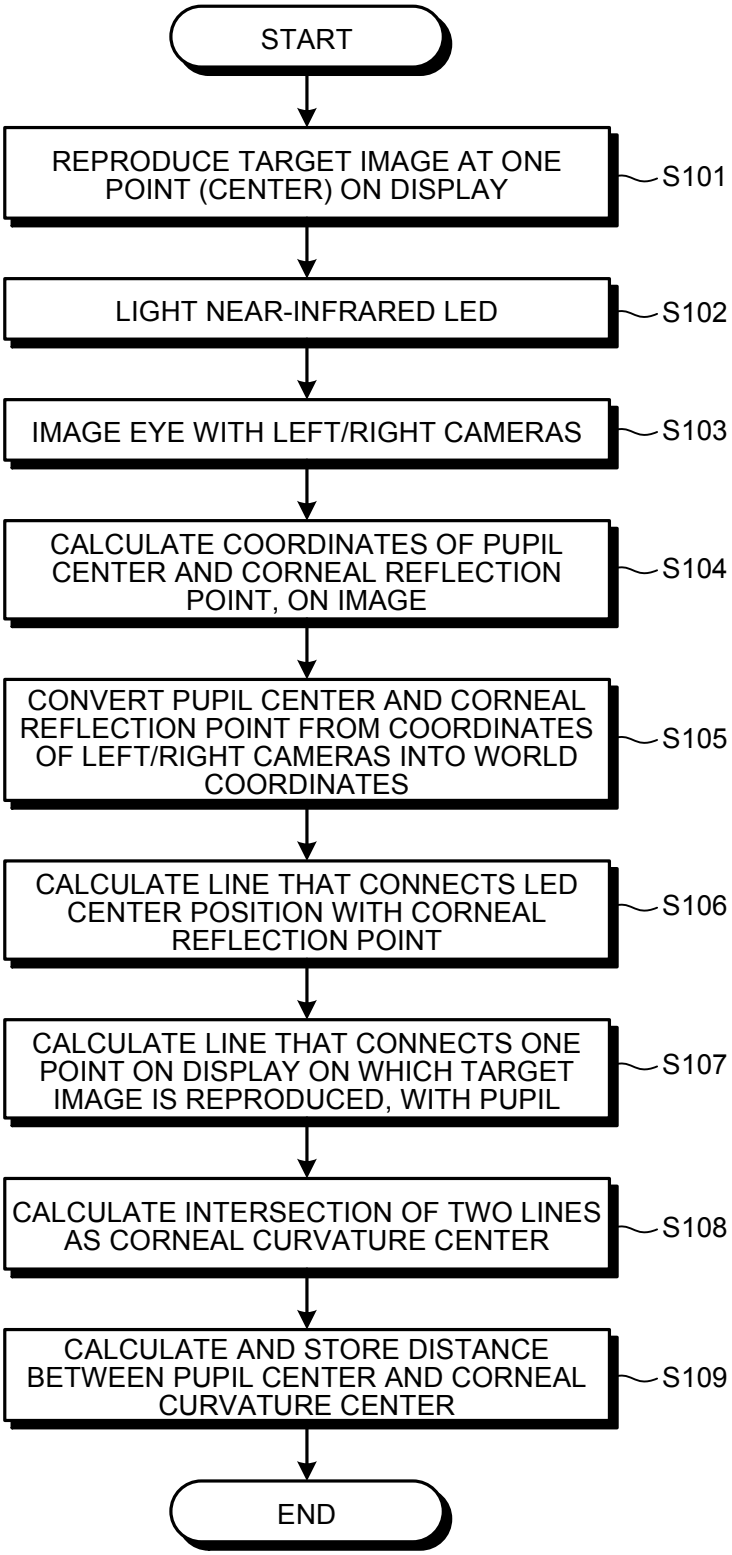

START
REPRODUCE TARGET IMAGE AT ONE POINT (CENTER) ON DISPLAY
S101
LIGHT NEAR-INFRARED LED
S102
IMAGE EYE WITH LEFT/RIGHT CAMERAS
S103
CALCULATE COORDINATES OF PUPIL CENTER AND CORNEAL REFLECTION POINT, ON IMAGE
S104
CONVERT PUPIL CENTER AND CORNEAL REFLECTION POINT FROM COORDINATES OF LEFT/RIGHT CAMERAS INTO WORLD COORDINATES
S105
CALCULATE LINE THAT CONNECTS LED CENTER POSITION WITH CORNEAL REFLECTION POINT
S106
CALCULATE LINE THAT CONNECTS ONE POINT ON DISPLAY ON WHICH TARGET IMAGE IS REPRODUCED, WITH PUPIL
S107
CALCULATE INTERSECTION OF TWO LINES AS CORNEAL CURVATURE CENTER
S108
CALCULATE AND STORE DISTANCE BETWEEN PUPIL CENTER AND CORNEAL CURVATURE CENTER
S109
END

FIG.9

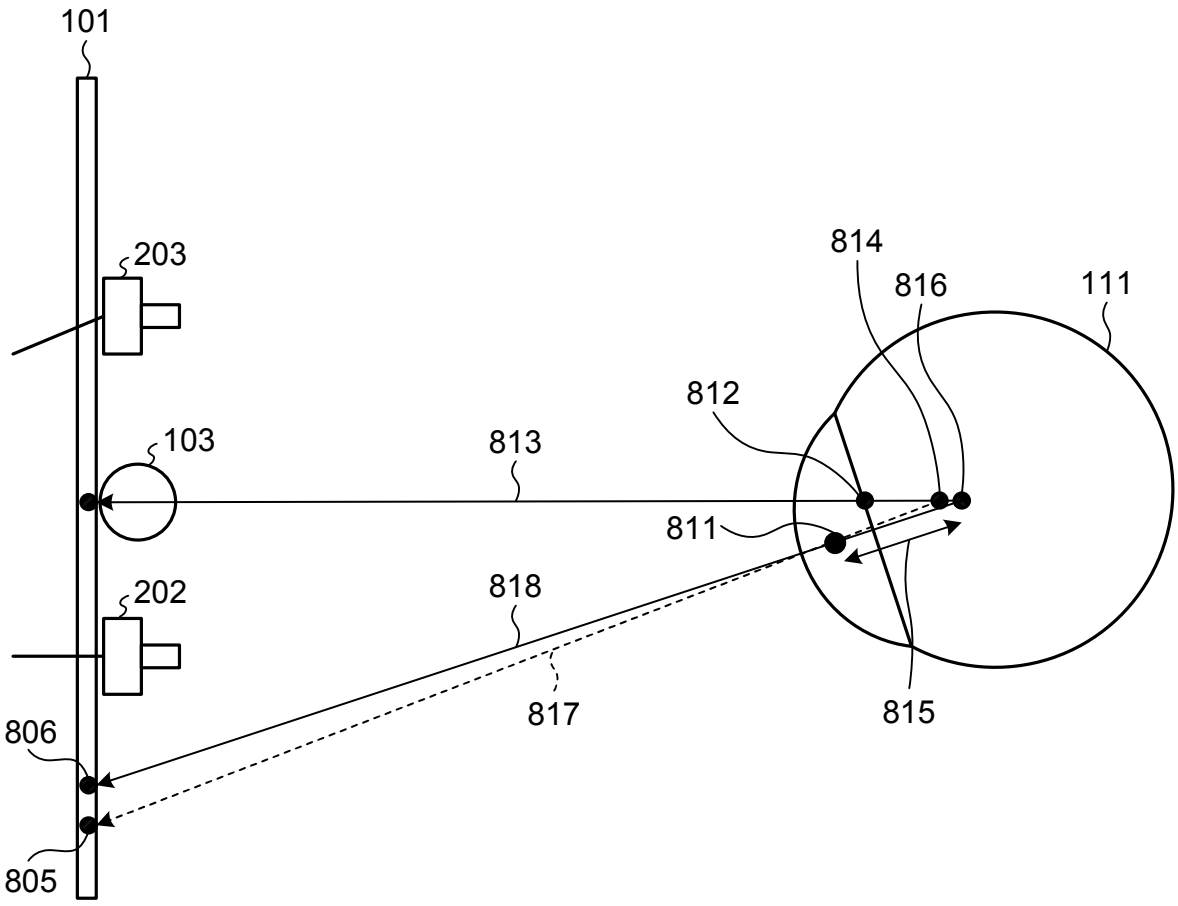


FIG.10

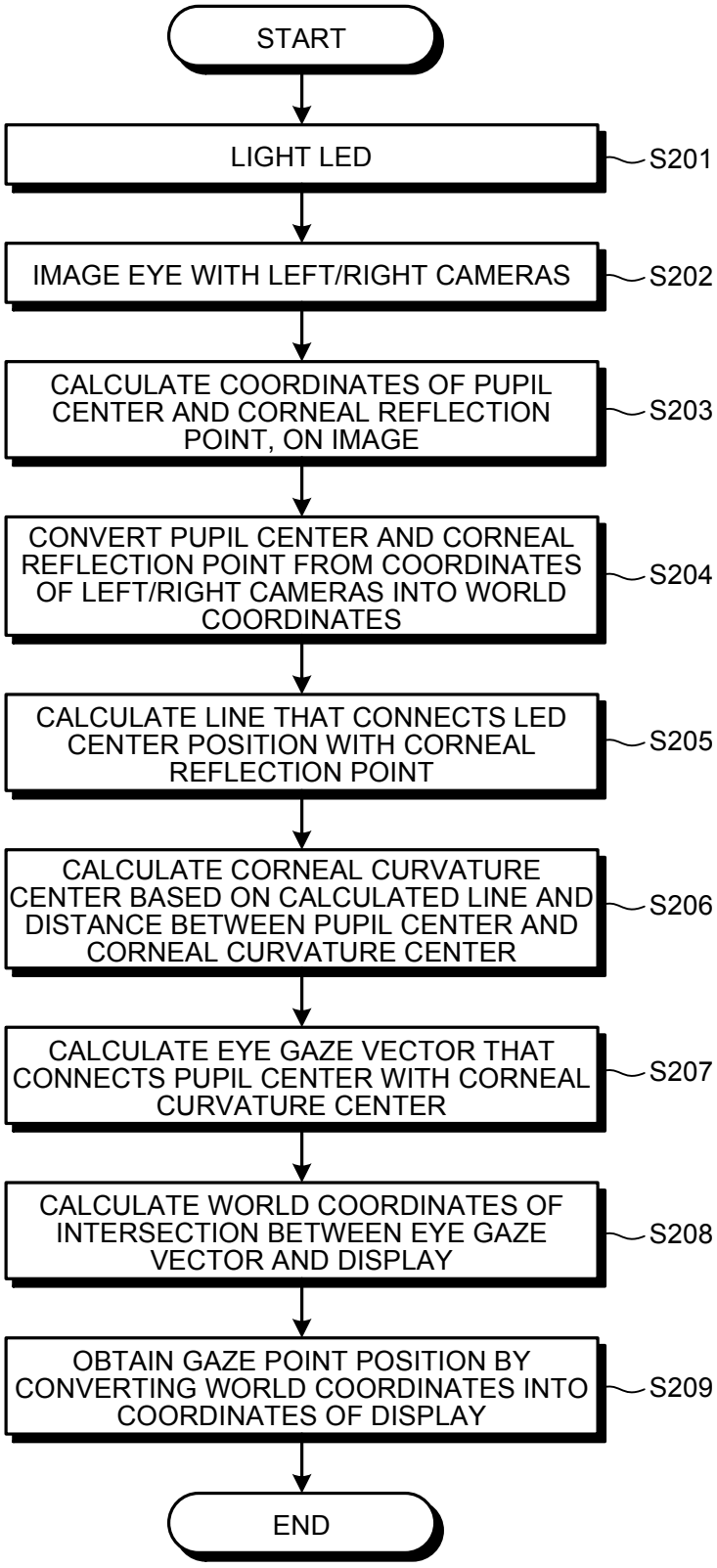

START
LIGHT LED
S201
IMAGE EYE WITH LEFT/RIGHT CAMERAS
S202
CALCULATE COORDINATES OF PUPIL CENTER AND CORNEAL REFLECTION POINT, ON IMAGE
S203
CONVERT PUPIL CENTER AND CORNEAL REFLECTION POINT FROM COORDINATES OF LEFT/RIGHT CAMERAS INTO WORLD COORDINATES
S204
CALCULATE LINE THAT CONNECTS LED CENTER POSITION WITH CORNEAL REFLECTION POINT
S205
CALCULATE CORNEAL CURVATURE CENTER BASED ON CALCULATED LINE AND DISTANCE BETWEEN PUPIL CENTER AND CORNEAL CURVATURE CENTER
S206
CALCULATE EYE GAZE VECTOR THAT CONNECTS PUPIL CENTER WITH CORNEAL CURVATURE CENTER
S207
CALCULATE WORLD COORDINATES OF INTERSECTION BETWEEN EYE GAZE VECTOR AND DISPLAY
S208
OBTAIN GAZE POINT POSITION BY CONVERTING WORLD COORDINATES INTO COORDINATES OF DISPLAY
S209
END

FIG.11

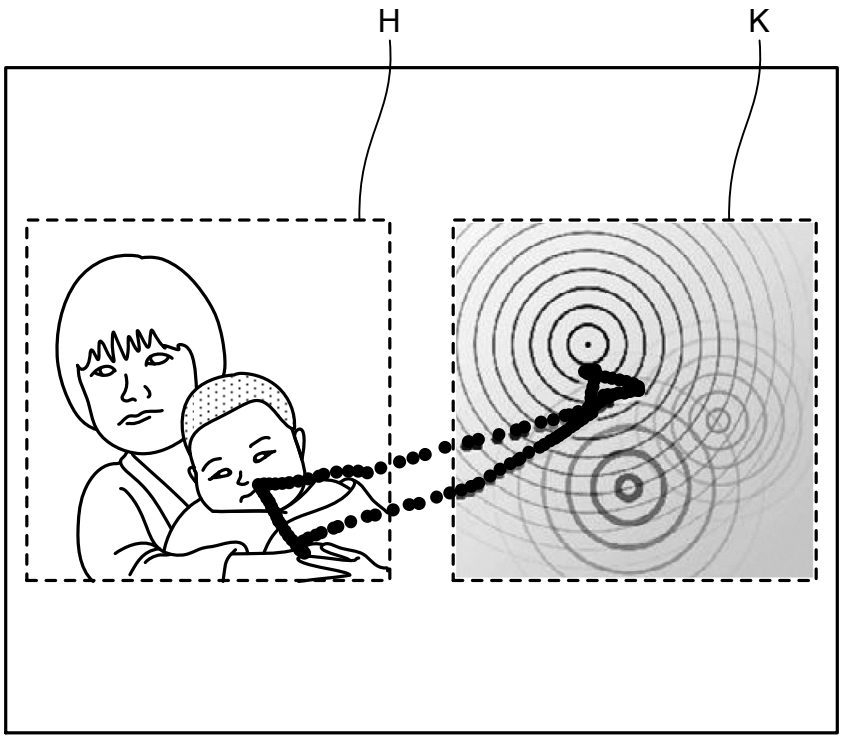


FIG.12

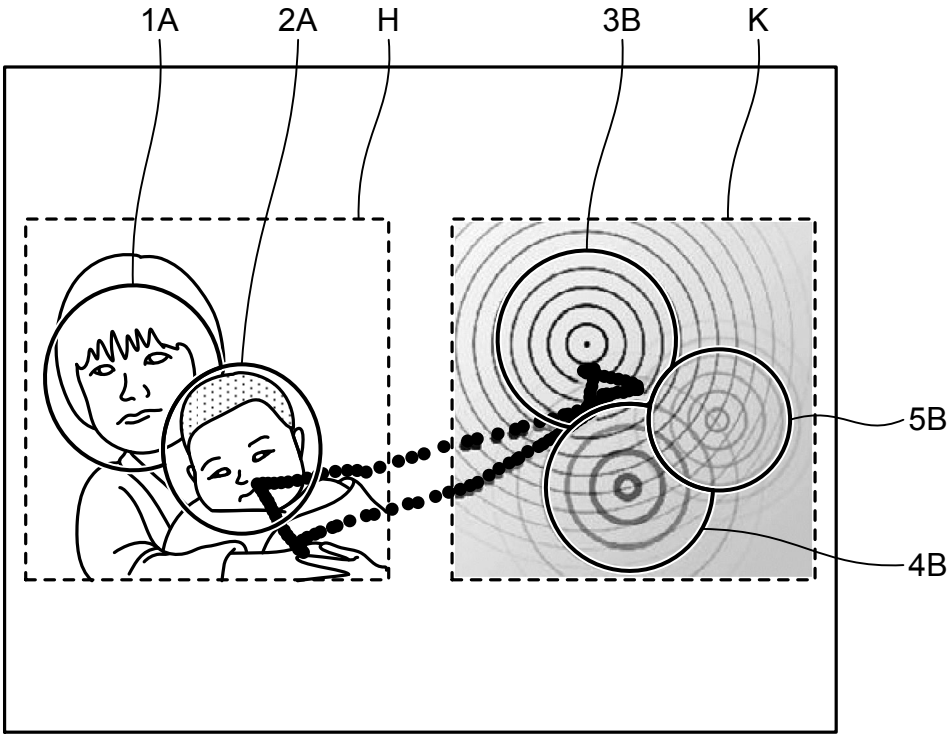


FIG.13

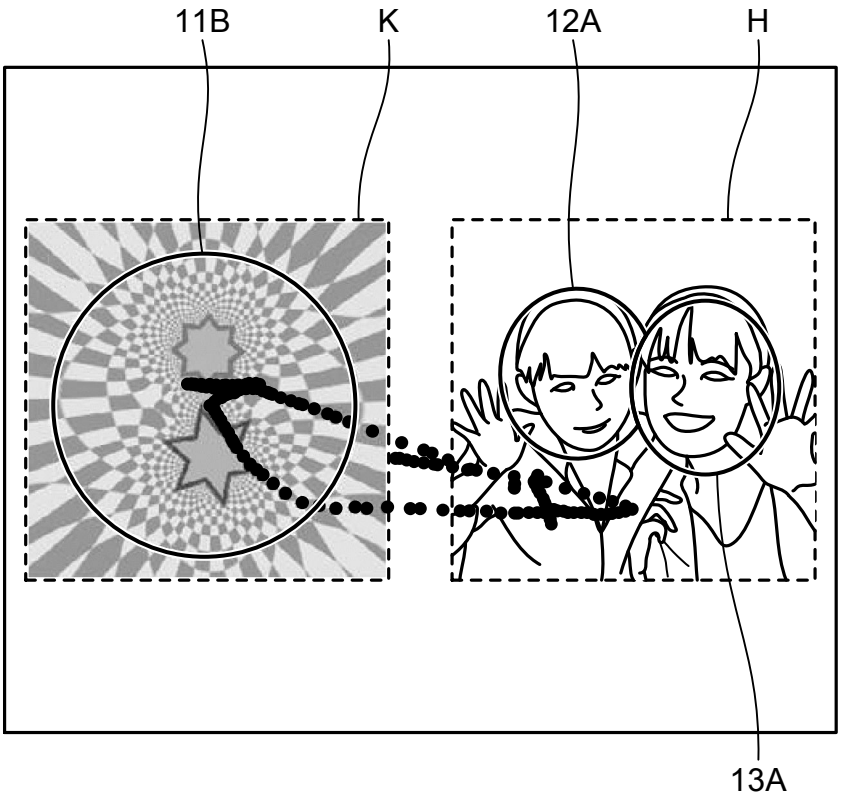


FIG.14

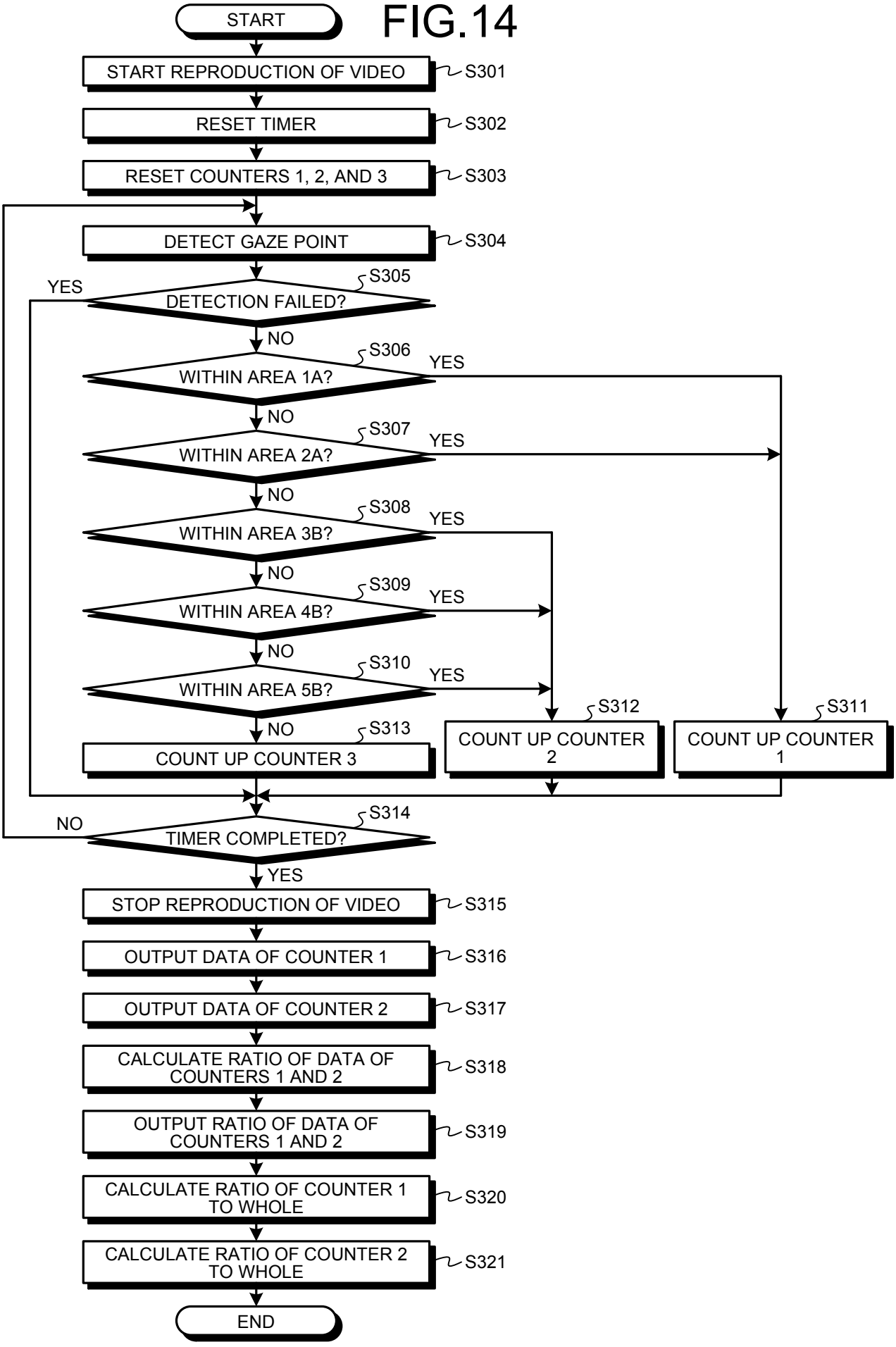
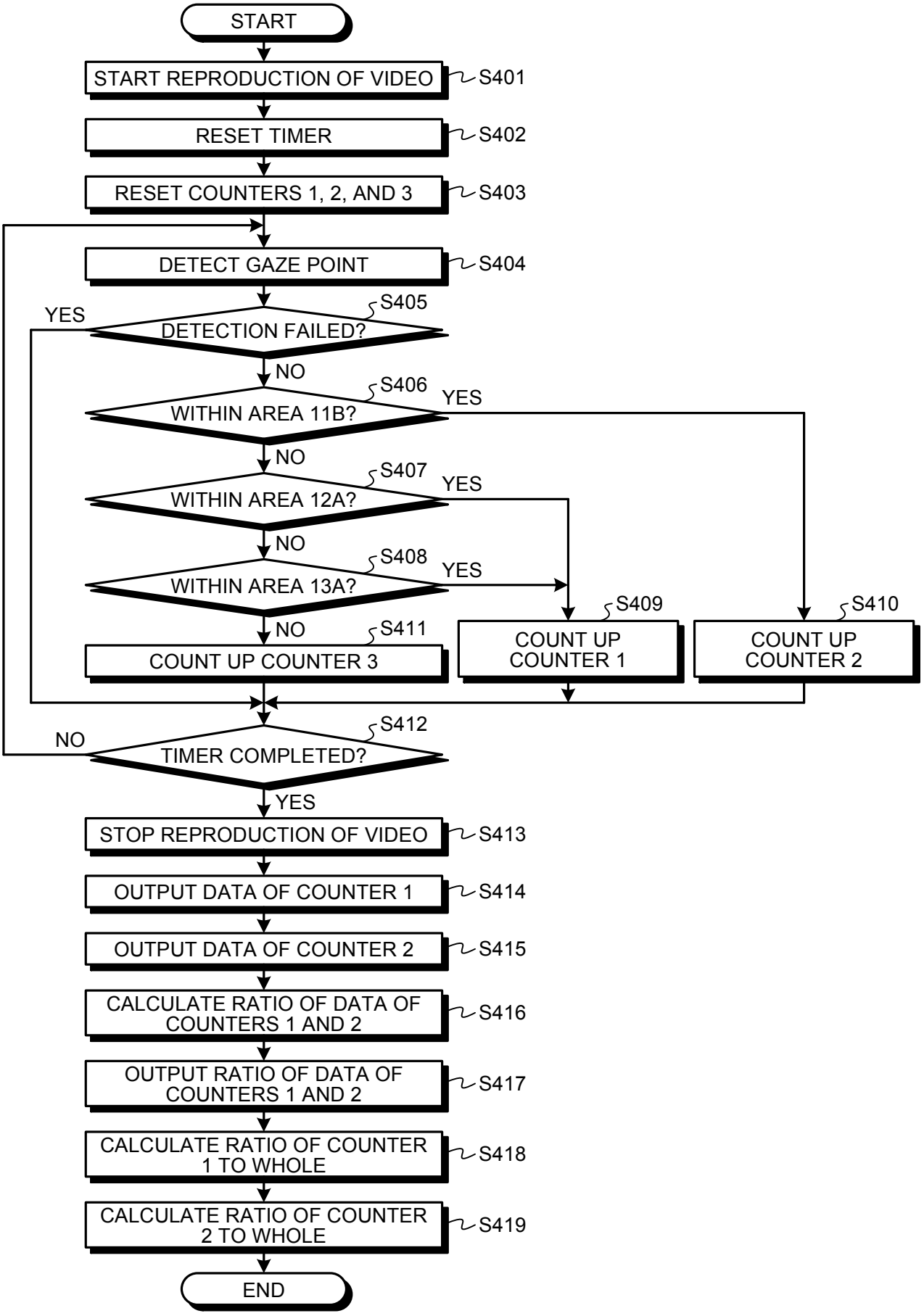

START
START REPRODUCTION OF VIDEO
S301
RESET TIMER
S302
RESET COUNTERS 1, 2, AND 3
S303
DETECT GAZE POINT
S304
DETECTION FAILED?
S305
YES
NO
WITHIN AREA 1A?
S306
YES
NO
WITHIN AREA 2A?
S307
YES
NO
WITHIN AREA 3B?
S308
YES
NO
WITHIN AREA 4B?
S309
YES
NO
WITHIN AREA 5B?
S310
YES
NO
COUNT UP COUNTER 3
S313
COUNT UP COUNTER 2
S312
COUNT UP COUNTER 1
S311
TIMER COMPLETED?
S314
NO
YES
STOP REPRODUCTION OF VIDEO
S315
OUTPUT DATA OF COUNTER 1
S316
OUTPUT DATA OF COUNTER 2
S317
CALCULATE RATIO OF DATA OF COUNTERS 1 AND 2
S318
OUTPUT RATIO OF DATA OF COUNTERS 1 AND 2
S319
CALCULATE RATIO OF COUNTER 1 TO WHOLE
S320
CALCULATE RATIO OF COUNTER 2 TO WHOLE
S321
END

FIG.15


START
START REPRODUCTION OF VIDEO
S401
RESET TIMER
S402
RESET COUNTERS 1, 2, AND 3
S403
DETECT GAZE POINT
S404
S405
DETECTION FAILED?
YES
NO
S406
WITHIN AREA 11B?
YES
NO
S407
WITHIN AREA 12A?
YES
NO
S408
WITHIN AREA 13A?
YES
NO
S409
COUNT UP COUNTER 1
S410
COUNT UP COUNTER 2
S411
COUNT UP COUNTER 3
S412
TIMER COMPLETED?
NO
YES
STOP REPRODUCTION OF VIDEO
S413
OUTPUT DATA OF COUNTER 1
S414
OUTPUT DATA OF COUNTER 2
S415
CALCULATE RATIO OF DATA OF COUNTERS 1 AND 2
S416
OUTPUT RATIO OF DATA OF COUNTERS 1 AND 2
S417
CALCULATE RATIO OF COUNTER 1 TO WHOLE
S418
CALCULATE RATIO OF COUNTER 2 TO WHOLE
S419
END

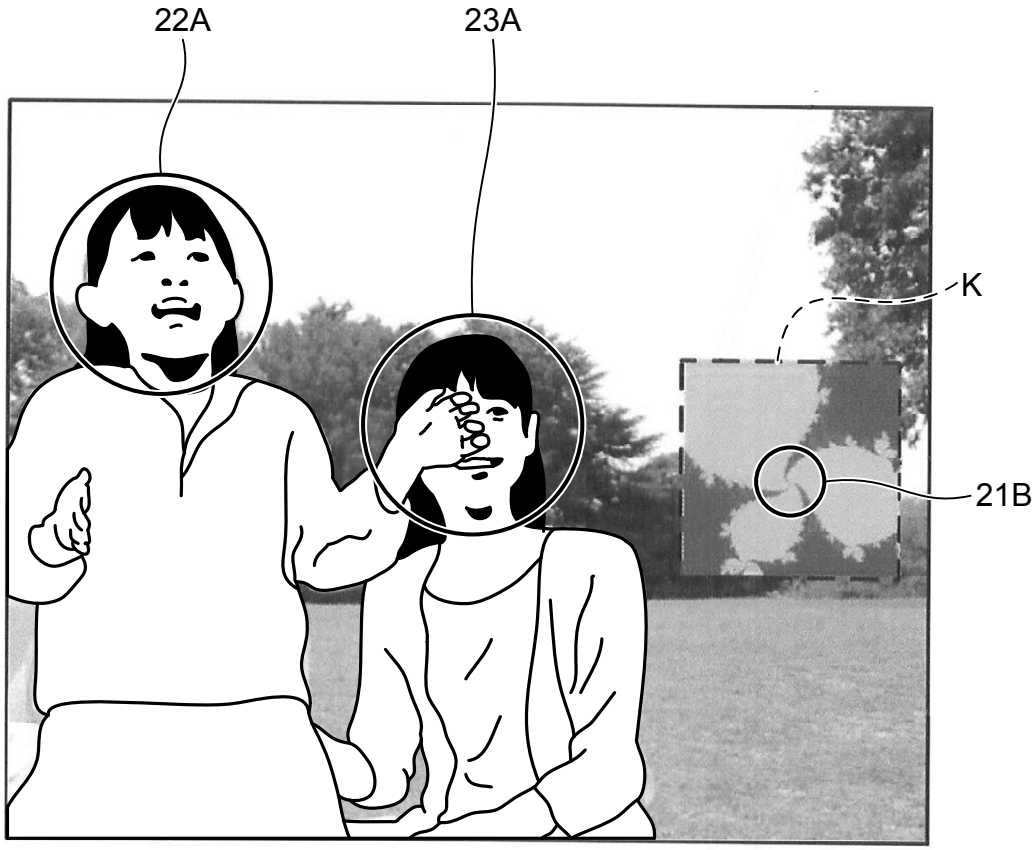



FIG.16