FIG.1

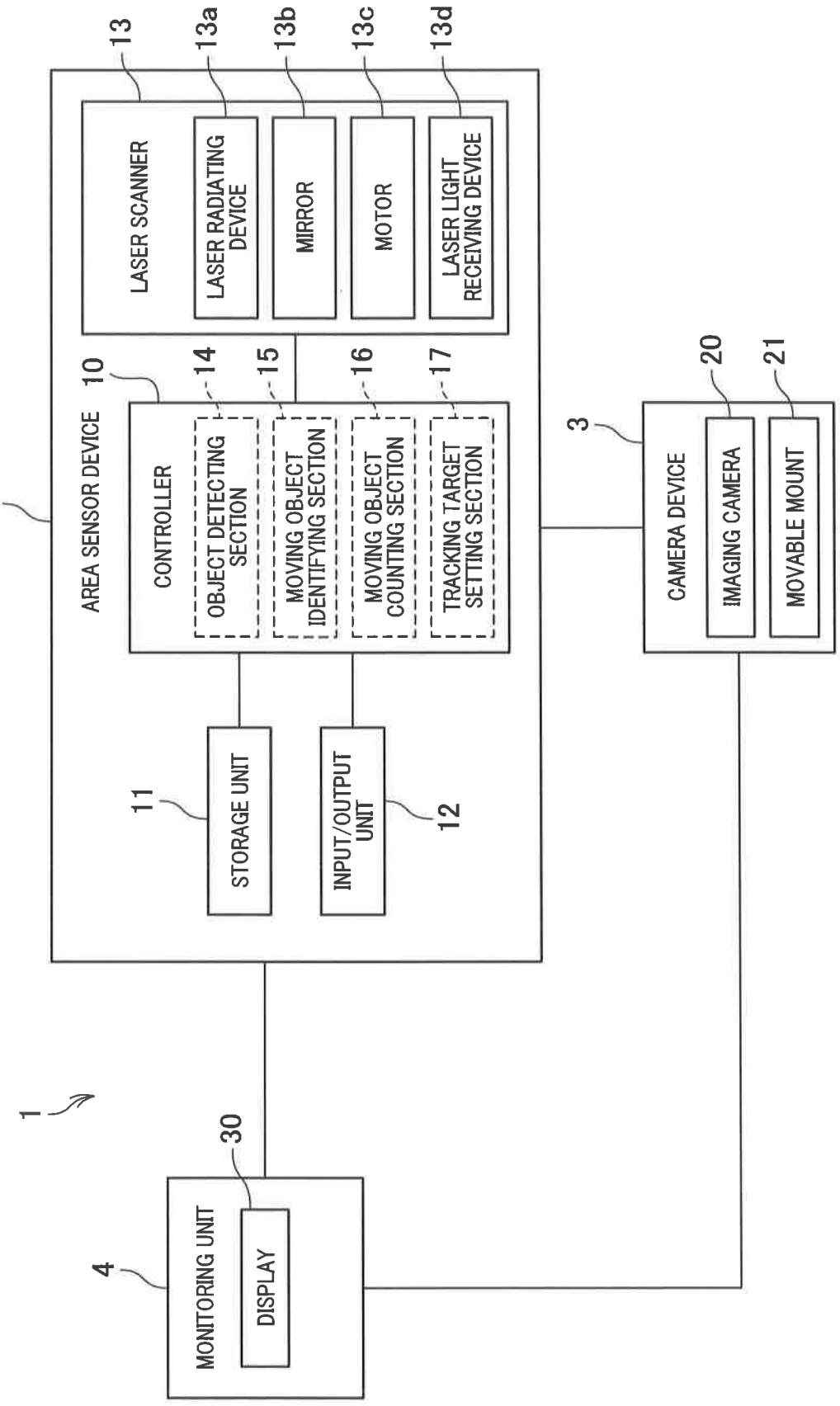

1
2
AREA SENSOR DEVICE
10
CONTROLLER
13
LASER SCANNER
13a
LASER RADIATING DEVICE
13b
MIRROR
13c
MOTOR
13d
LASER LIGHT RECEIVING DEVICE
14
OBJECT DETECTING SECTION
15
MOVING OBJECT IDENTIFYING SECTION
16
MOVING OBJECT COUNTING SECTION
17
TRACKING TARGET SETTING SECTION
11
STORAGE UNIT
12
INPUT/OUTPUT UNIT
3
CAMERA DEVICE
20
IMAGING CAMERA
21
MOVABLE MOUNT
4
MONITORING UNIT
30
DISPLAY

FIG.2

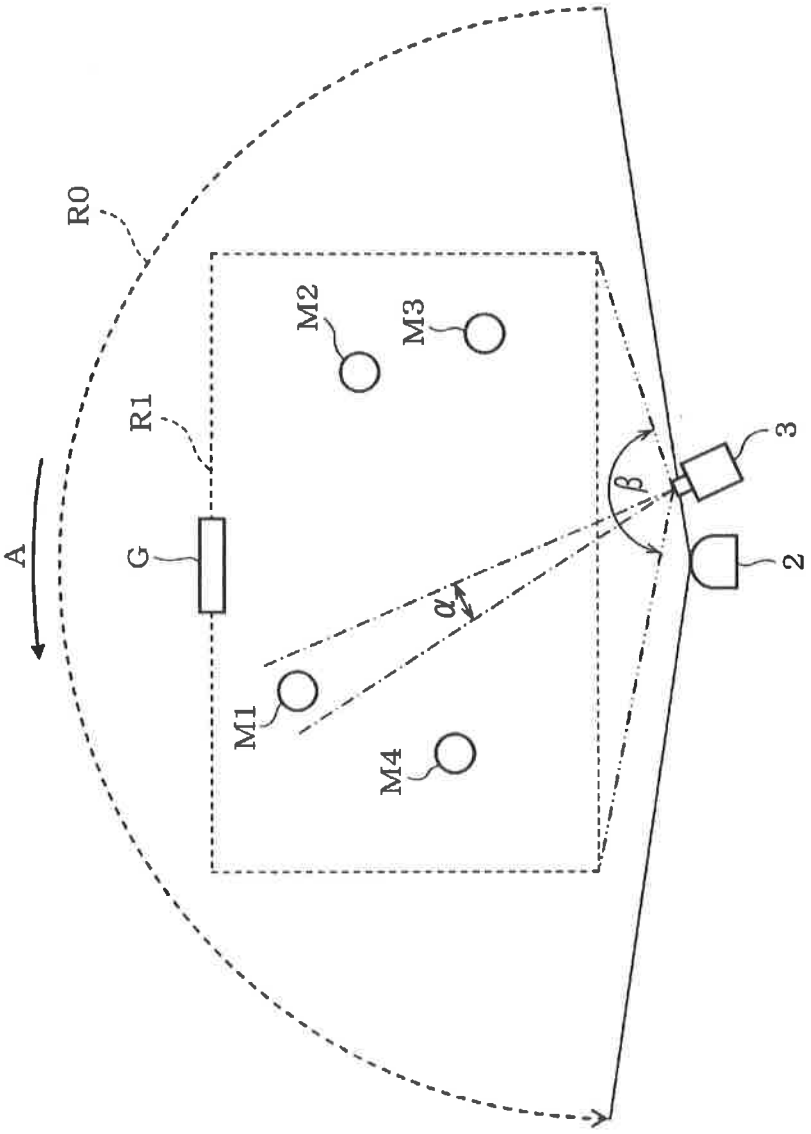


FIG.3

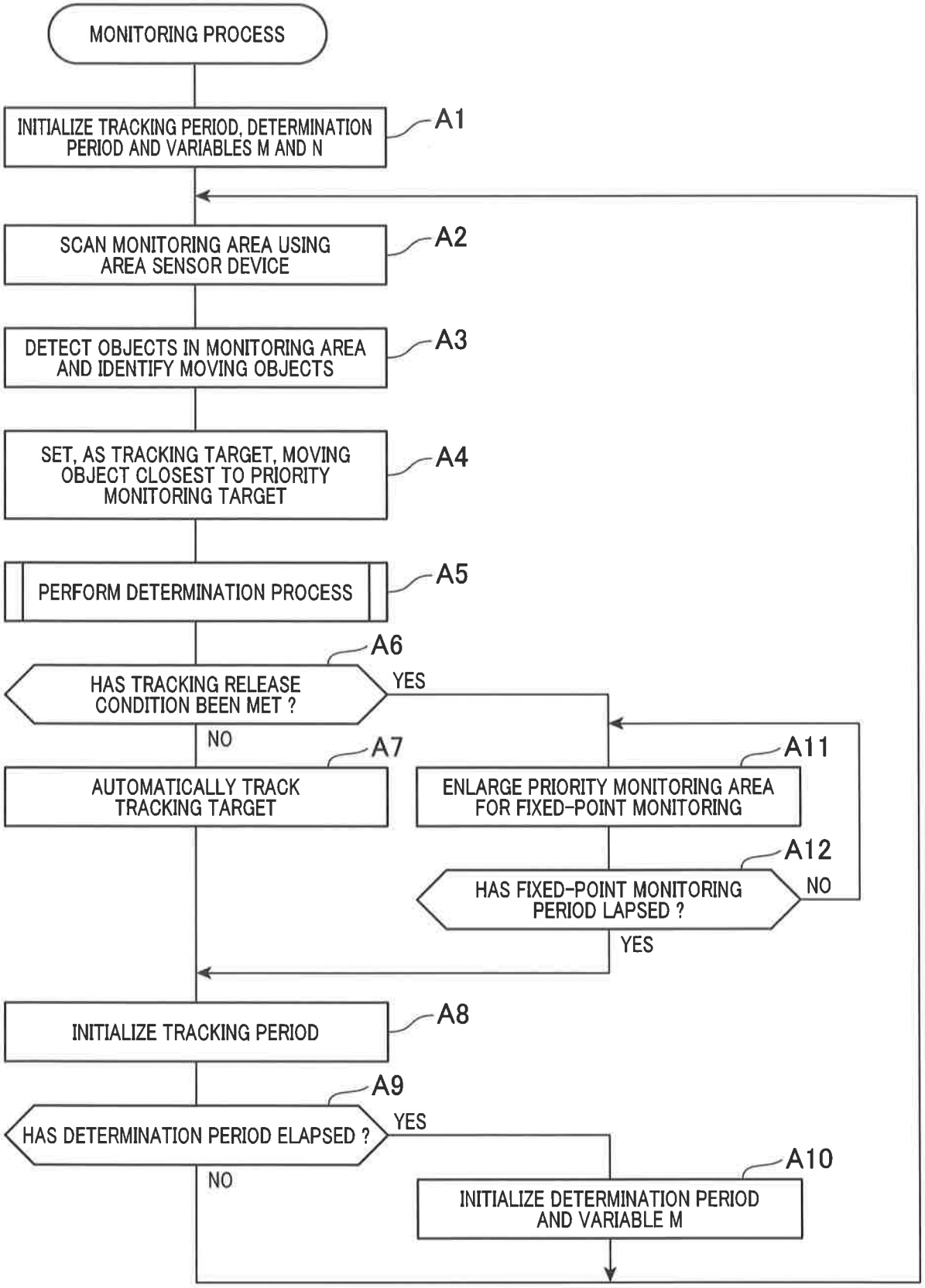

MONITORING PROCESS
INITIALIZE TRACKING PERIOD, DETERMINATION PERIOD AND VARIABLES M AND N
A1
SCAN MONITORING AREA USING AREA SENSOR DEVICE
A2
DETECT OBJECTS IN MONITORING AREA AND IDENTIFY MOVING OBJECTS
A3
SET, AS TRACKING TARGET, MOVING OBJECT CLOSEST TO PRIORITY MONITORING TARGET
A4
PERFORM DETERMINATION PROCESS
A5
A6
HAS TRACKING RELEASE CONDITION BEEN MET ?
YES
NO
A7
AUTOMATICALLY TRACK TRACKING TARGET
A11
ENLARGE PRIORITY MONITORING AREA FOR FIXED-POINT MONITORING
A12
HAS FIXED-POINT MONITORING PERIOD LAPSED ?
NO
YES
INITIALIZE TRACKING PERIOD
A8
A9
HAS DETERMINATION PERIOD ELAPSED ?
YES
NO
A10
INITIALIZE DETERMINATION PERIOD AND VARIABLE M

FIG.4

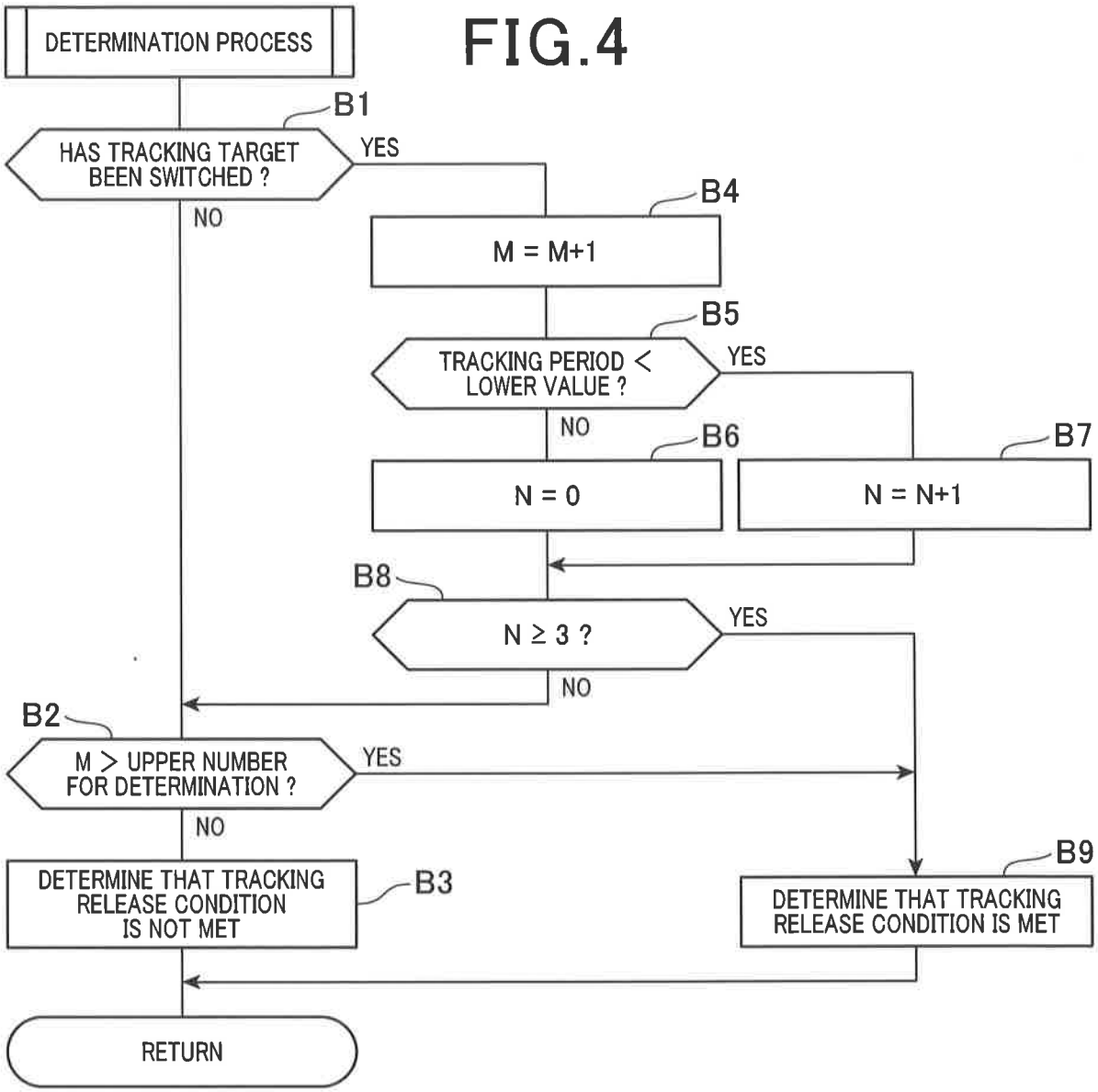

DETERMINATION PROCESS
B1
HAS TRACKING TARGET BEEN SWITCHED ?
YES
NO
B4
M = M+1
B5
TRACKING PERIOD < LOWER VALUE ?
YES
NO
B6
N = 0
B7
N = N+1
B8
N ≥ 3 ?
YES
NO
B2
M > UPPER NUMBER FOR DETERMINATION ?
YES
NO
DETERMINE THAT TRACKING RELEASE CONDITION IS NOT MET
B3
B9
DETERMINE THAT TRACKING RELEASE CONDITION IS MET
RETURN

FIG.5

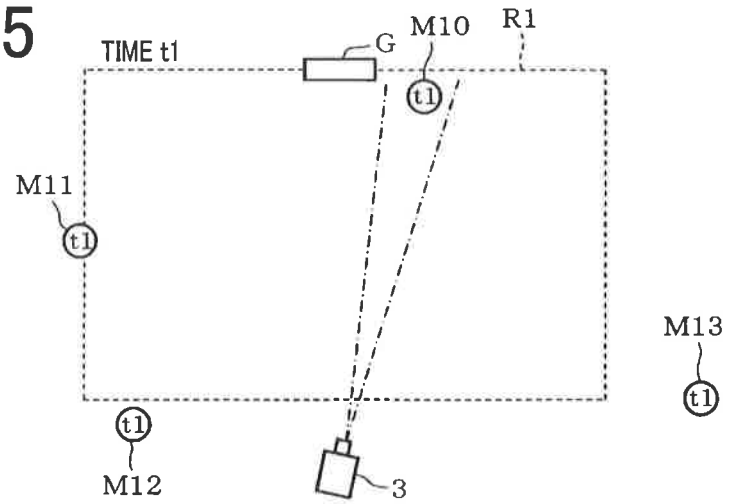

TIME t1
G
M10
R1
t1
M11
t1
M13
t1
t1
M12
3

FIG.6

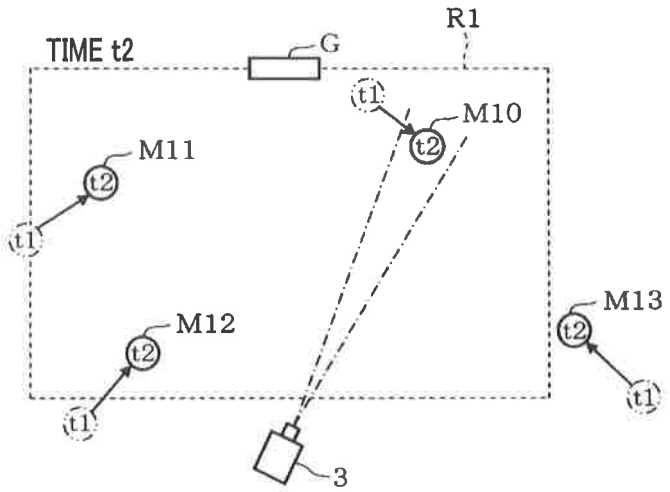


FIG.7

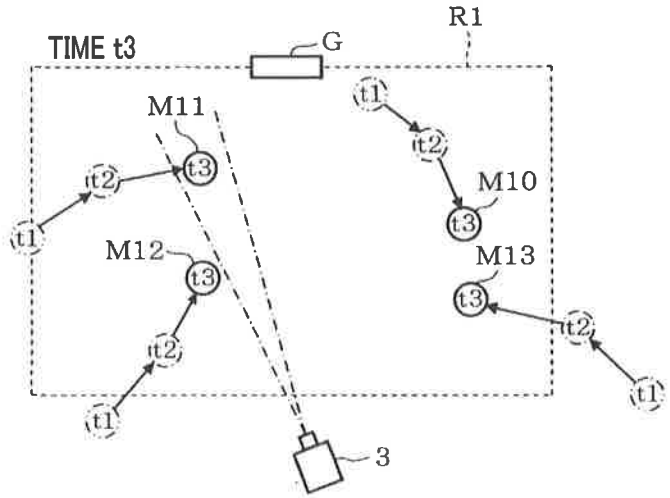


FIG.8

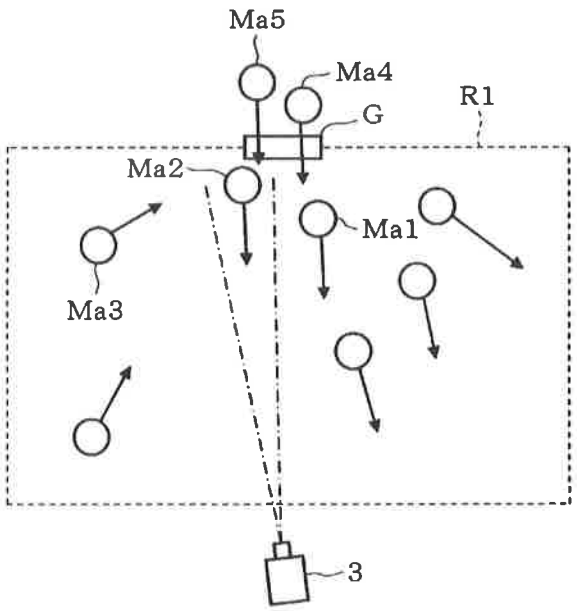


FIG.9

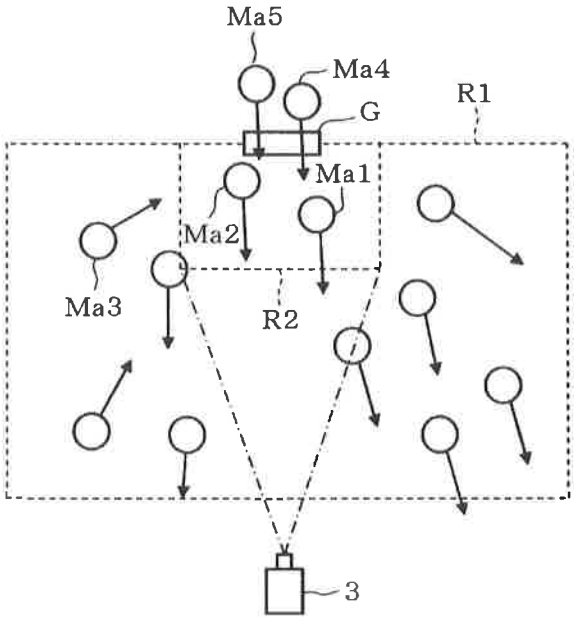


FIG.10

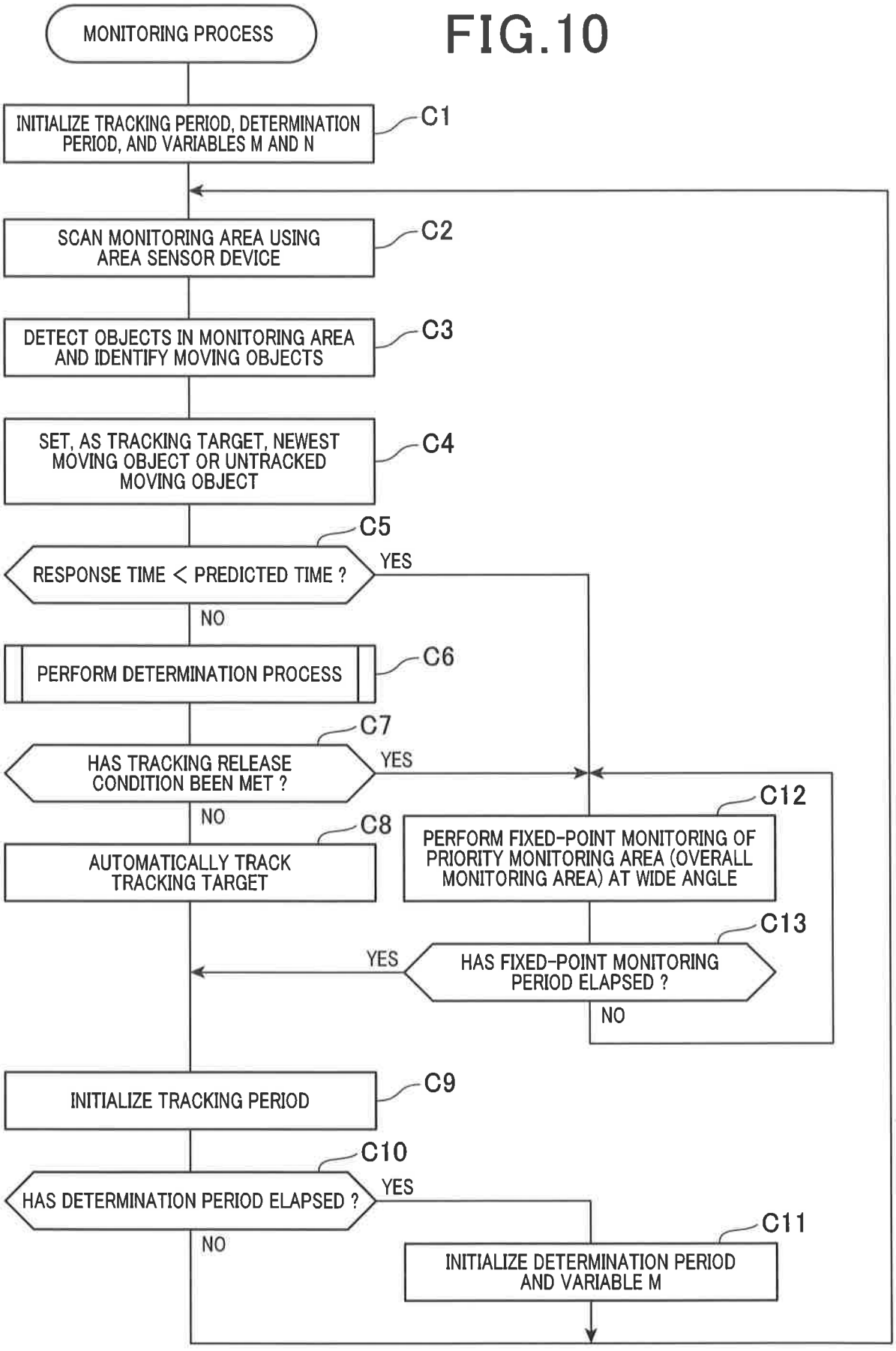

MONITORING PROCESS
INITIALIZE TRACKING PERIOD, DETERMINATION PERIOD, AND VARIABLES M AND N
C1
SCAN MONITORING AREA USING AREA SENSOR DEVICE
C2
DETECT OBJECTS IN MONITORING AREA AND IDENTIFY MOVING OBJECTS
C3
SET, AS TRACKING TARGET, NEWEST MOVING OBJECT OR UNTRACKED MOVING OBJECT
C4
C5
RESPONSE TIME < PREDICTED TIME ?
YES
NO
PERFORM DETERMINATION PROCESS
C6
C7
HAS TRACKING RELEASE CONDITION BEEN MET ?
YES
NO
C8
AUTOMATICALLY TRACK TRACKING TARGET
C12
PERFORM FIXED-POINT MONITORING OF PRIORITY MONITORING AREA (OVERALL MONITORING AREA) AT WIDE ANGLE
C13
YES
HAS FIXED-POINT MONITORING PERIOD ELAPSED ?
NO
INITIALIZE TRACKING PERIOD
C9
C10
HAS DETERMINATION PERIOD ELAPSED ?
YES
NO
C11
INITIALIZE DETERMINATION PERIOD AND VARIABLE M

FIG.11

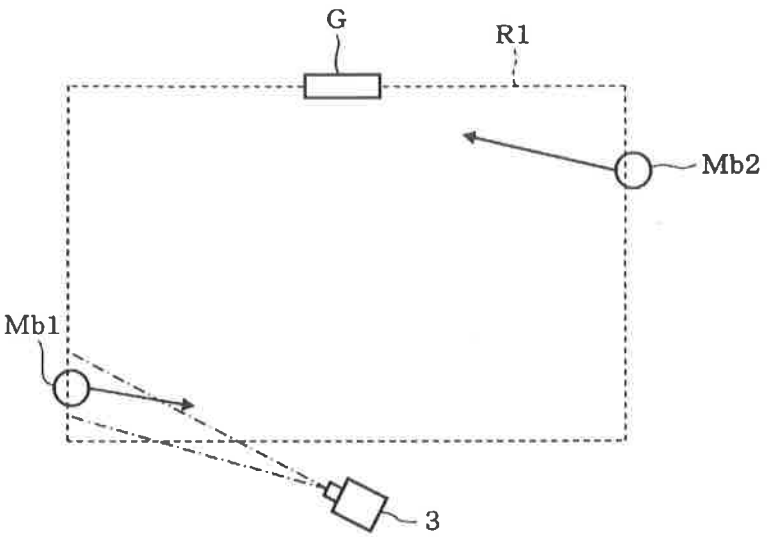


FIG.12

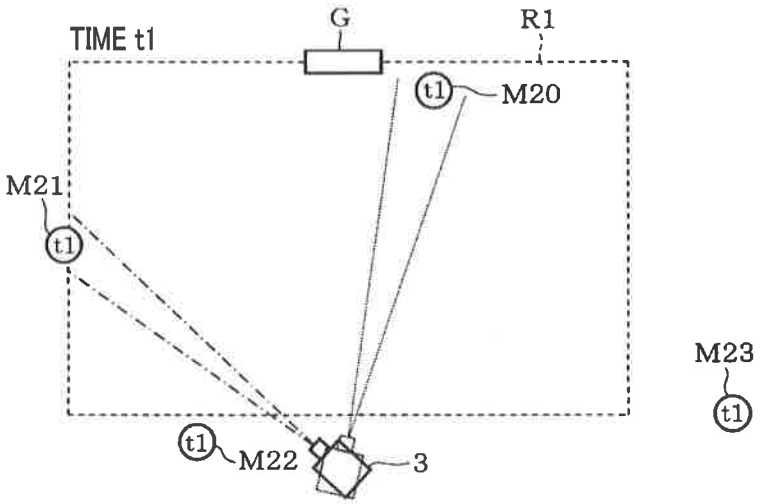


FIG.13

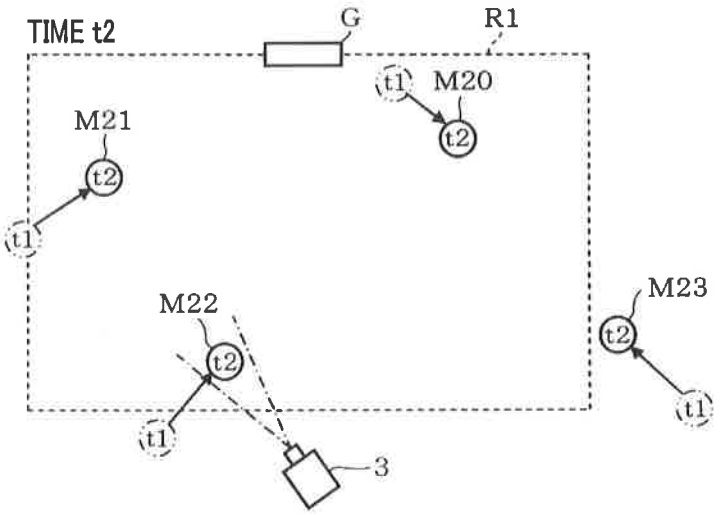


FIG.14

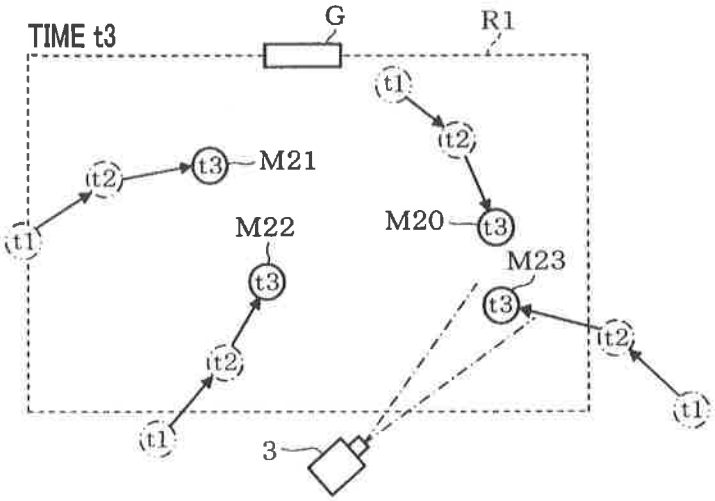

TIME t3
G
R1
t1
t2
t3
M21
M22
M20
M23
3

FIG.15

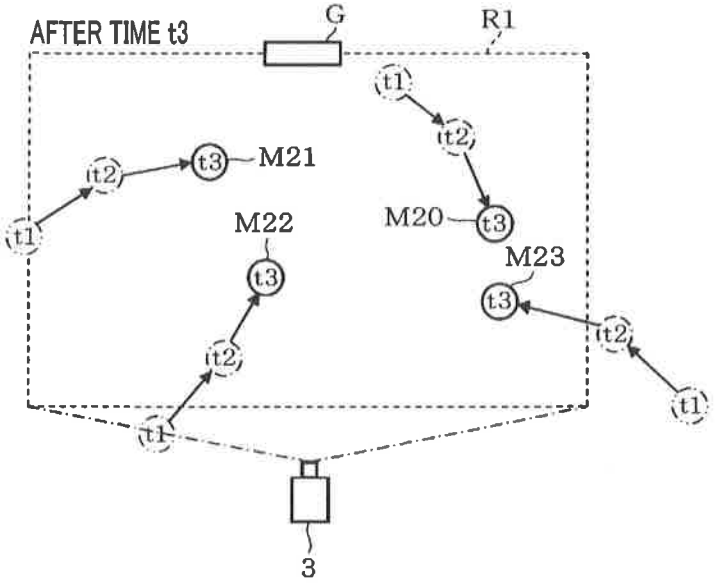

AFTER TIME t3
G
R1
t1
t2
t3
M21
M22
M20
M23
3

FIG.16

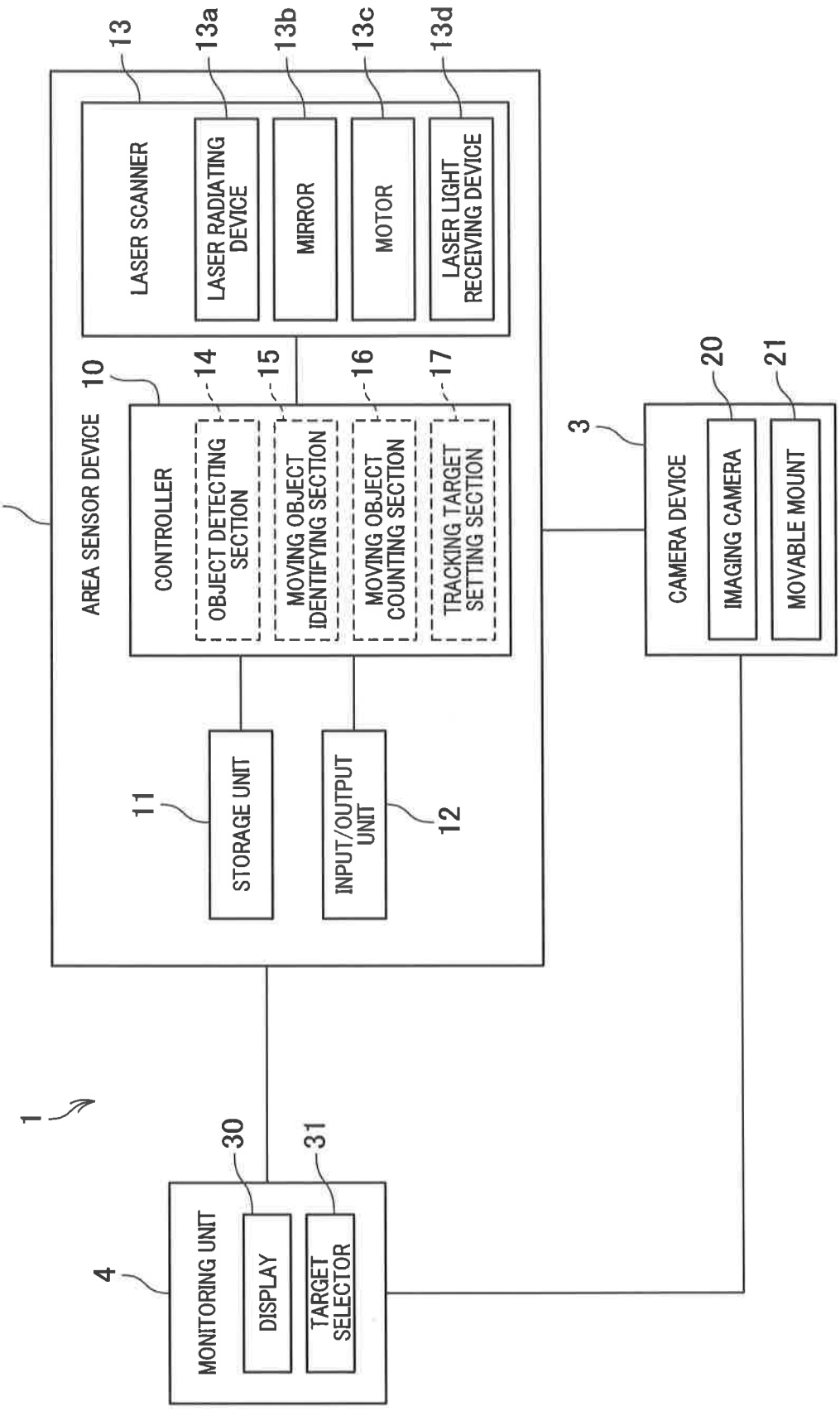

1
2
AREA SENSOR DEVICE
10
CONTROLLER
OBJECT DETECTING SECTION
14
MOVING OBJECT IDENTIFYING SECTION
15
MOVING OBJECT COUNTING SECTION
16
TRACKING TARGET SETTING SECTION
17
LASER SCANNER
13
LASER RADIATING DEVICE
13a
MIRROR
13b
MOTOR
13c
LASER LIGHT RECEIVING DEVICE
13d
STORAGE UNIT
11
INPUT/OUTPUT UNIT
12
3
CAMERA DEVICE
IMAGING CAMERA
20
MOVABLE MOUNT
21
4
MONITORING UNIT
DISPLAY
30
TARGET SELECTOR
31

FIG.17

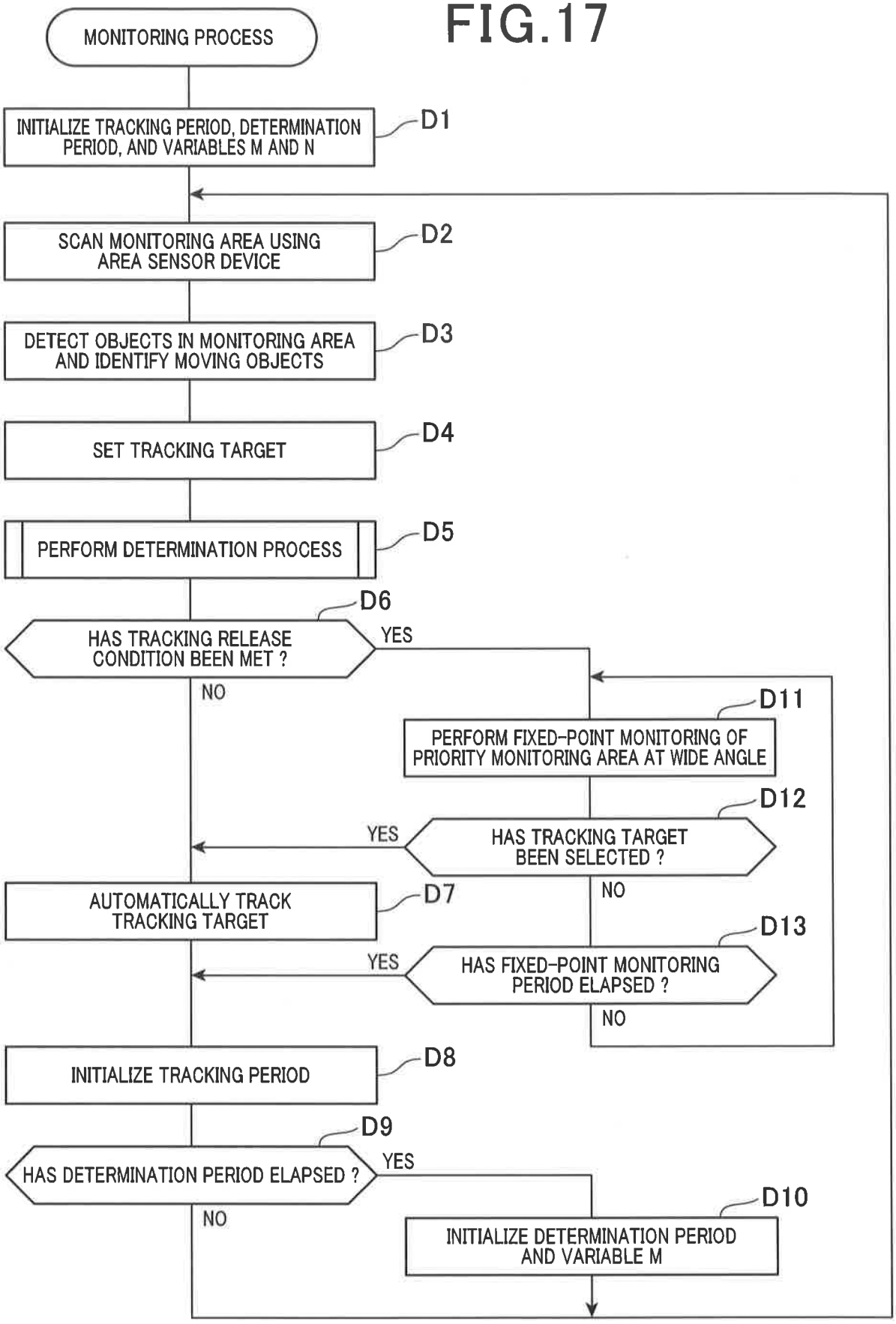
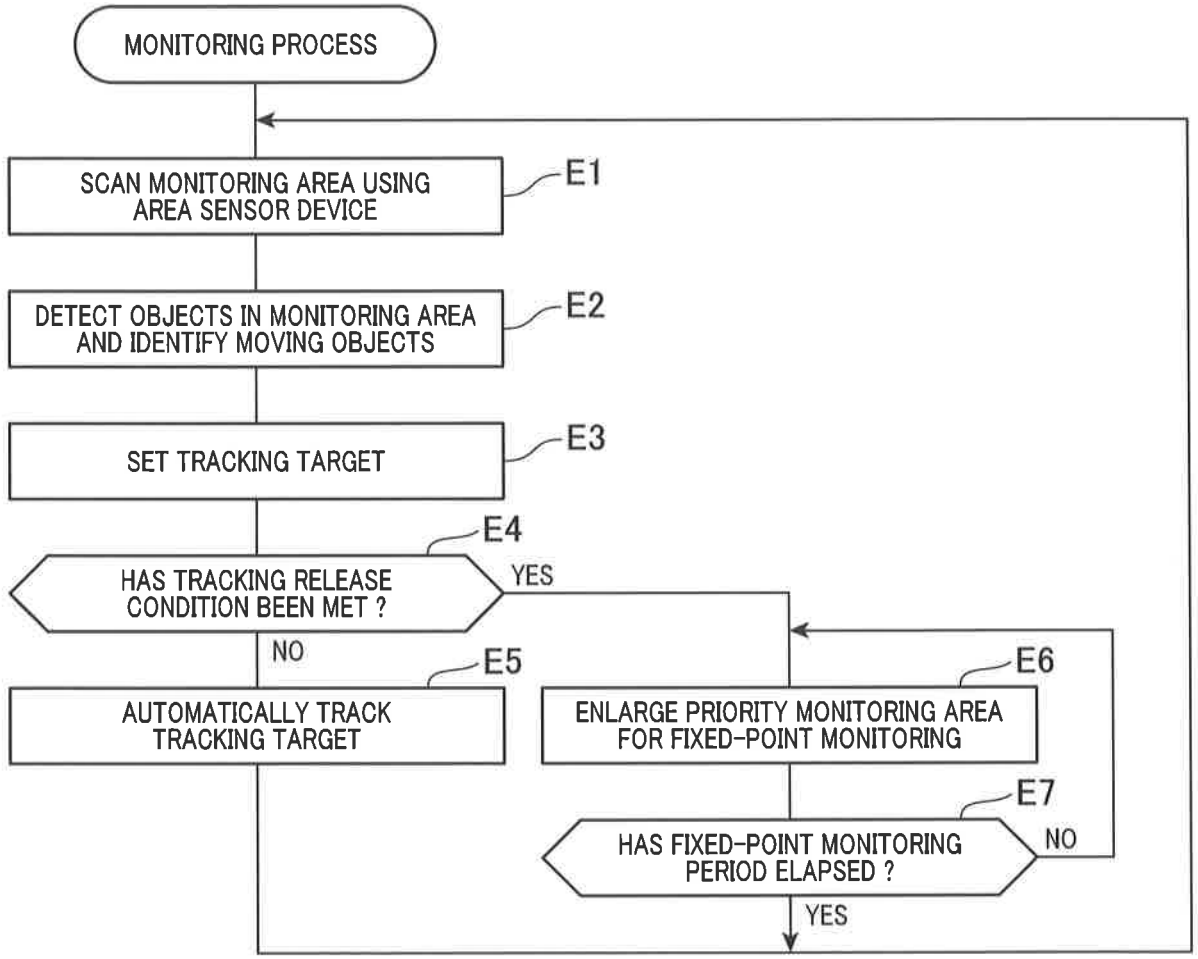

MONITORING PROCESS
INITIALIZE TRACKING PERIOD, DETERMINATION PERIOD, AND VARIABLES M AND N
D1
SCAN MONITORING AREA USING AREA SENSOR DEVICE
D2
DETECT OBJECTS IN MONITORING AREA AND IDENTIFY MOVING OBJECTS
D3
SET TRACKING TARGET
D4
PERFORM DETERMINATION PROCESS
D5
D6
HAS TRACKING RELEASE CONDITION BEEN MET ?
YES
NO
D11
PERFORM FIXED-POINT MONITORING OF PRIORITY MONITORING AREA AT WIDE ANGLE
D12
YES
HAS TRACKING TARGET BEEN SELECTED ?
NO
AUTOMATICALLY TRACK TRACKING TARGET
D7
D13
YES
HAS FIXED-POINT MONITORING PERIOD ELAPSED ?
NO
INITIALIZE TRACKING PERIOD
D8
D9
HAS DETERMINATION PERIOD ELAPSED ?
YES
NO
D10
INITIALIZE DETERMINATION PERIOD AND VARIABLE M

FIG.18


MONITORING PROCESS
SCAN MONITORING AREA USING AREA SENSOR DEVICE
E1
DETECT OBJECTS IN MONITORING AREA AND IDENTIFY MOVING OBJECTS
E2
SET TRACKING TARGET
E3
E4
HAS TRACKING RELEASE CONDITION BEEN MET ?
YES
NO
E5
AUTOMATICALLY TRACK TRACKING TARGET
E6
ENLARGE PRIORITY MONITORING AREA FOR FIXED-POINT MONITORING
E7
HAS FIXED-POINT MONITORING PERIOD ELAPSED ?
NO
YES