US009870684B2

(12) **United States Patent**
**Wang et al.**

(10) **Patent No.: US 9,870,684 B2**
(45) **Date of Patent: Jan. 16, 2018**

(54) **INFORMATION PROCESSING APPARATUS, INFORMATION PROCESSING METHOD, PROGRAM, AND INFORMATION PROCESSING SYSTEM FOR ACHIEVING A SURVEILLANCE CAMERA SYSTEM**

(71) Applicant: **SONY CORPORATION**, Tokyo (JP)

(72) Inventors: **QiHong Wang**, Tokyo (JP); **Kenichi Okada**, Tokyo (JP); **Ken Miyashita**, Tokyo (JP); **Yasushi Okumura**, Tokyo (JP)

(73) Assignee: **Sony Corporation**, Tokyo (JP)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 121 days.

(21) Appl. No.: **14/763,581**

(22) PCT Filed: **Jan. 16, 2014**

(86) PCT No.: **PCT/JP2014/000180**
§ 371 (c)(1),
(2) Date: **Jul. 27, 2015**

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PCT Pub. Date: **Aug. 14, 2014**

(65) **Prior Publication Data**

US 2015/0356840 A1 Dec. 10, 2015

(30) **Foreign Application Priority Data**

Feb. 6, 2013 (JP) ..... 2013-021371

(51) **Int. Cl.**
***G08B 13/196*** (2006.01)

(52) **U.S. Cl.**
CPC . ***G08B 13/19608*** (2013.01); ***G08B 13/19682*** (2013.01); ***G08B 13/19691*** (2013.01)

(58) **Field of Classification Search**
CPC ..... G08B 13/19608; G08B 13/19682; G08B 13/19691
See application file for complete search history.

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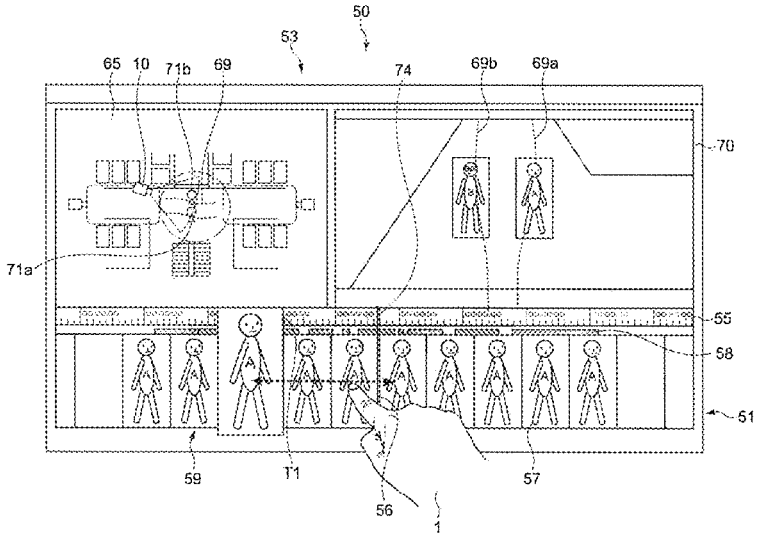
*Primary Examiner* — Siamak Harandi
(74) *Attorney, Agent, or Firm* — Paratus Law Group, PLLC

(57) **ABSTRACT**

There is provided an information processing apparatus including an obtaining unit configured to obtain a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments contains at least one image frame within which a specific target object is found to be captured, and a providing unit configured to provide image frames of the obtained plurality of segments for display along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

**24 Claims, 84 Drawing Sheets**



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|---|---|---|---|
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| WO | WO2009/121053 | A2 | 10/2009 |

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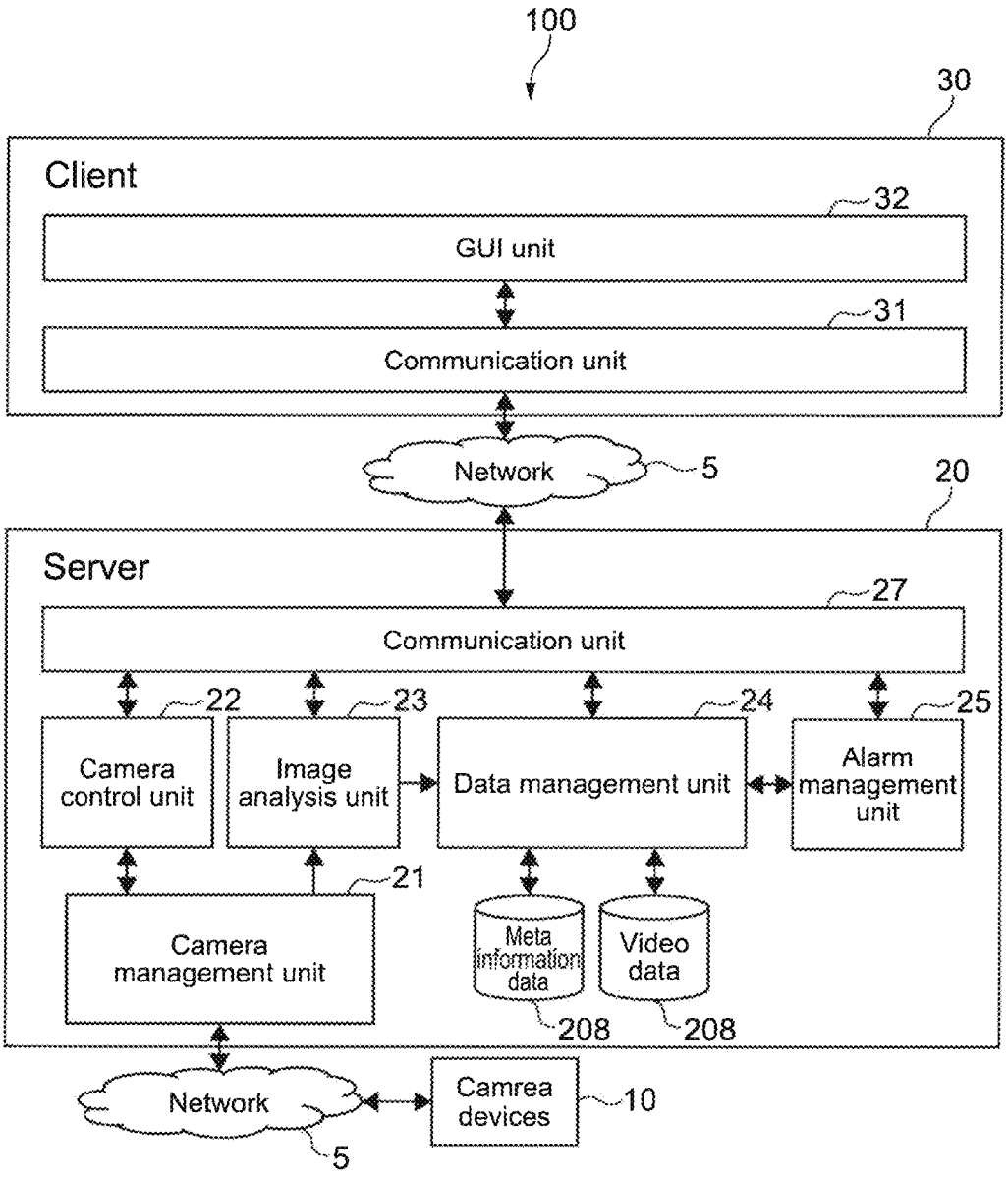

100
30
Client
32
GUI unit
31
Communication unit
Network
5
20
Server
27
Communication unit
22
23
24
25
Camera control unit
Image analysis unit
Data management unit
Alarm management unit
21
Camera management unit
Meta information data
Video data
208
208
Network
5
Camrea devices
10

FIG.1

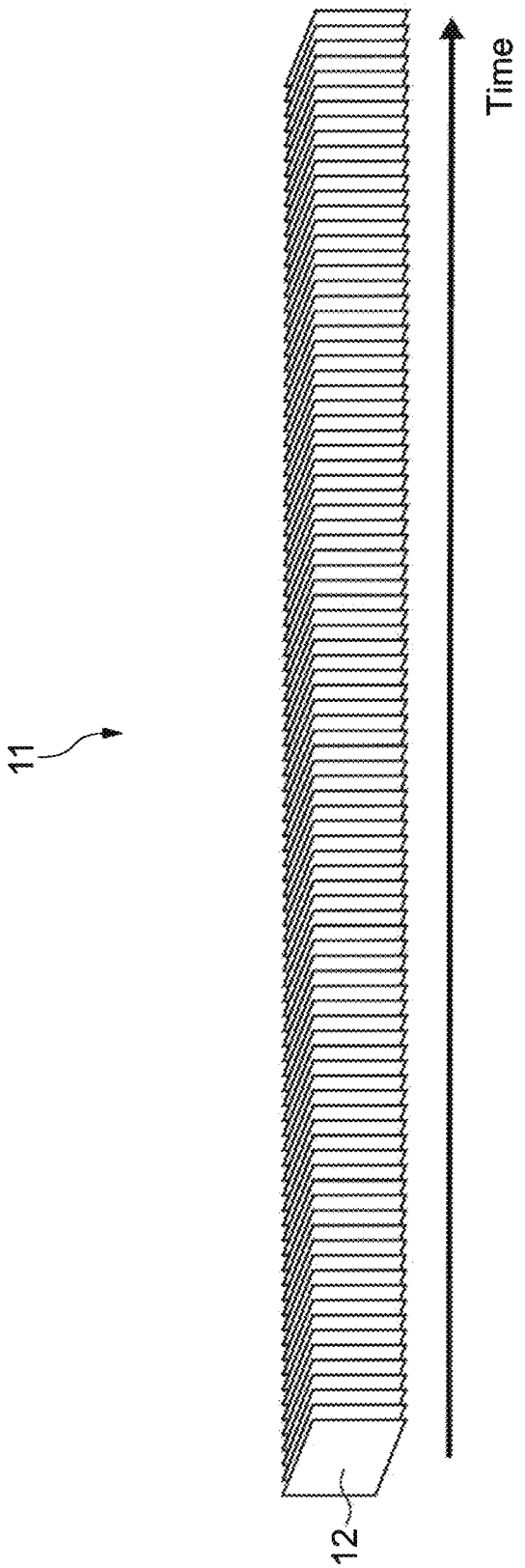



FIG.2

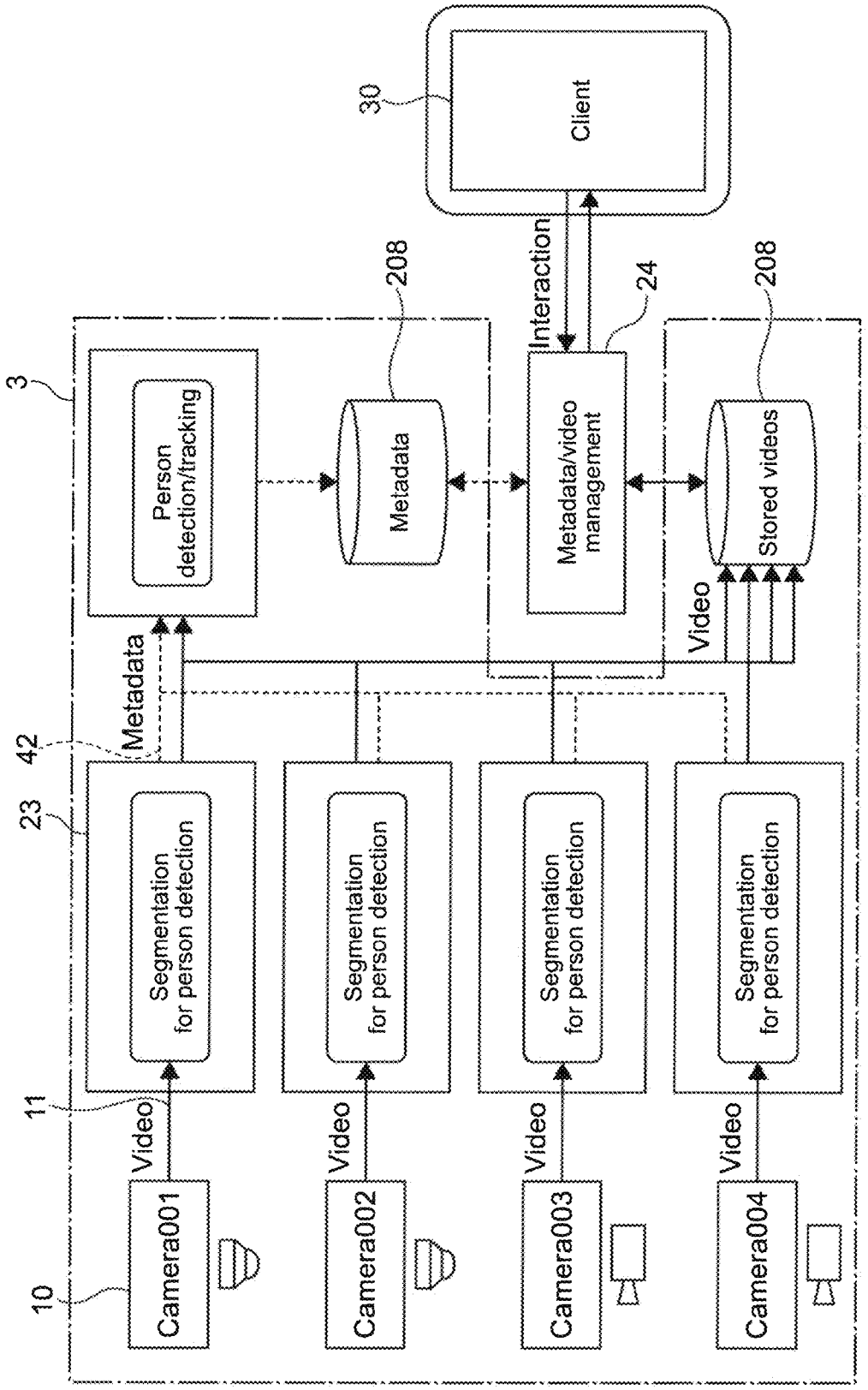
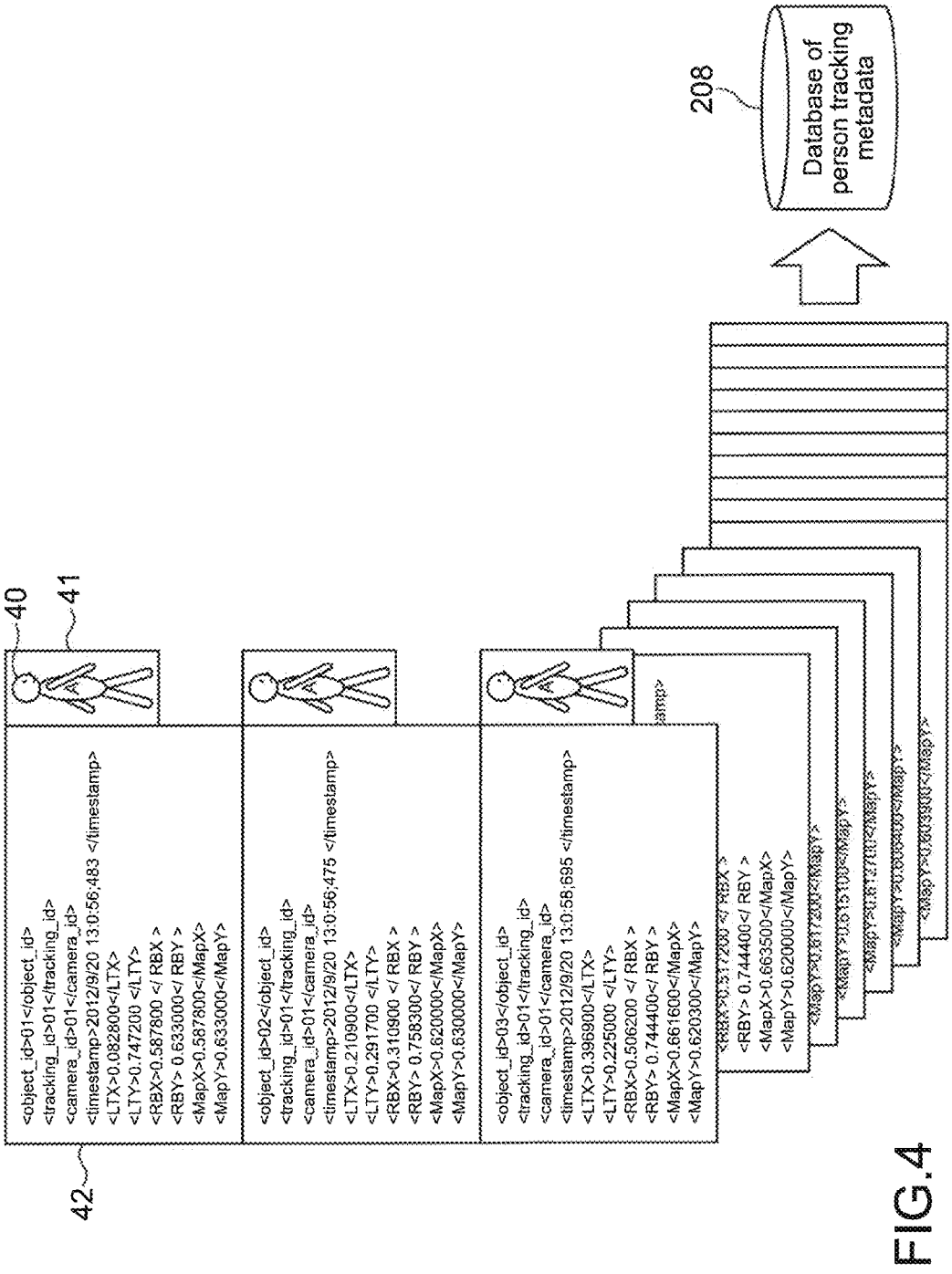

30
Client
Interaction
208
24
208
3
Person detection/tracking
Metadata
Metadata/video management
Stored videos
Video
Metadata
42
23
Segmentation for person detection
Segmentation for person detection
Segmentation for person detection
Segmentation for person detection
11
Video
Video
Video
Video
10
Camera001
Camera002
Camera003
Camera004

FIG.3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Database of person tracking metadata
40
41
42
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<camera_id>01</camera_id>
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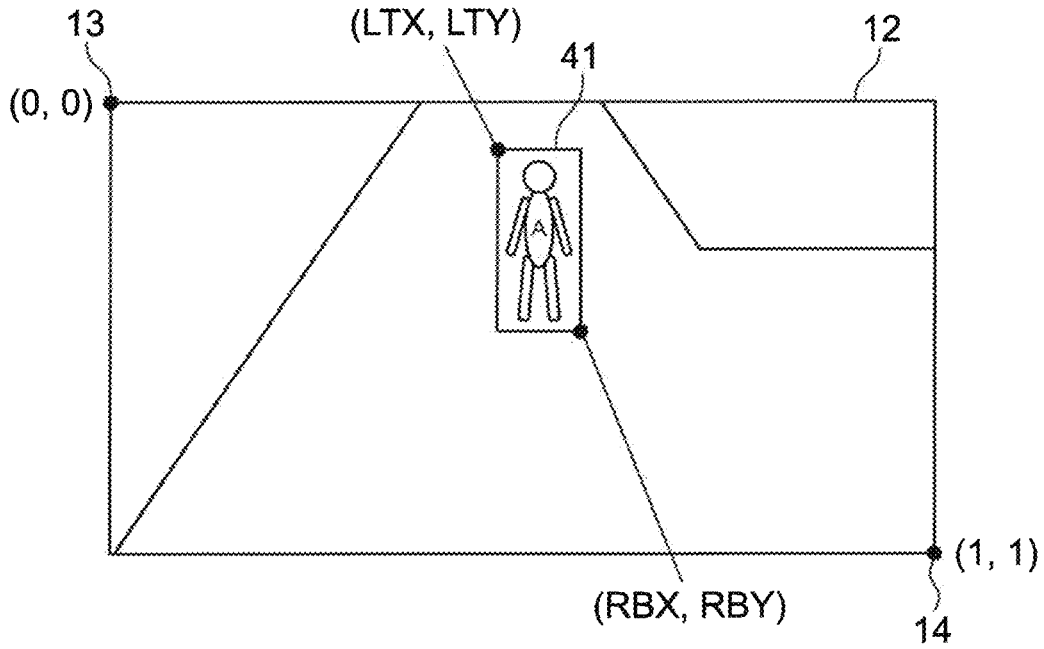
FIG.4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(LTX, LTY)
12
41
(0, 0)
A
(1, 1)
(RBX, RBY)
14

FIG.5A

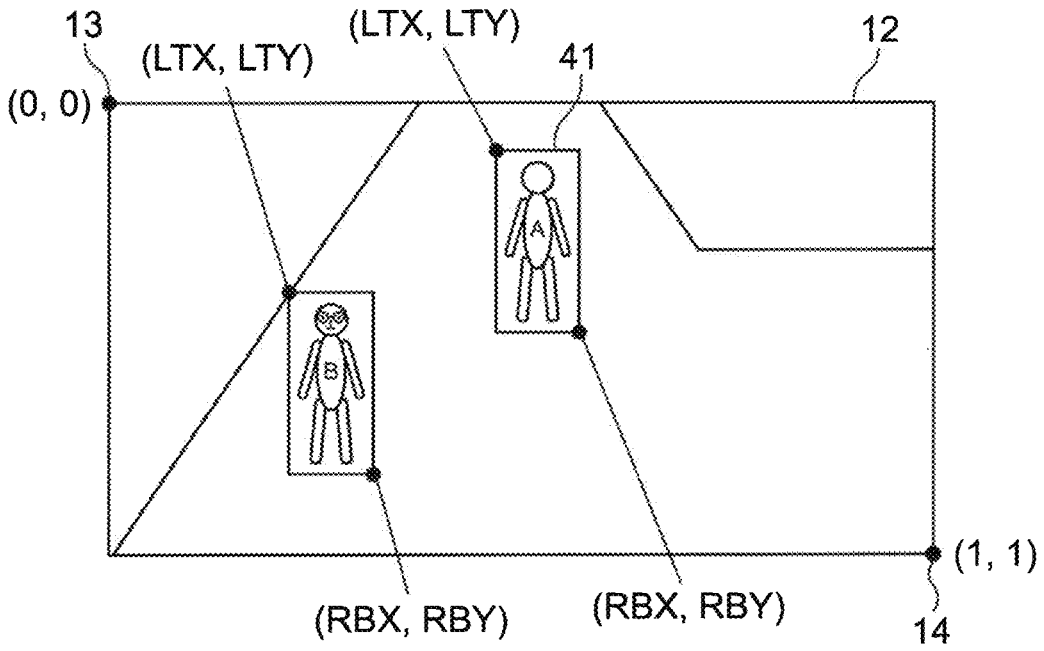

13
(LTX, LTY)
(LTX, LTY)
12
41
(0, 0)
A
B
(1, 1)
(RBX, RBY)
(RBX, RBY)
14

FIG.5B

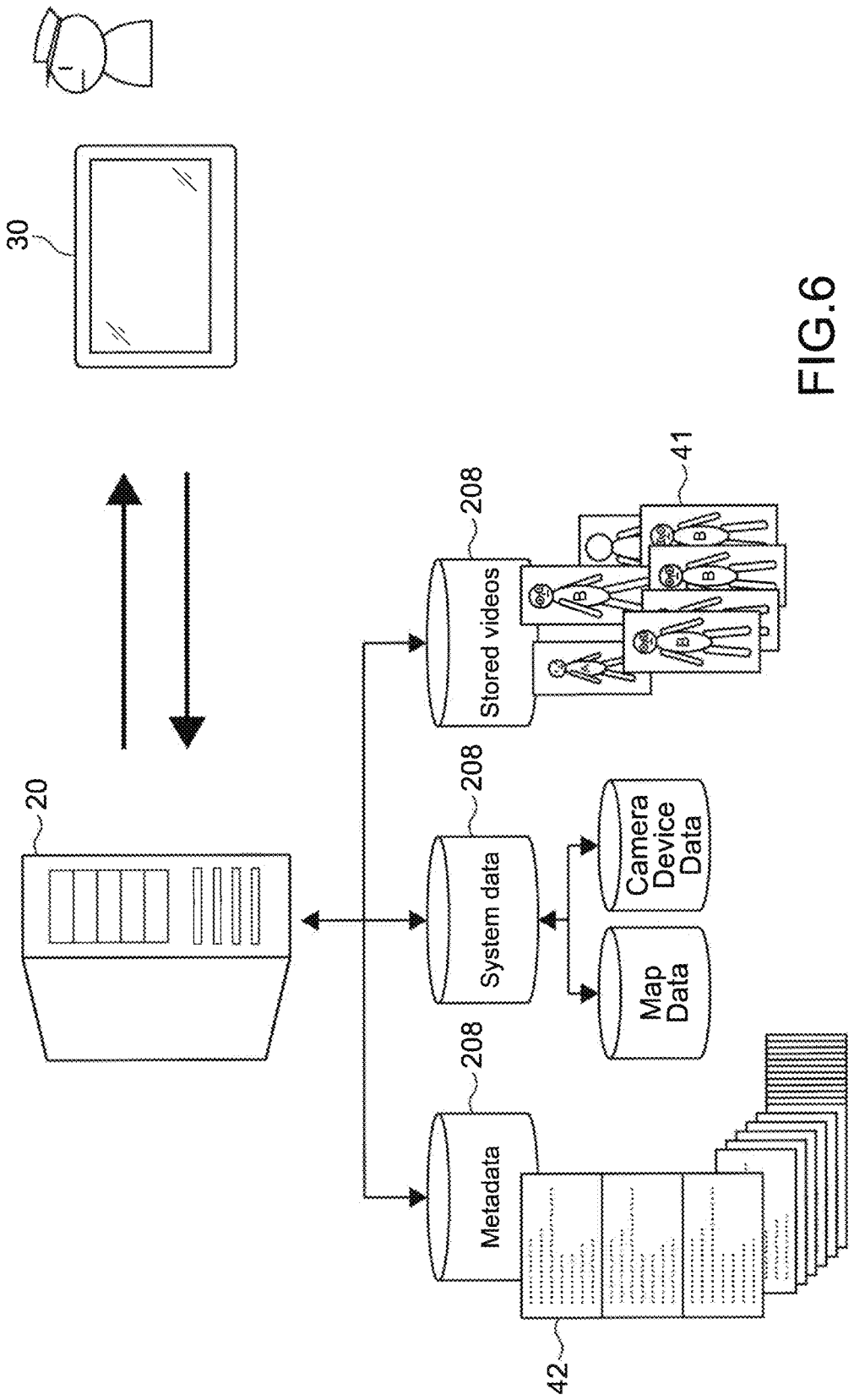

30
20
208
Stored videos
41
208
System data
Camera Device Data
Map Data
208
Metadata
42

FIG.6

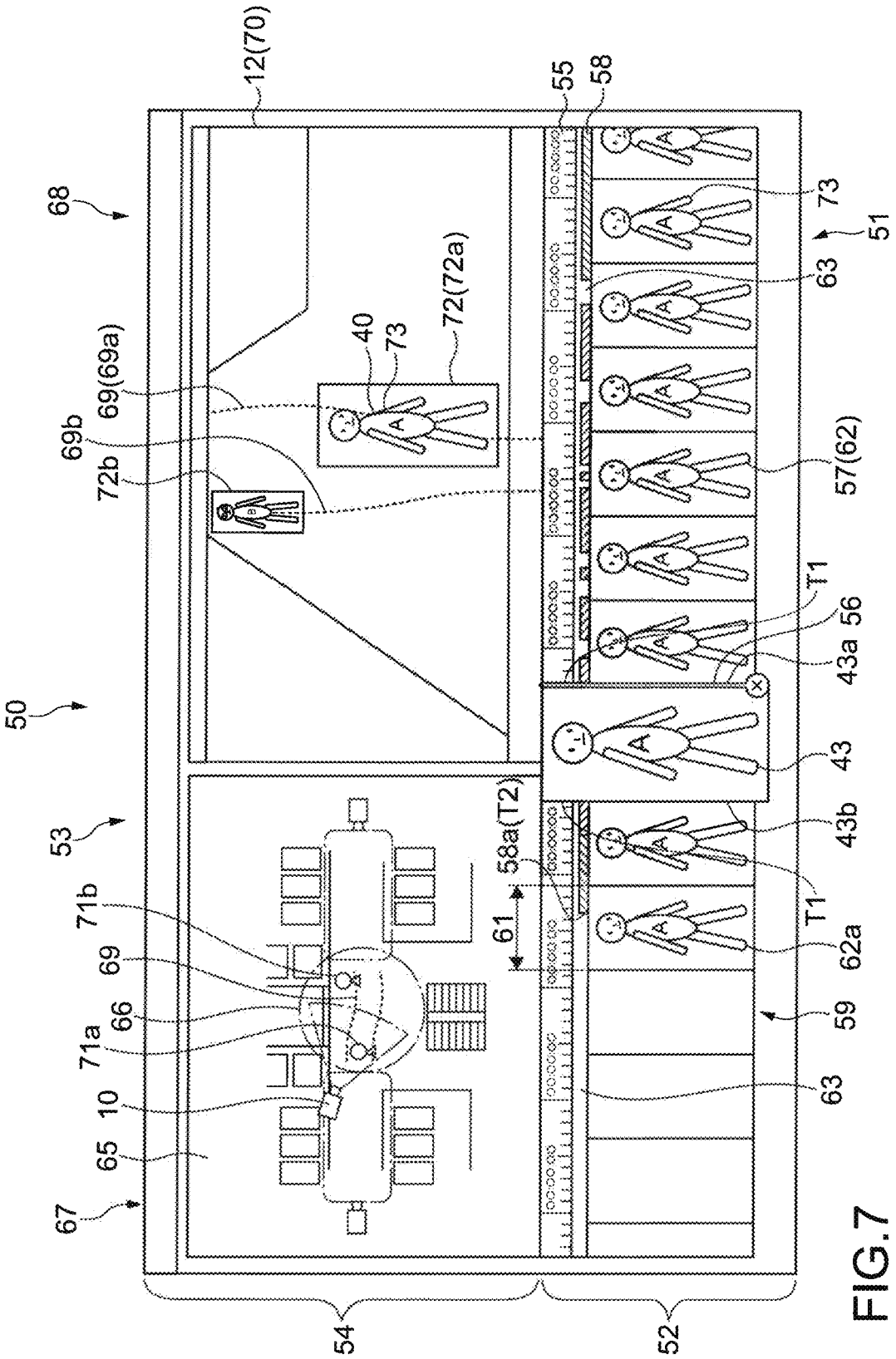

12(70)
55
58
68
73
51
63
72(72a)
40
73
69(69a)
69b
72b
57(62)
T1
56
43a
50
43
53
43b
58a(T2)
71b
61
T1
69
62a
66
59
71a
63
10
65
67
54
52

FIG.7

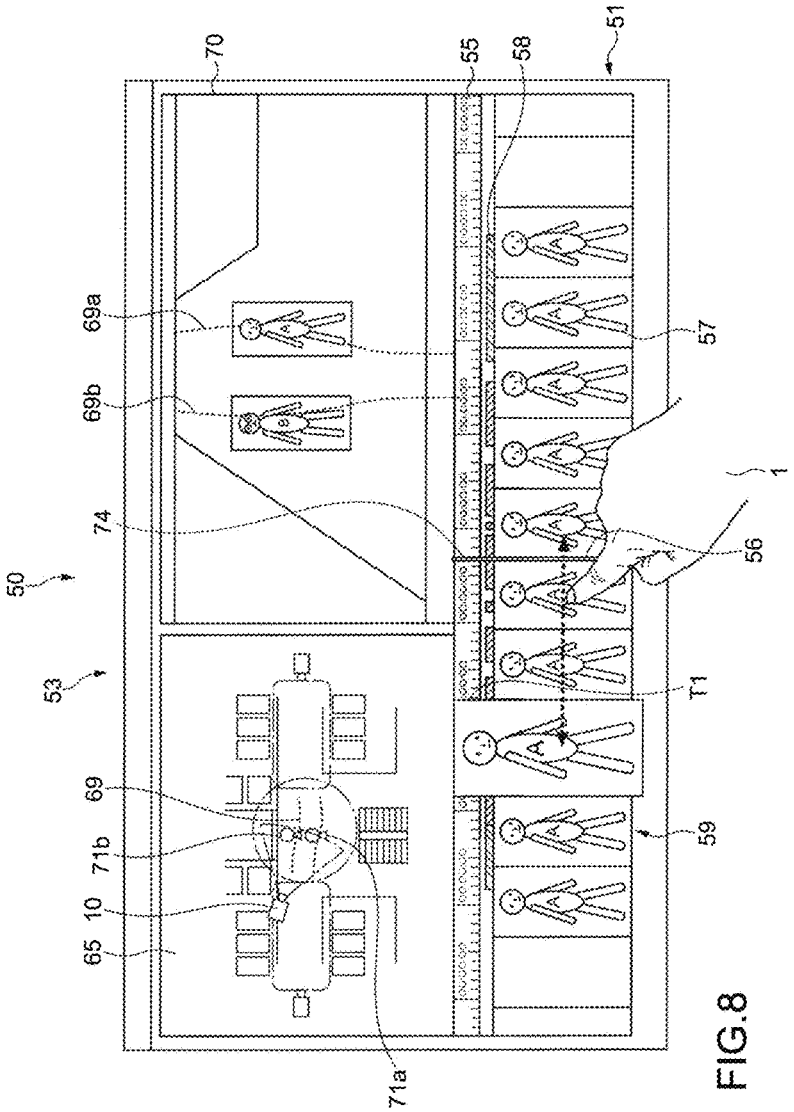



FIG.8

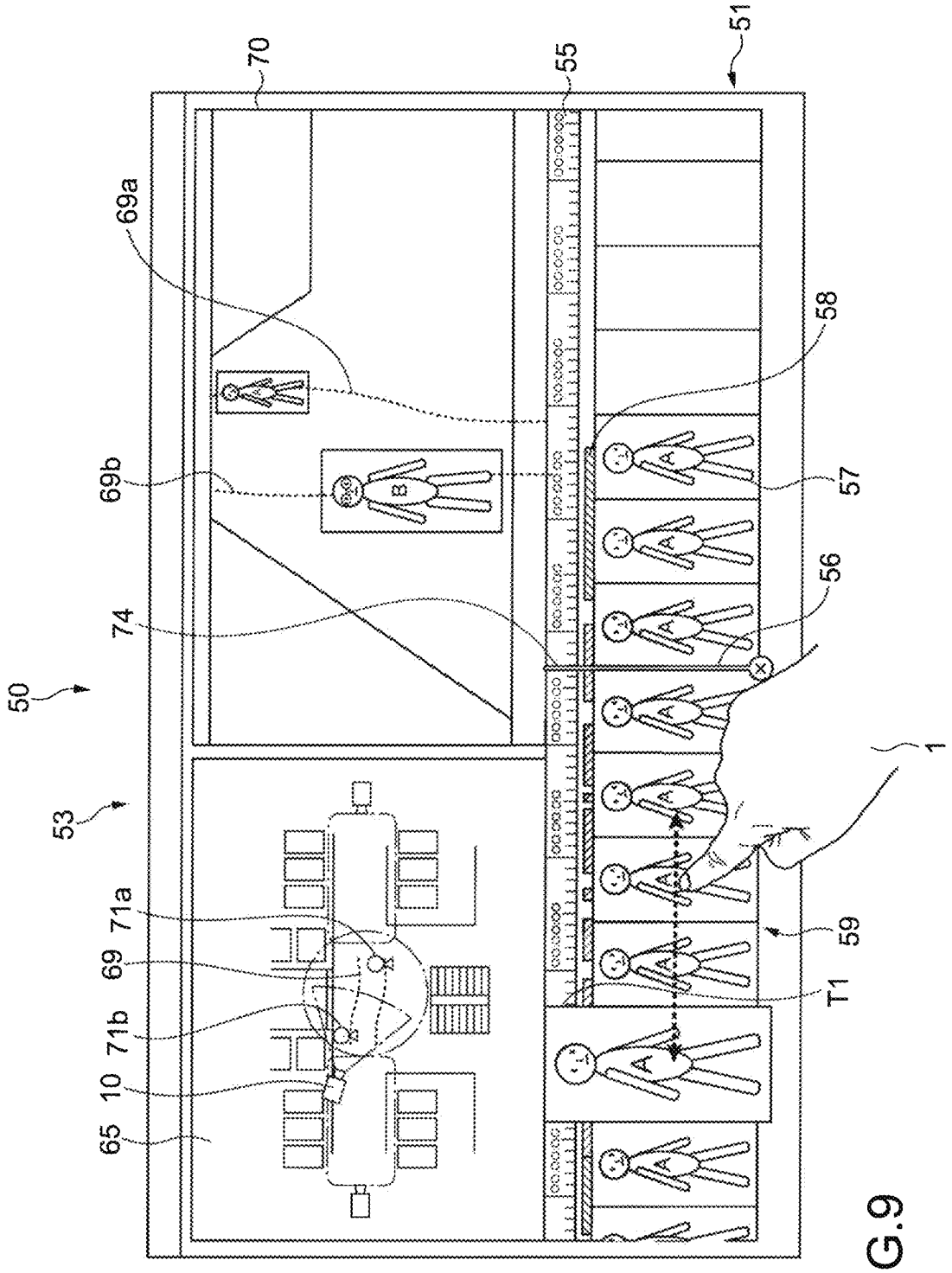



FIG.9

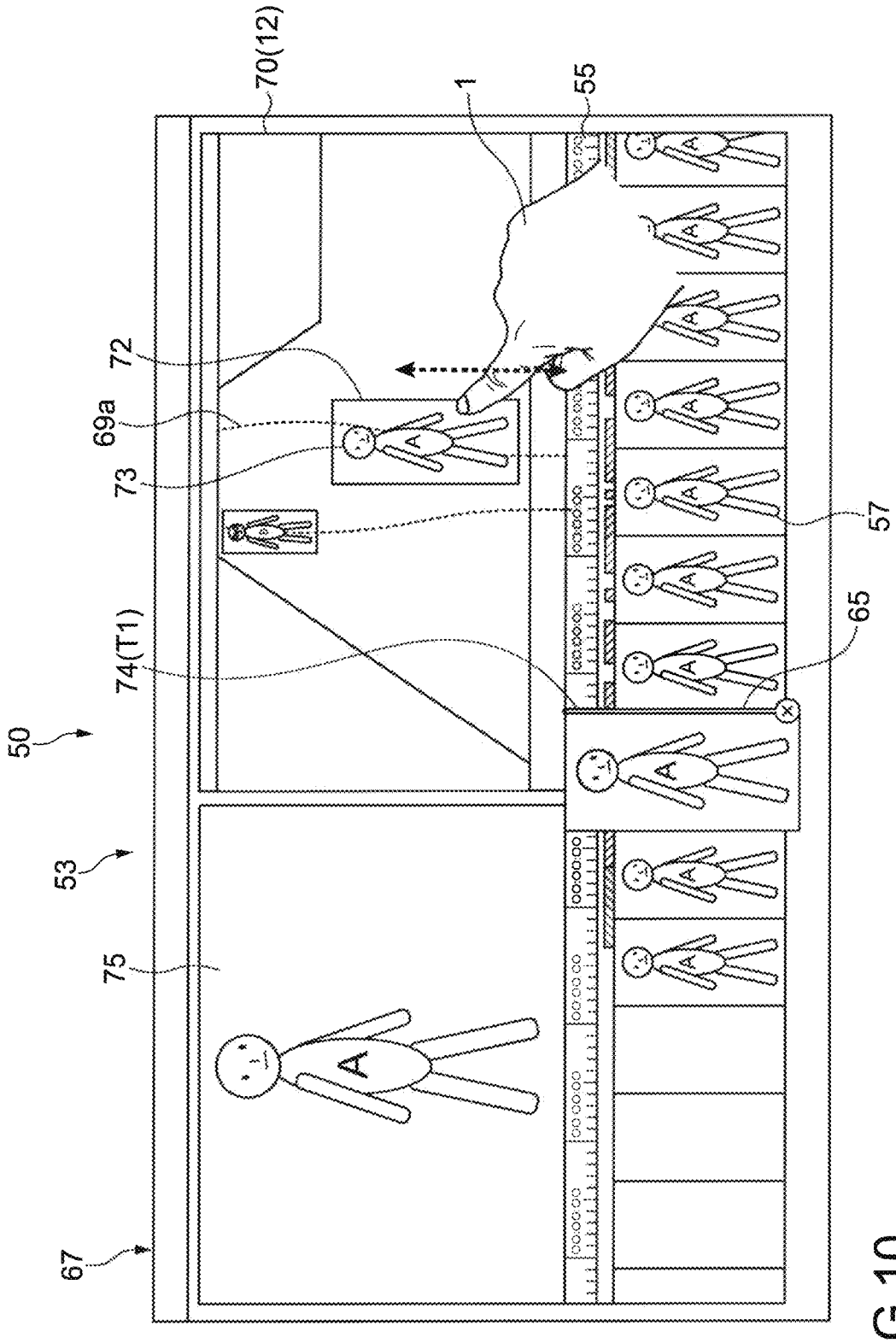



FIG.10

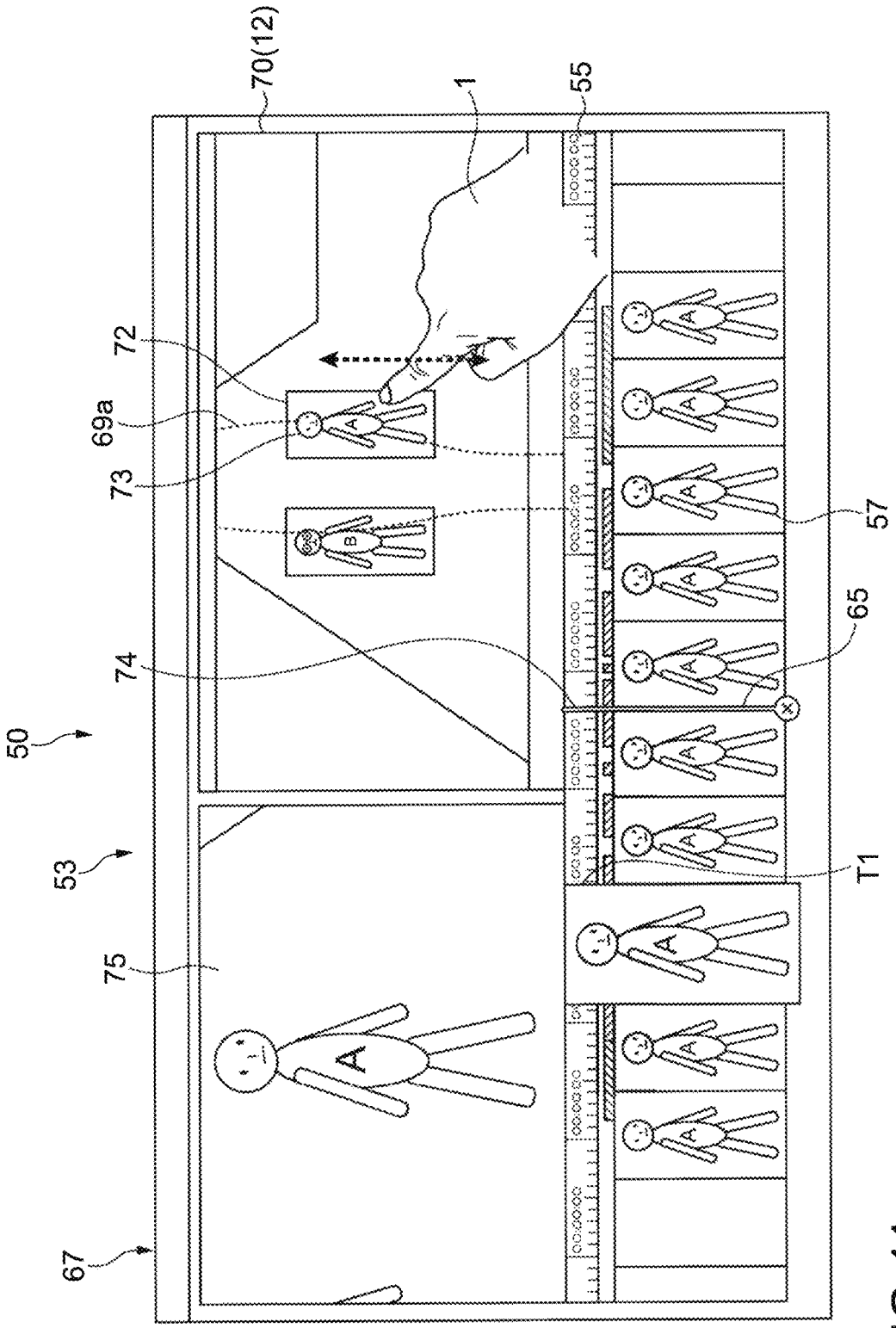



FIG.11

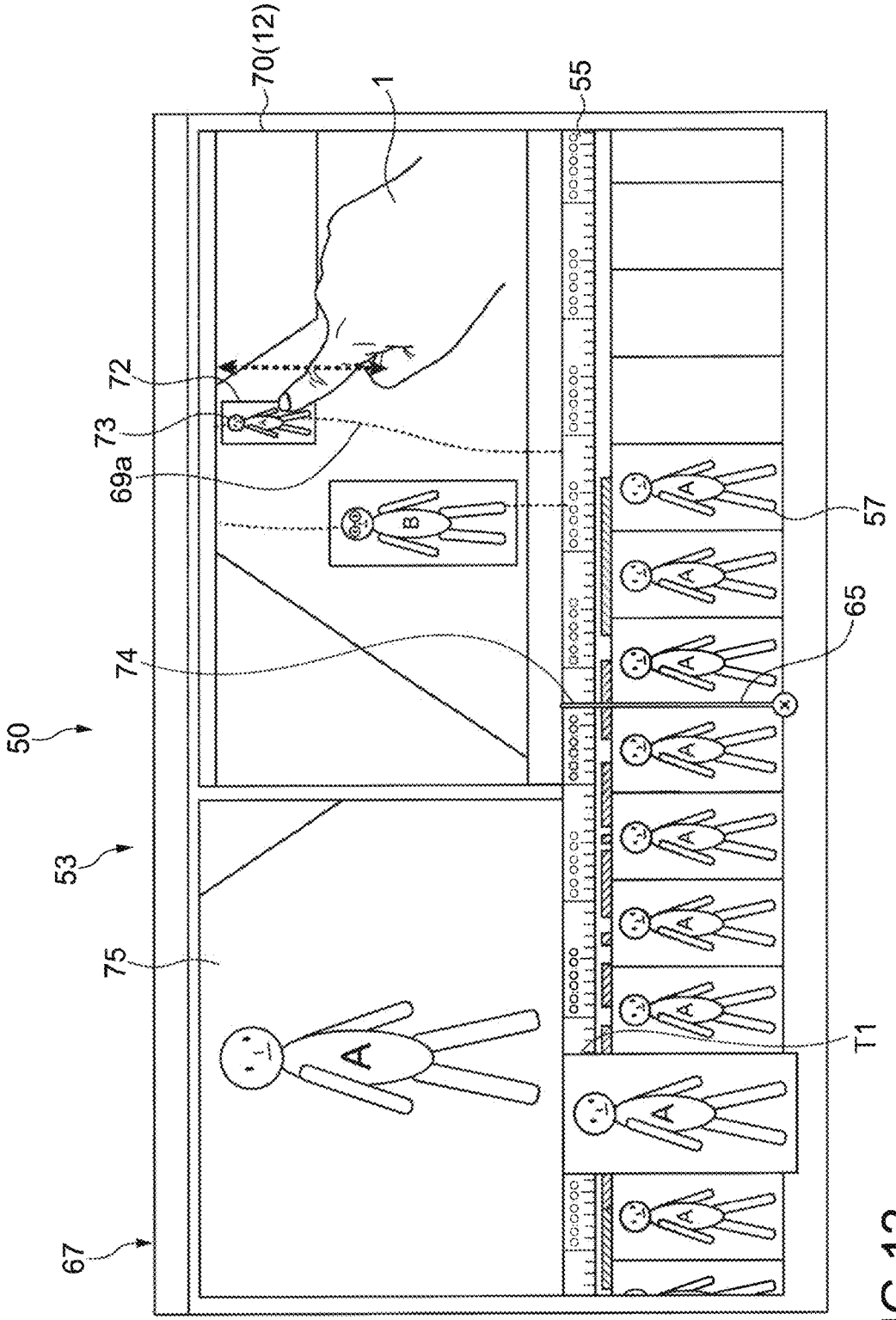



FIG.12

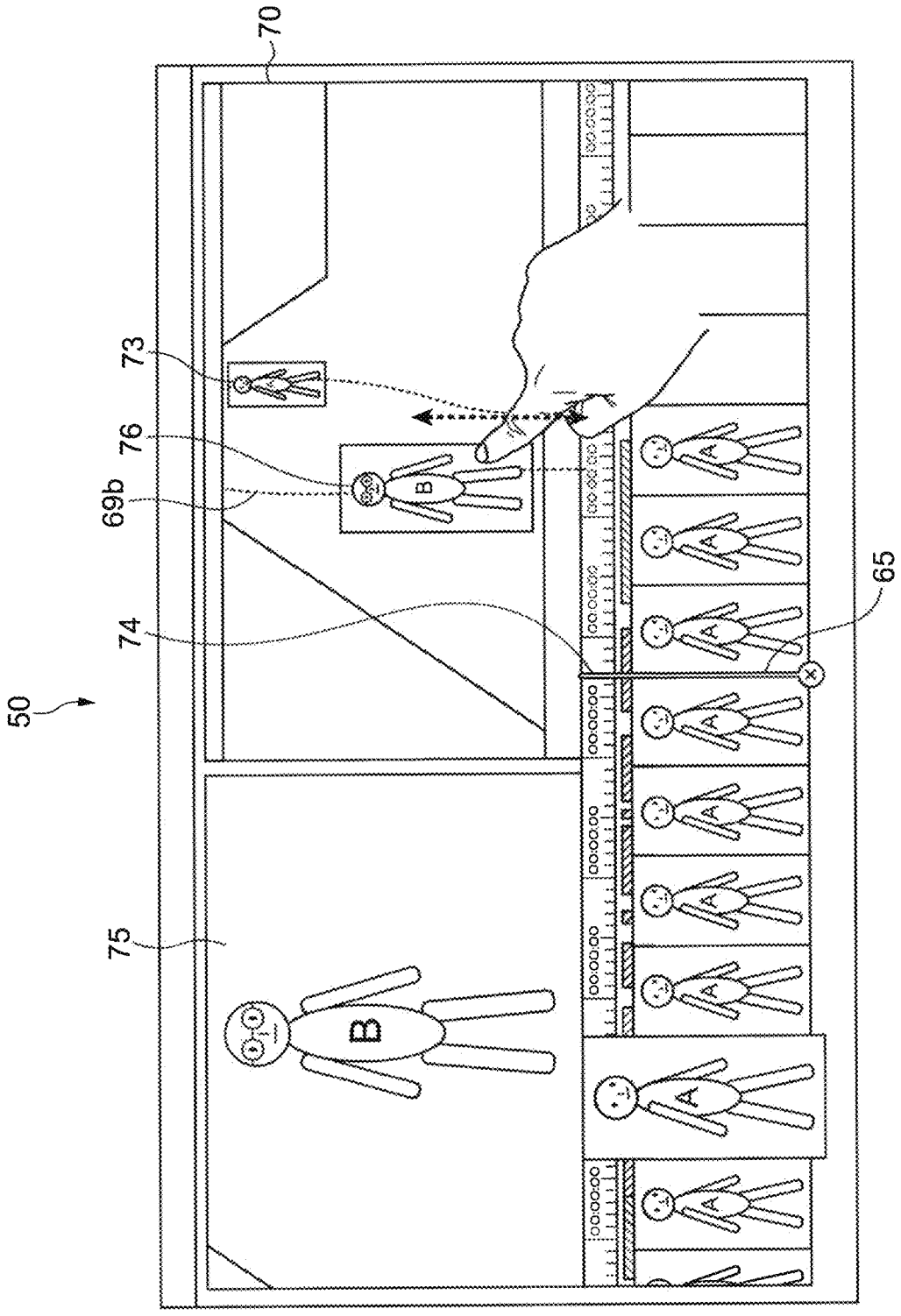



FIG.13

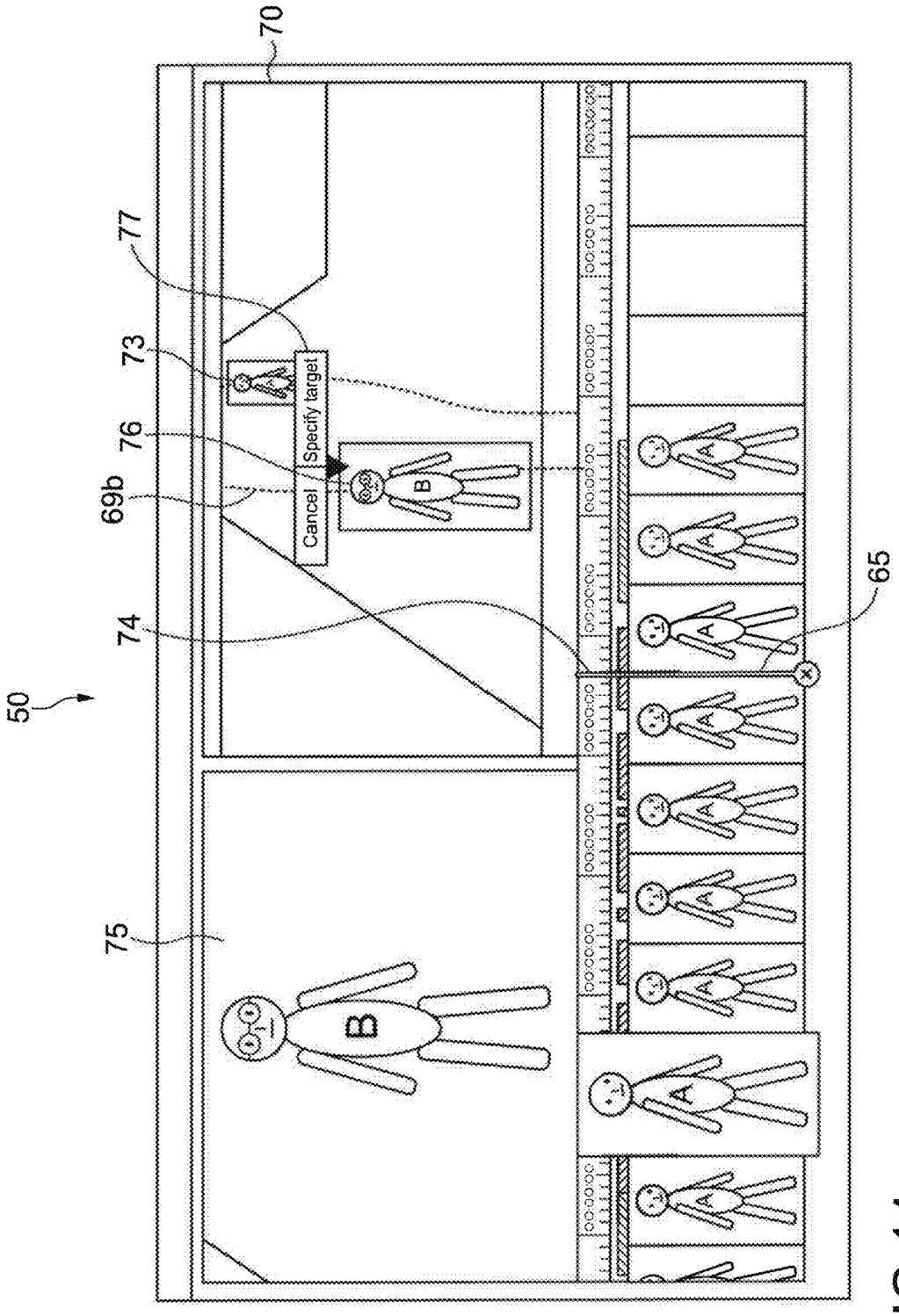



FIG.14

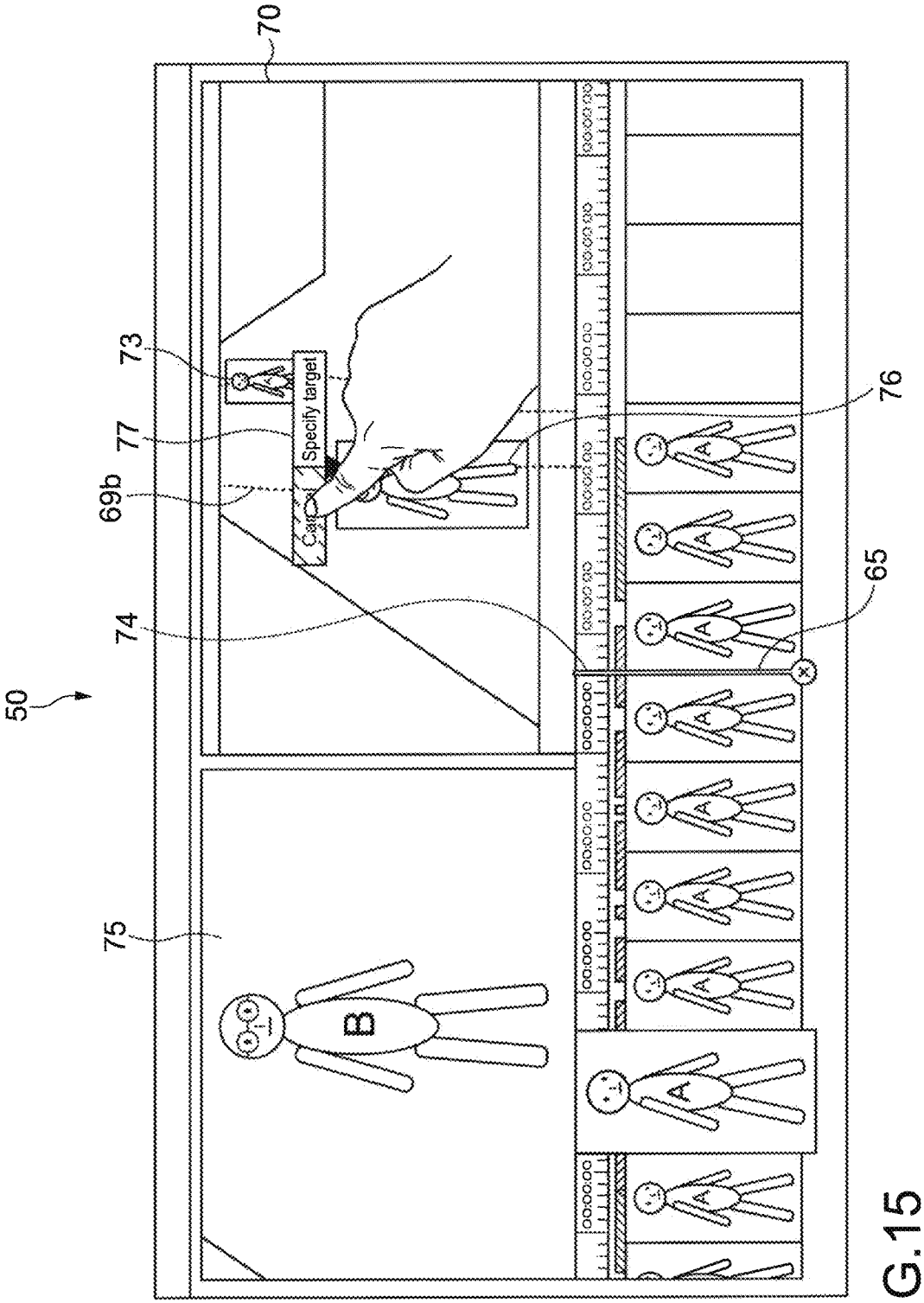



FIG.15

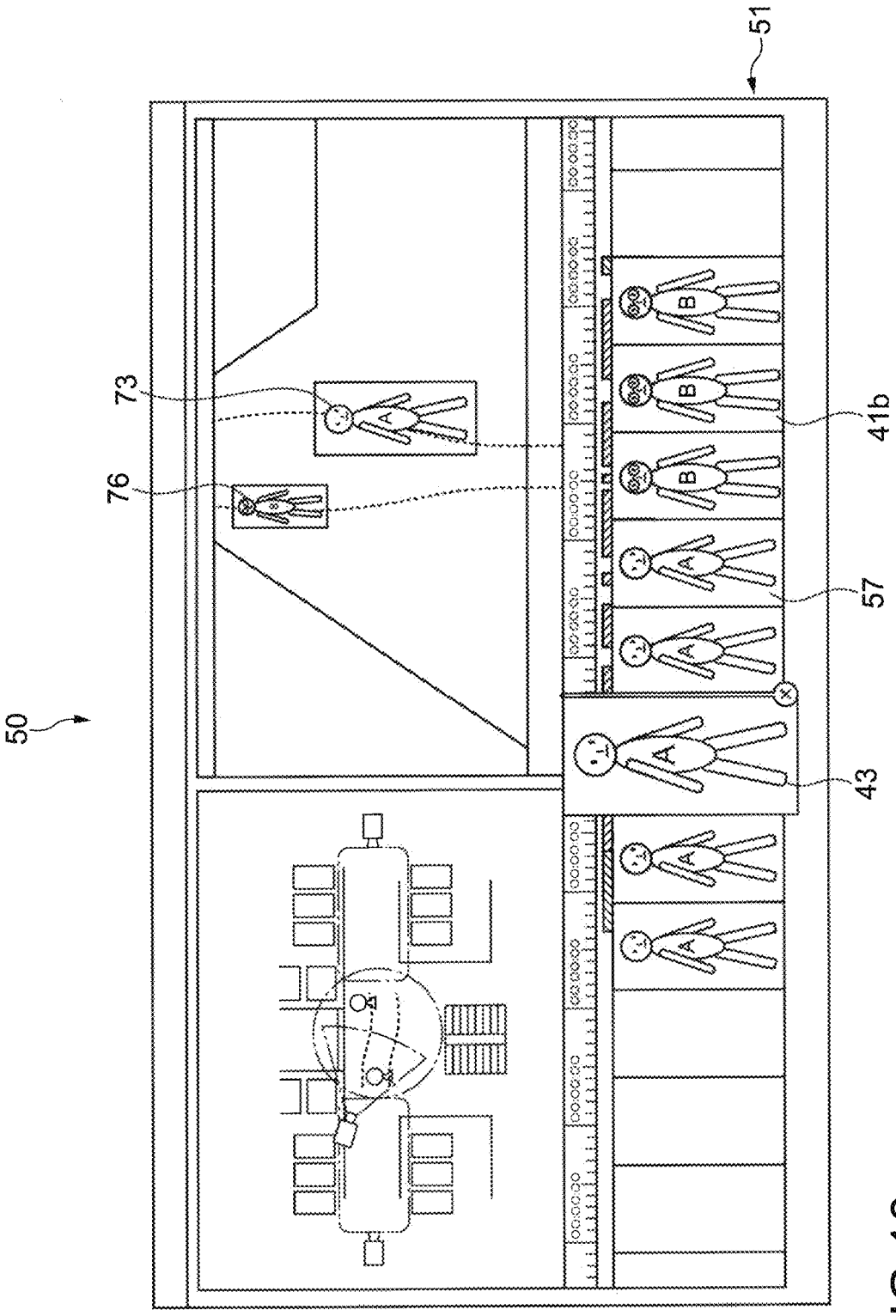



FIG.16

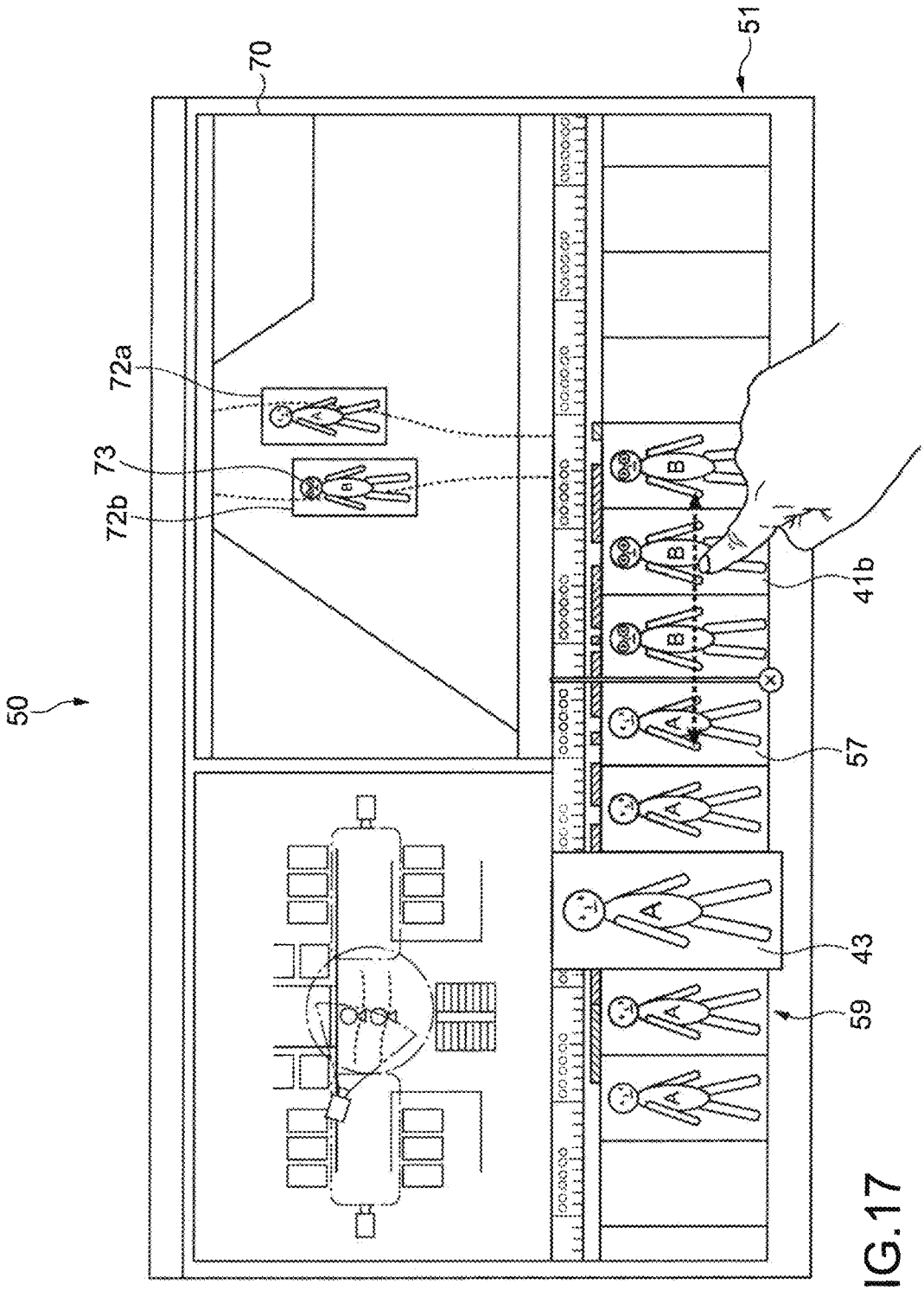



FIG.17

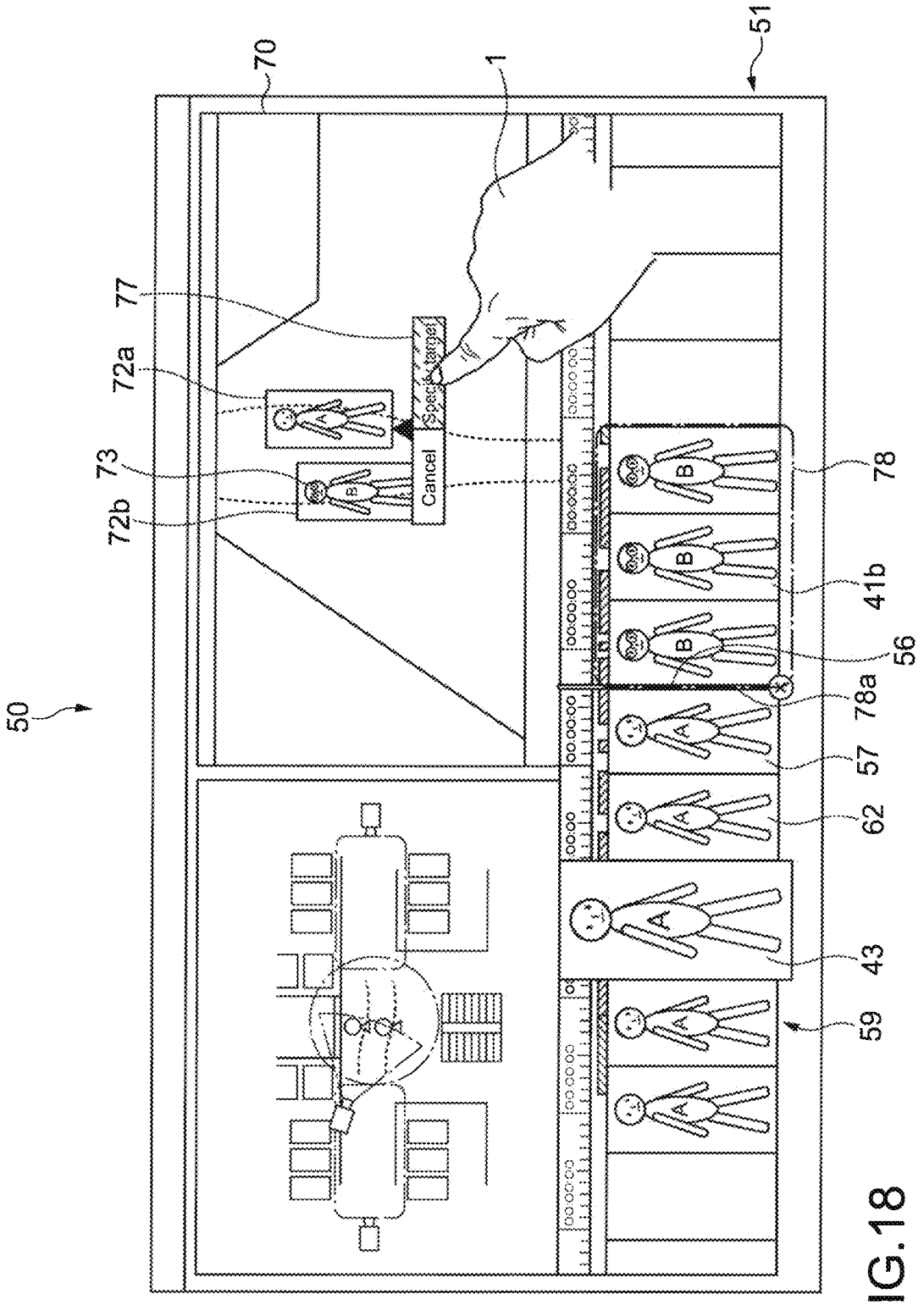

70
1
51
77
72a
73
72b
Specify target
Cancel
78
41b
56
78a
57
62
43
59
50

FIG.18

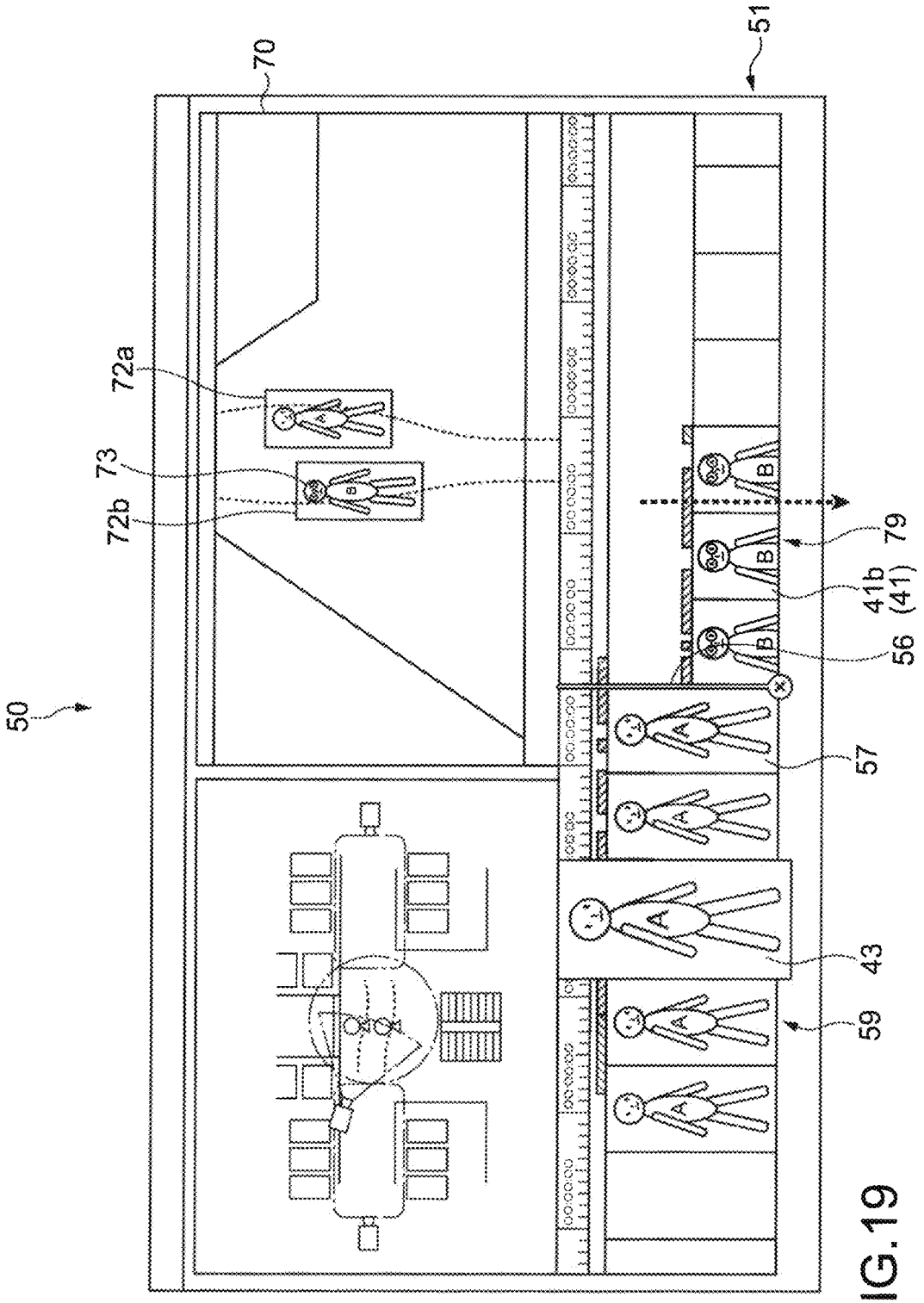



FIG.19

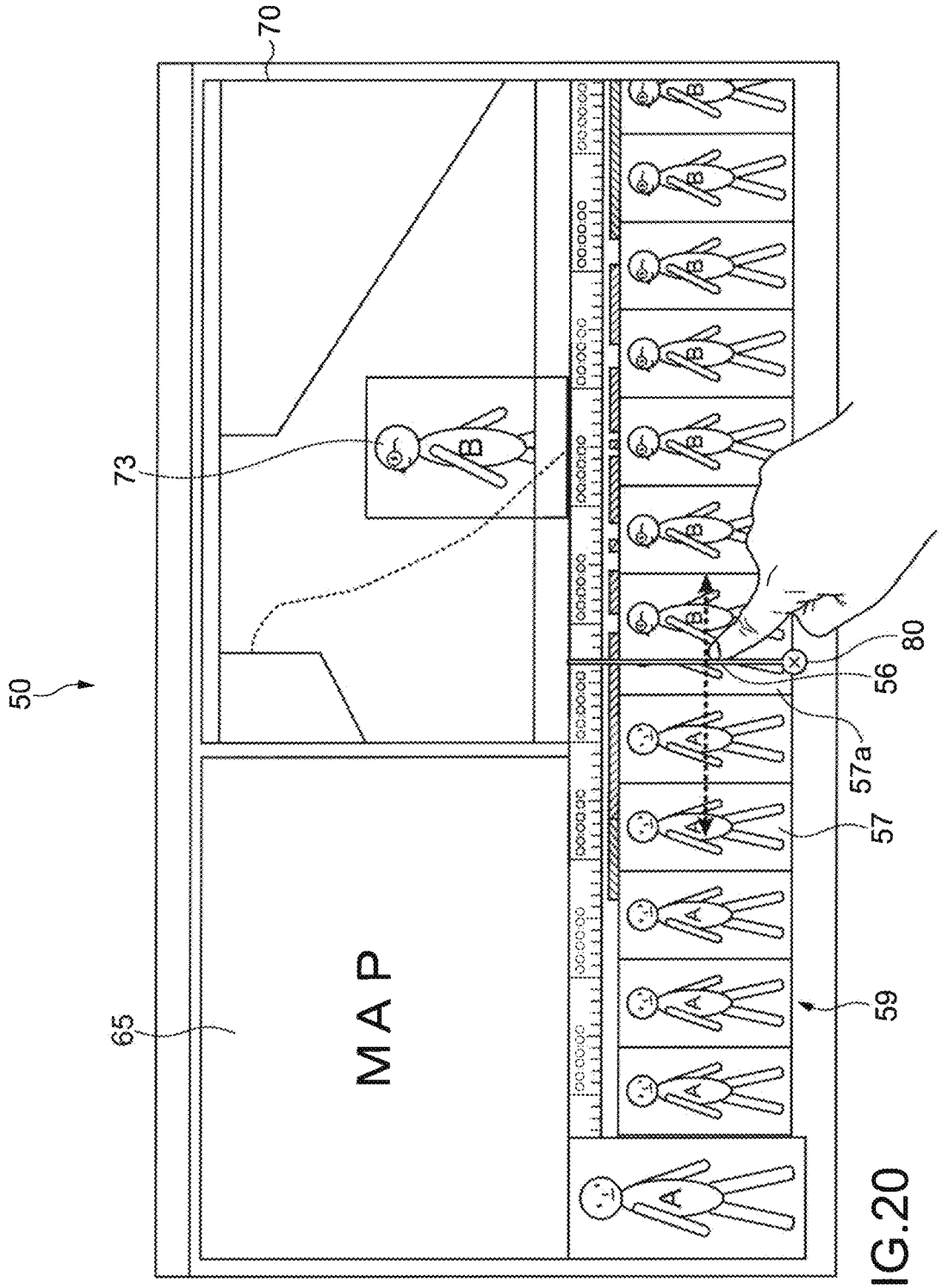



FIG.20

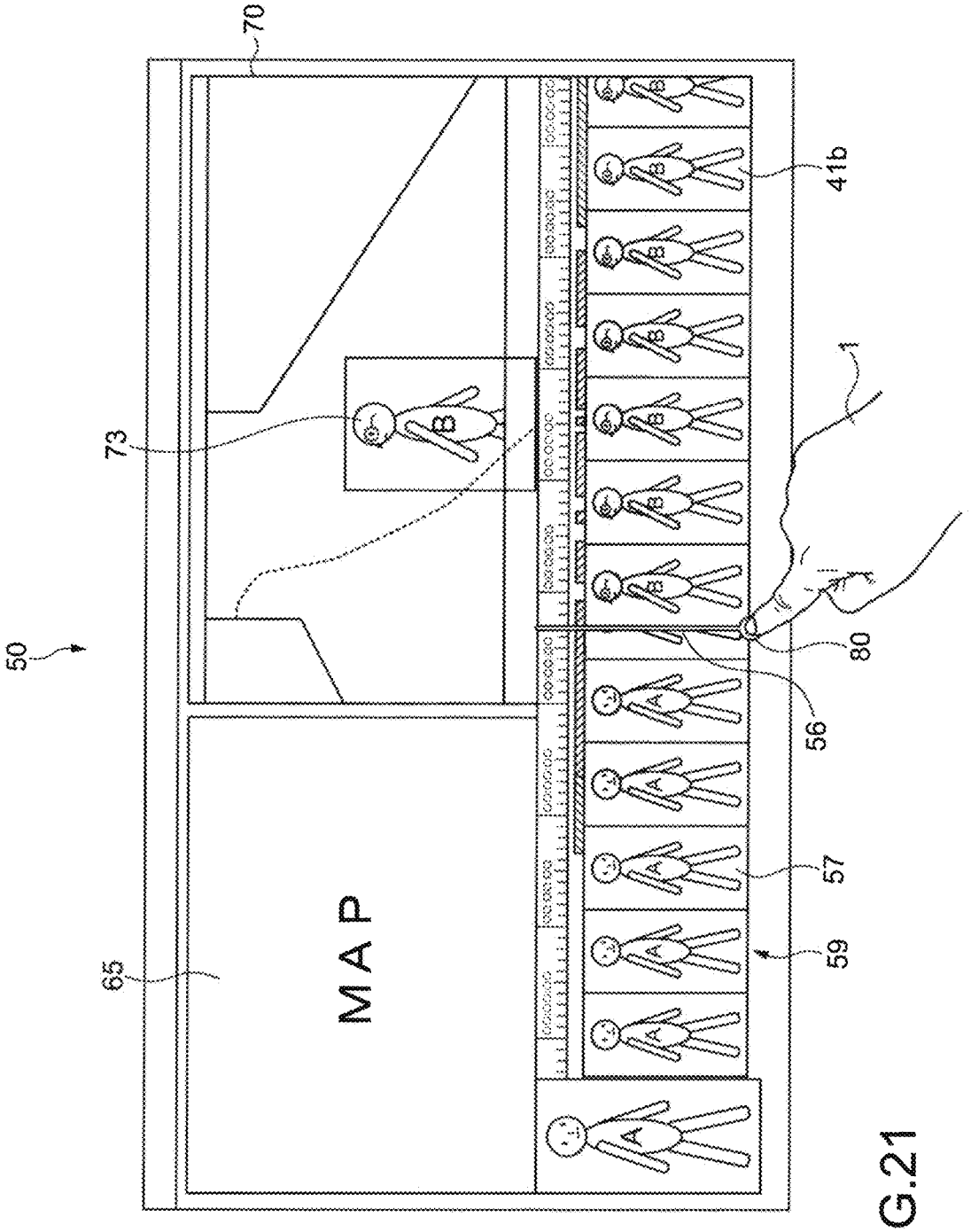



FIG.21

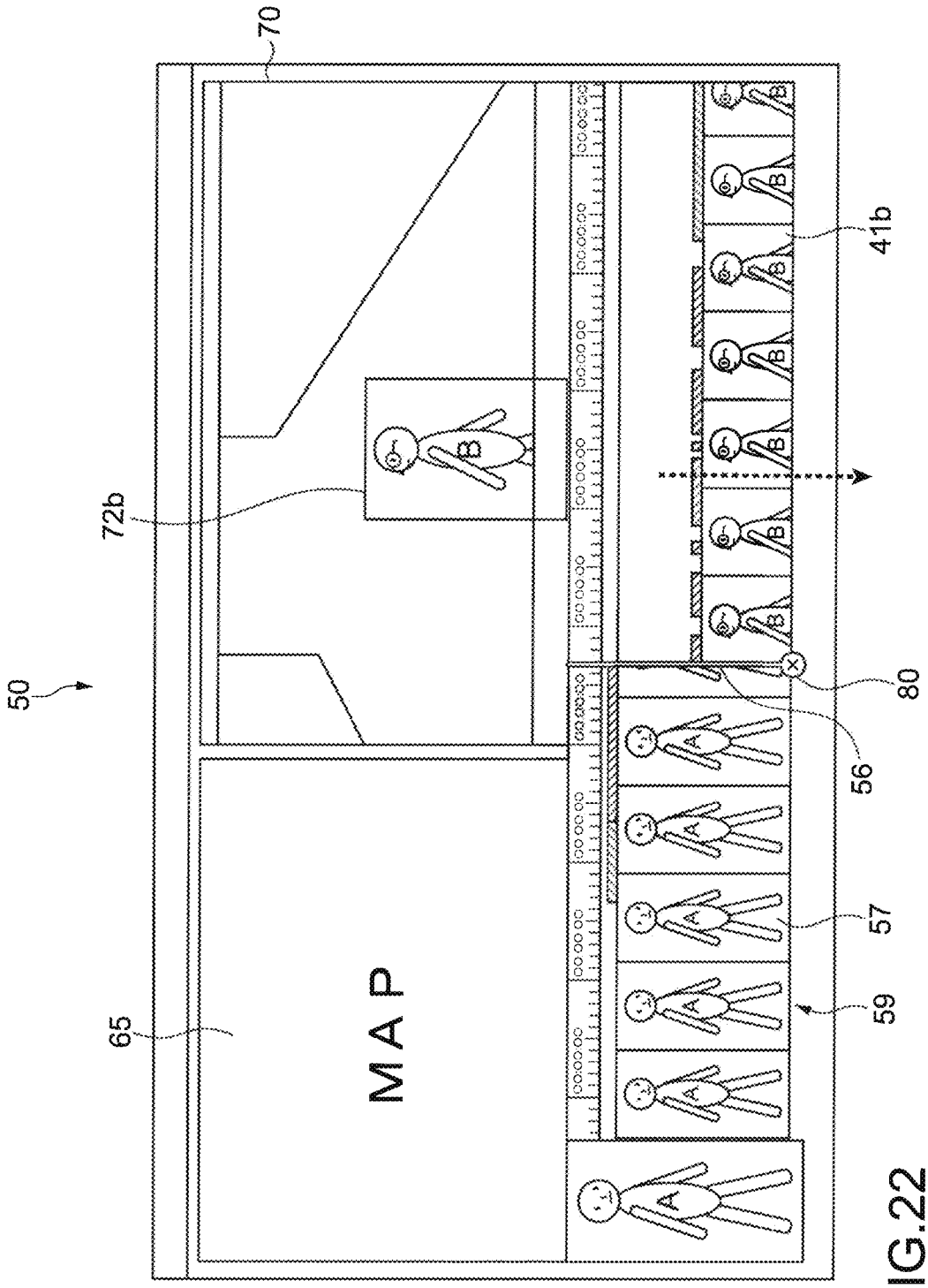



FIG.22

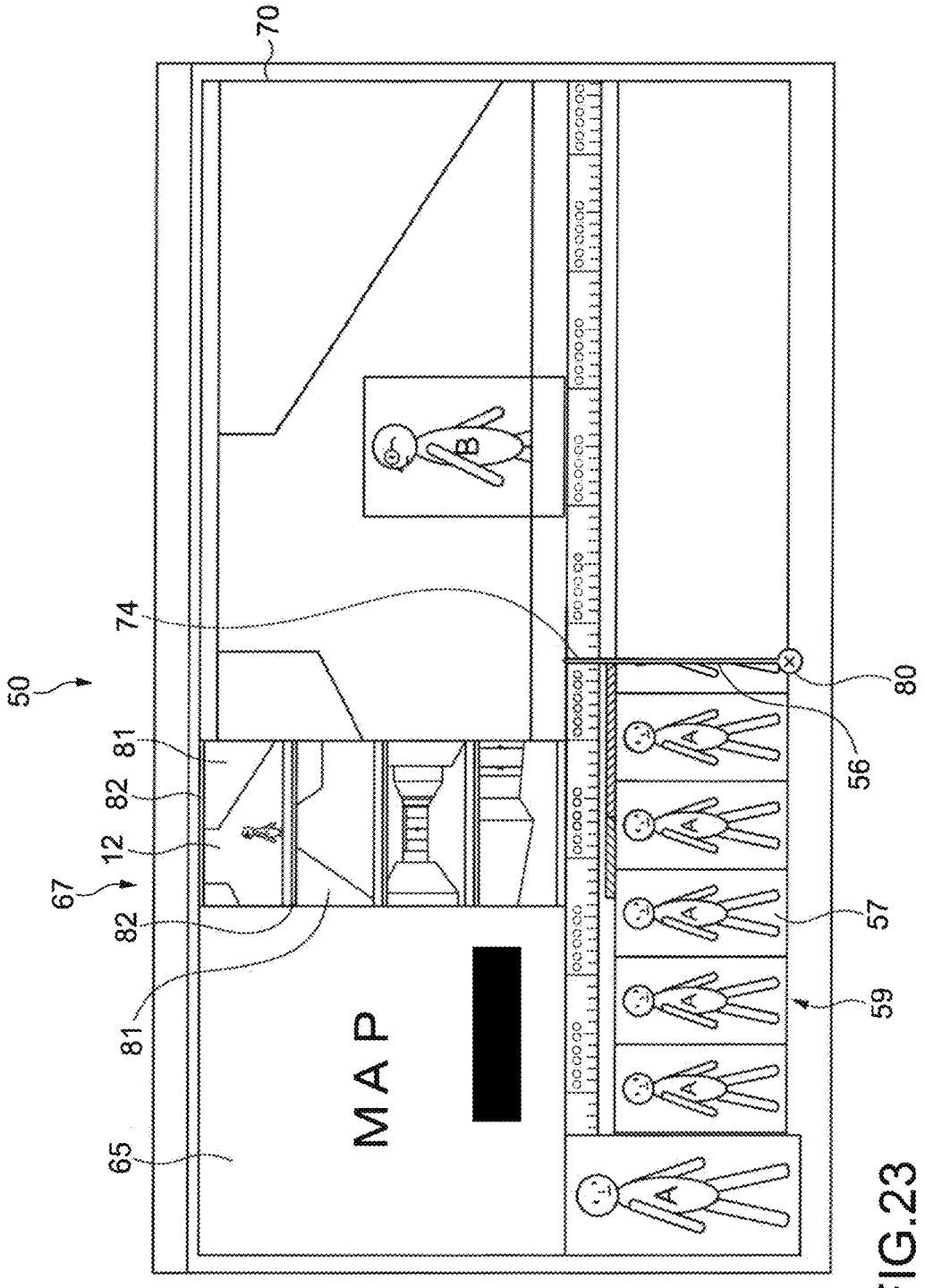



FIG.23

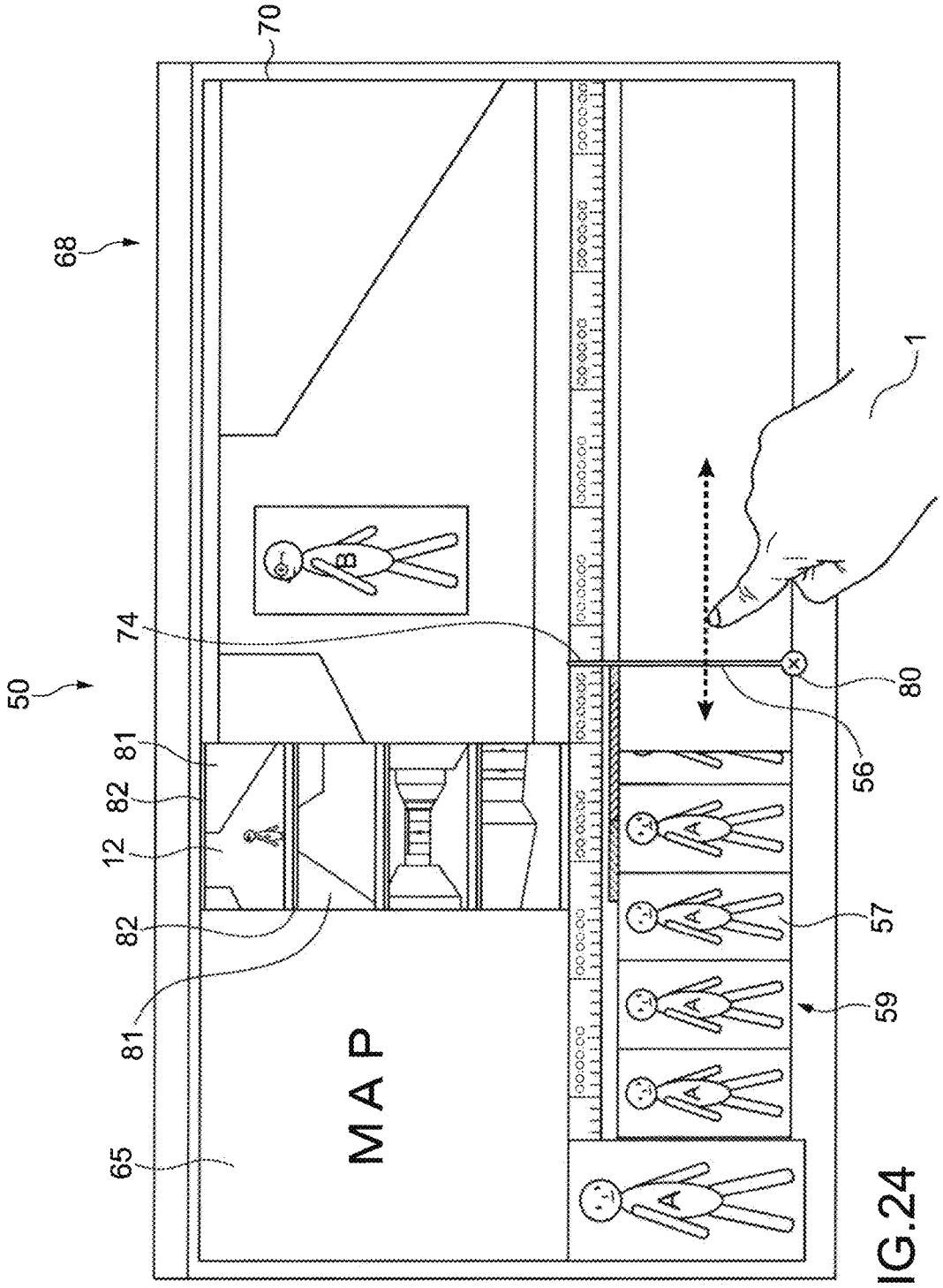



FIG.24

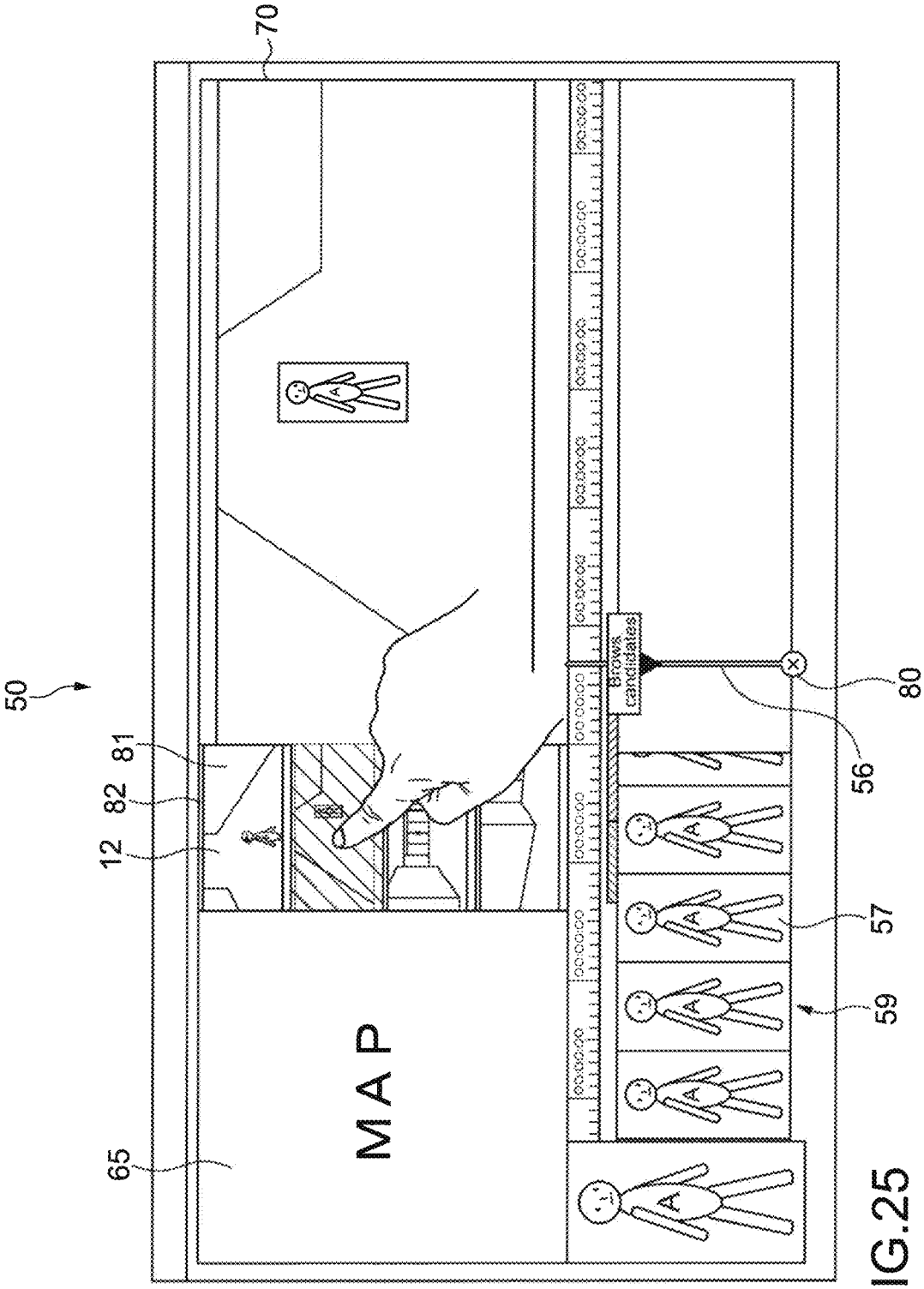



FIG.25

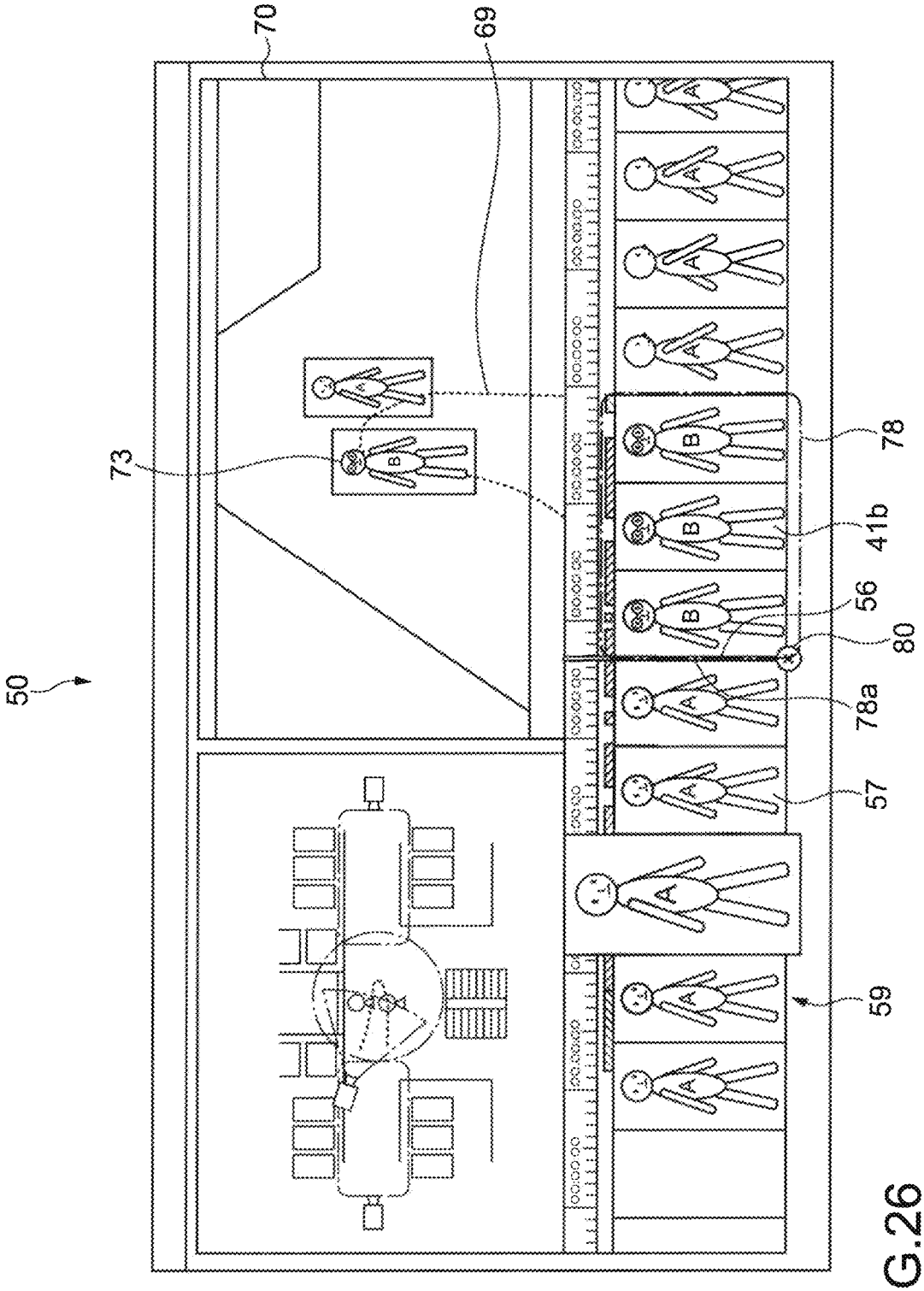



FIG.26

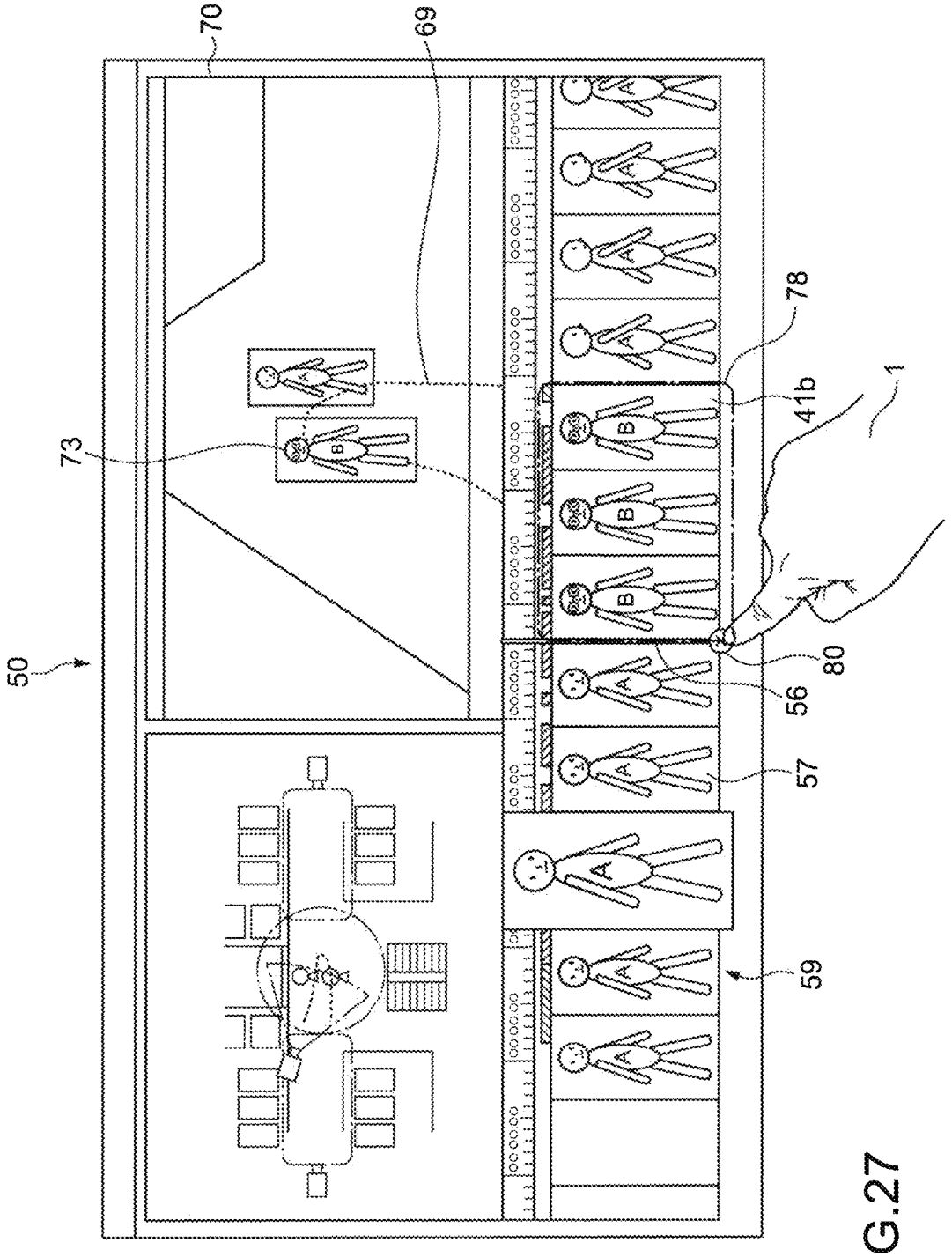



FIG.27

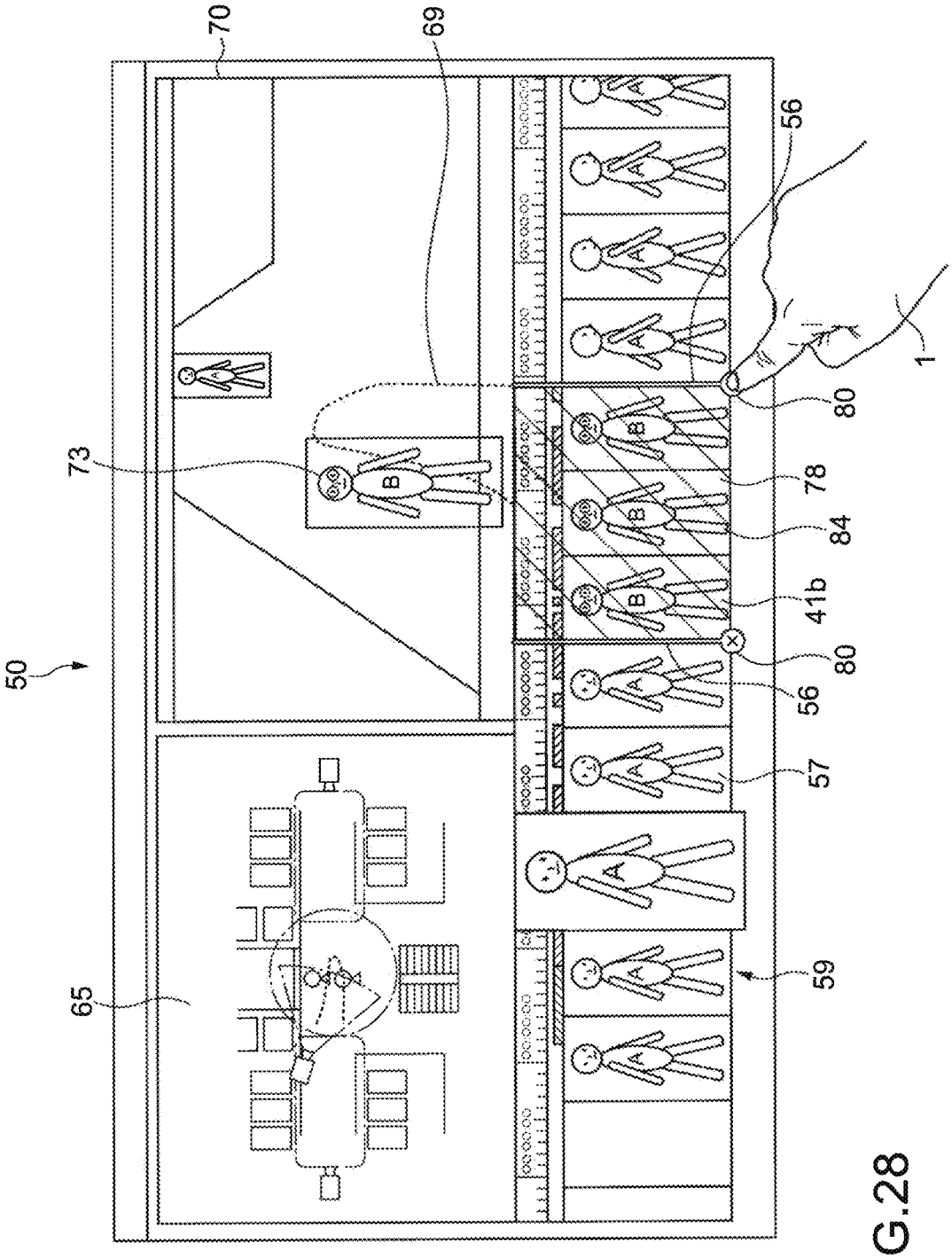



FIG.28

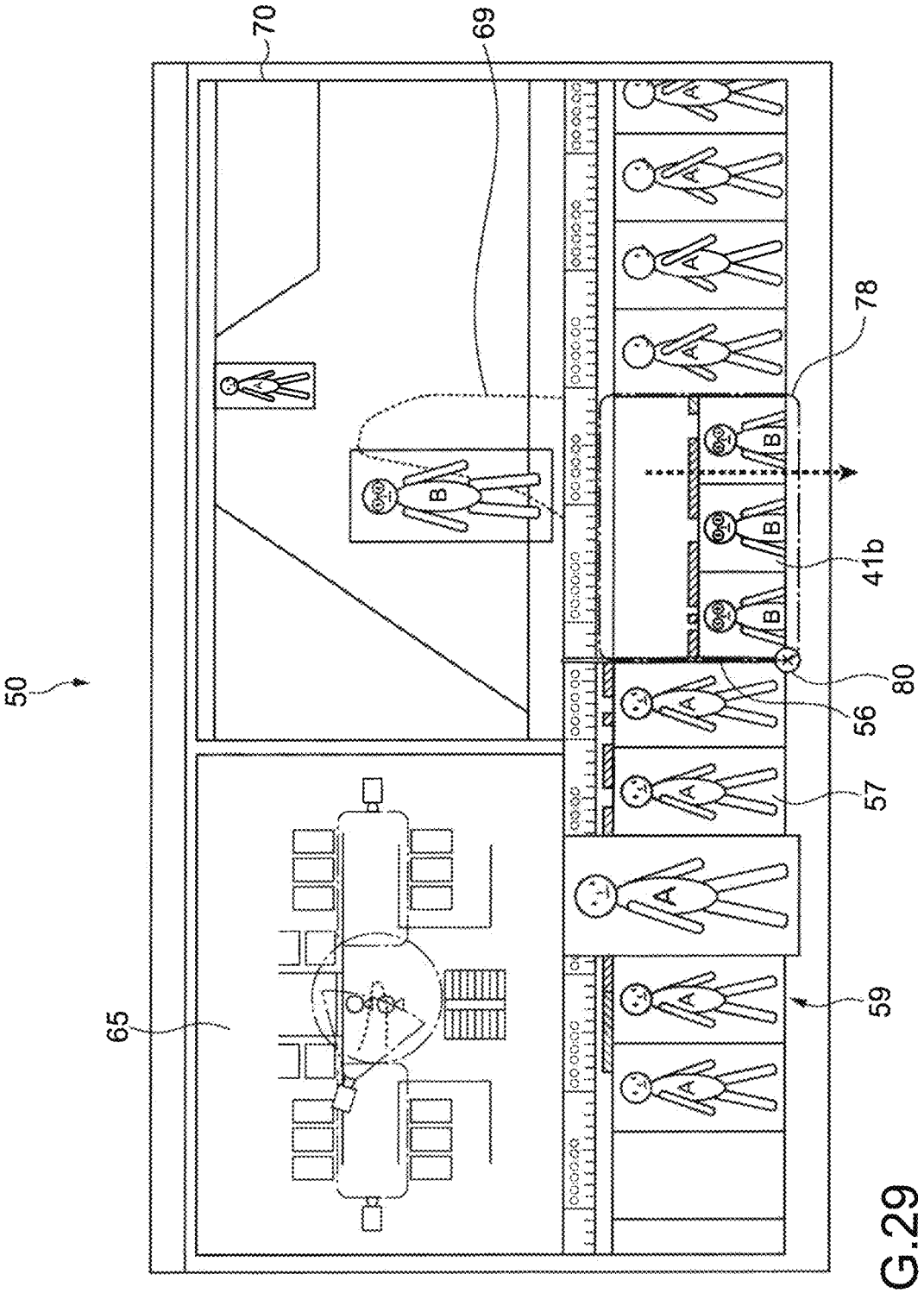



FIG.29

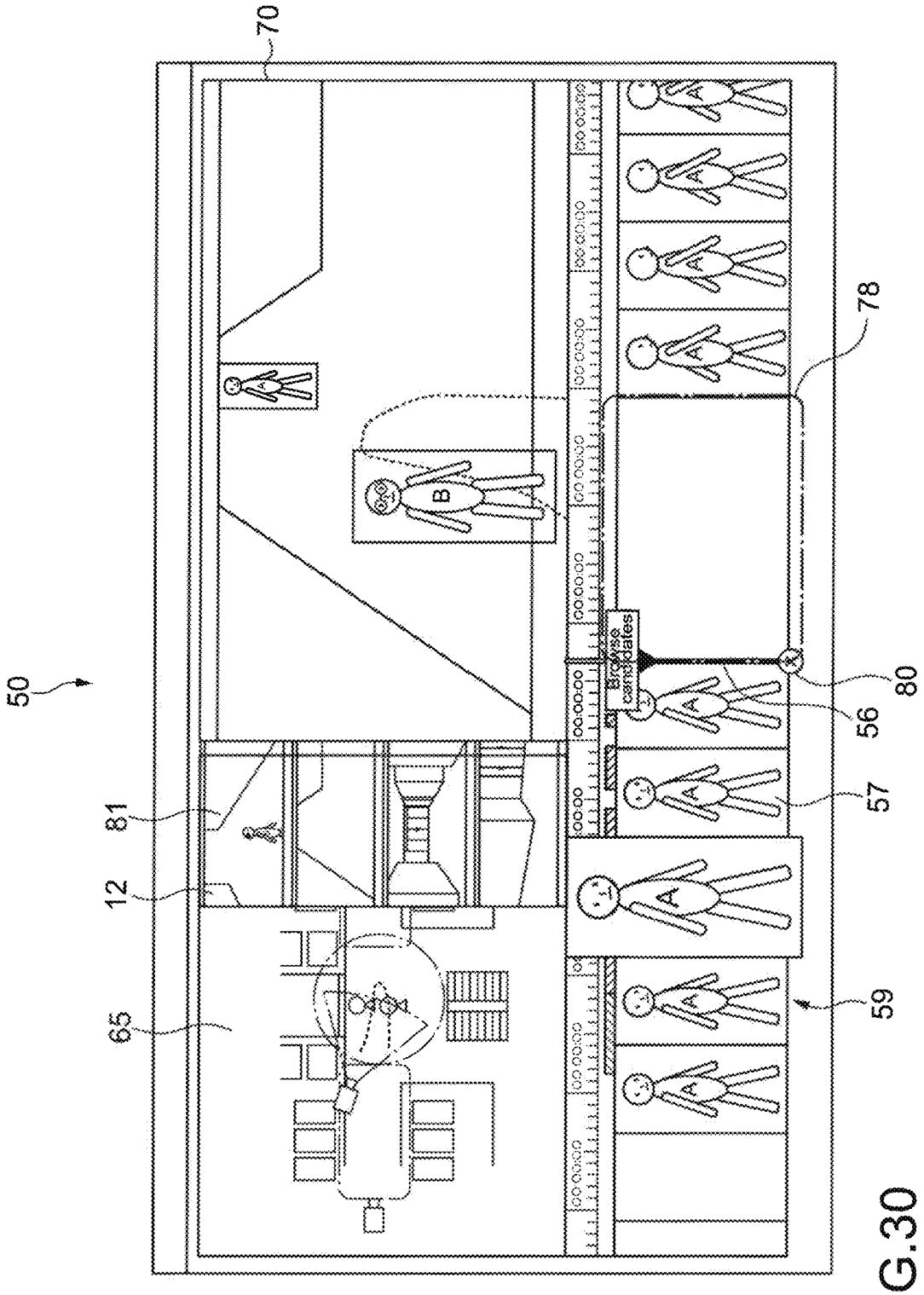



FIG.30

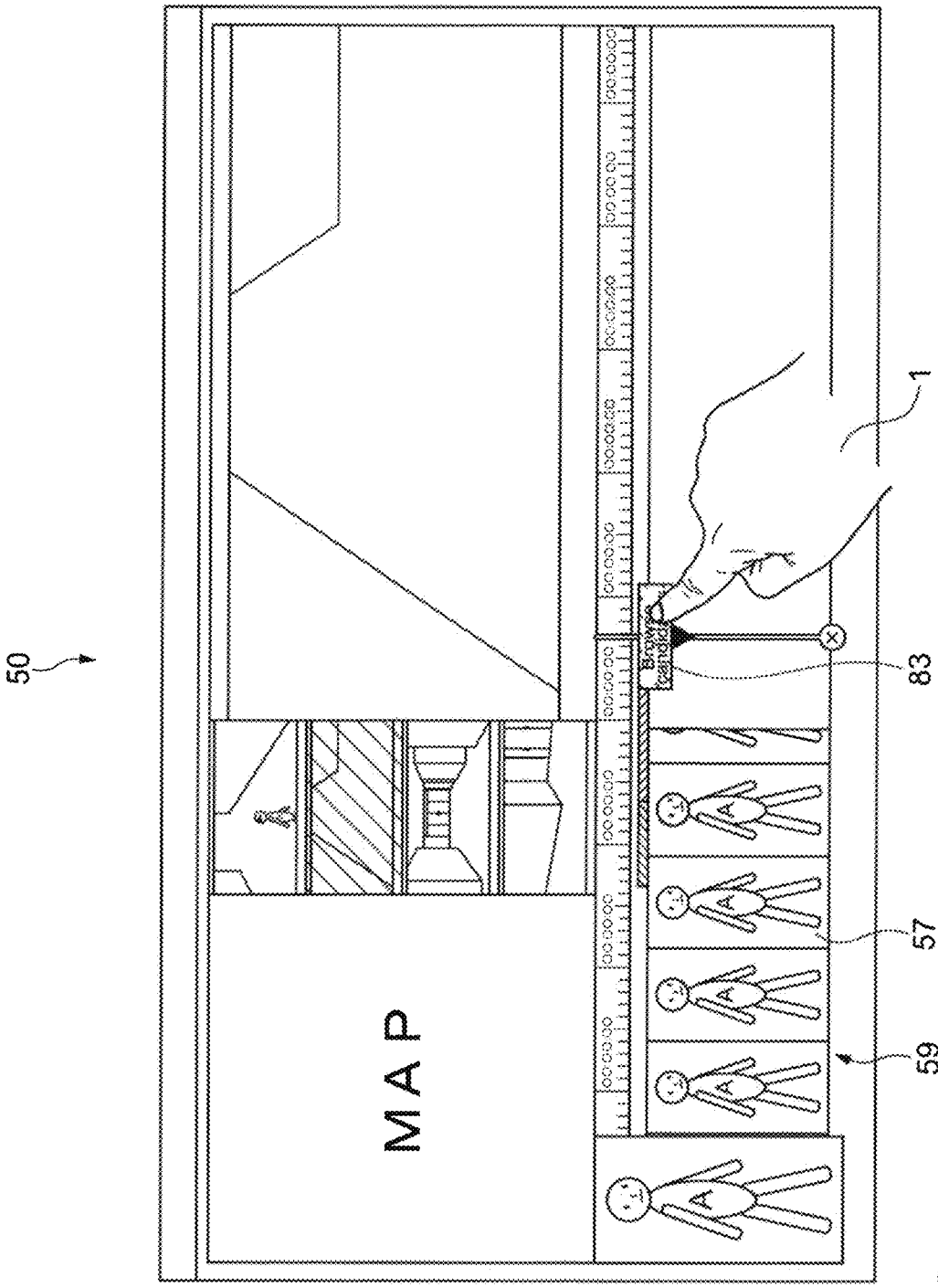



FIG.31

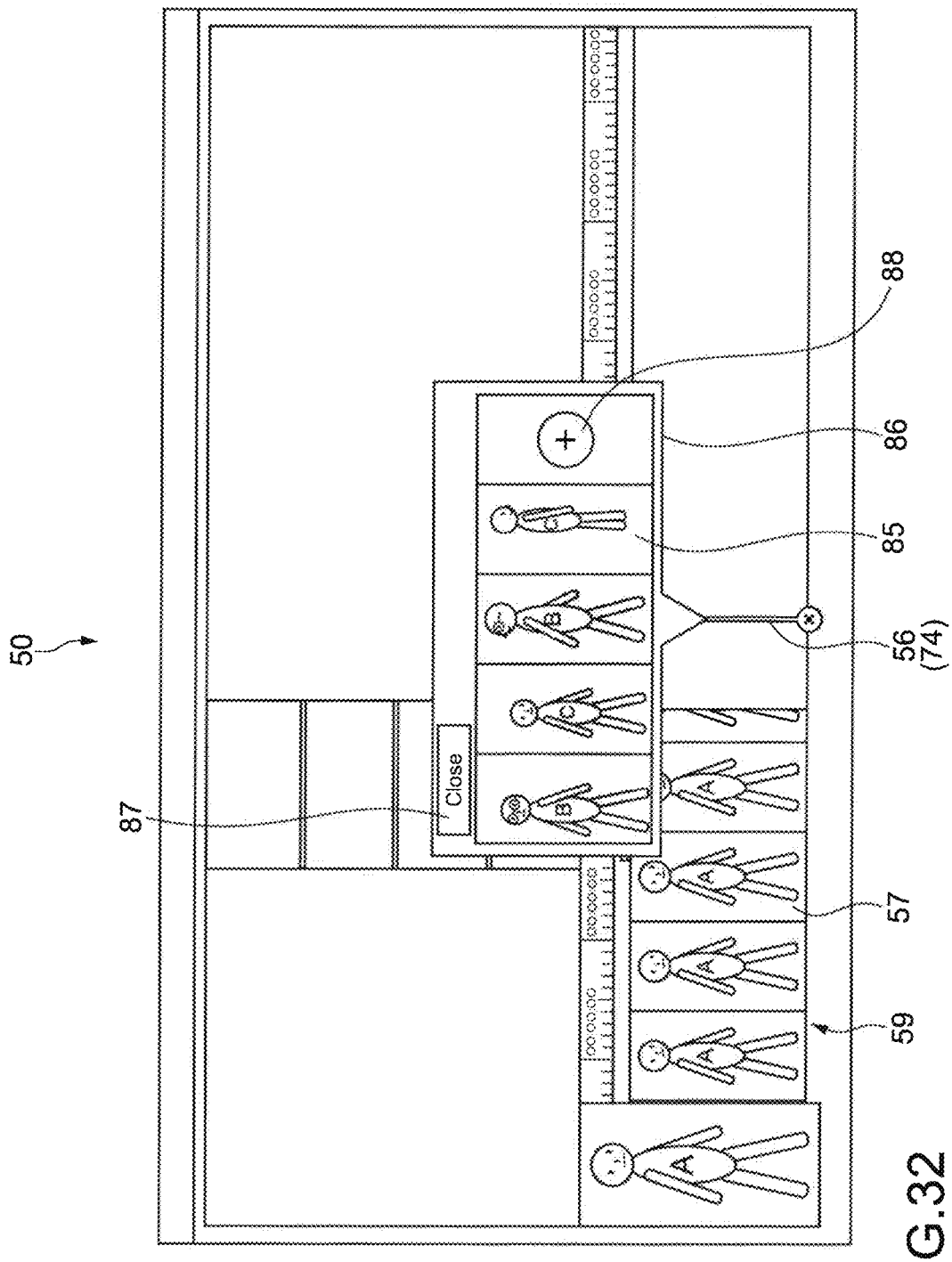



FIG.32

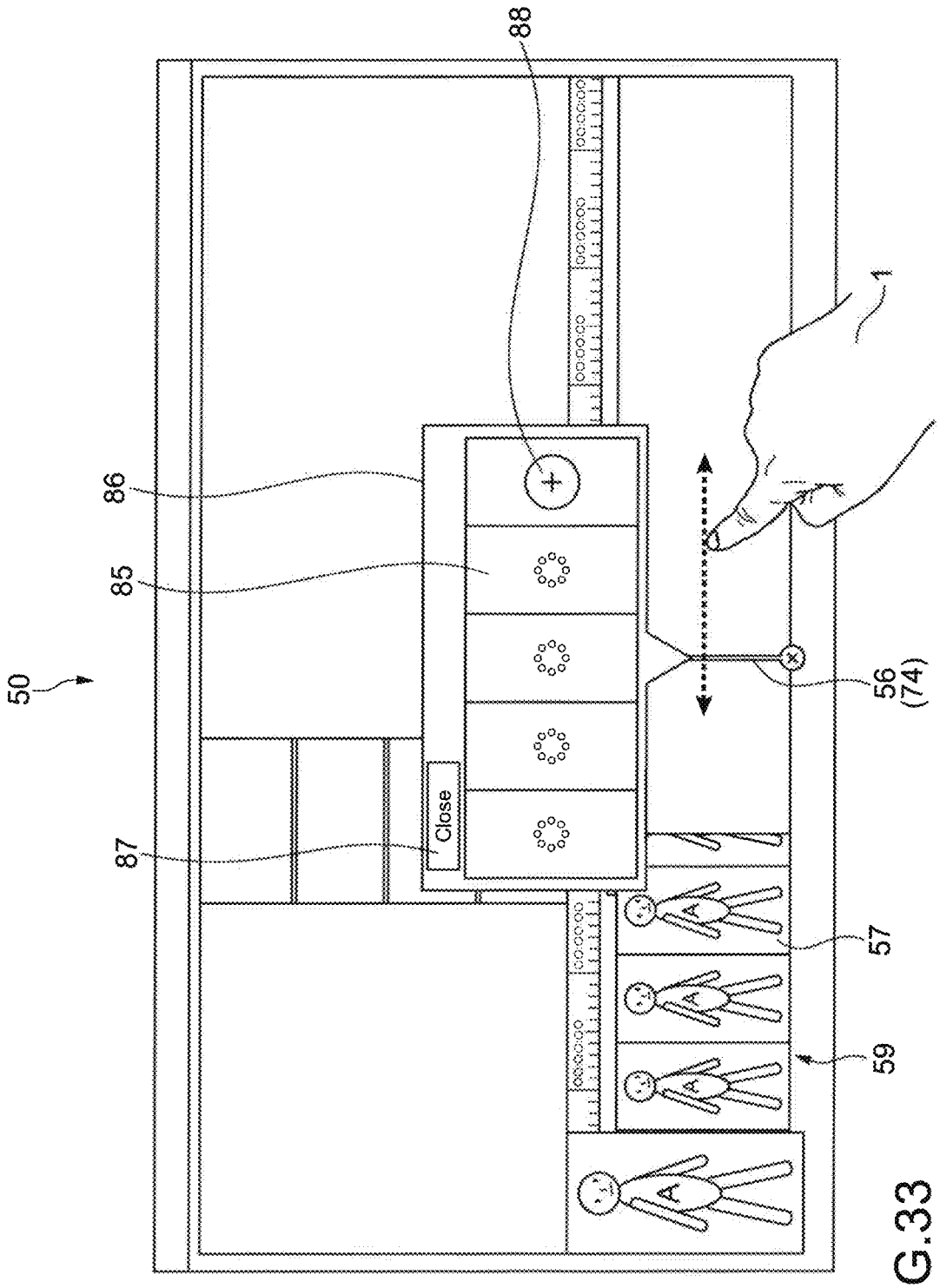



FIG.33

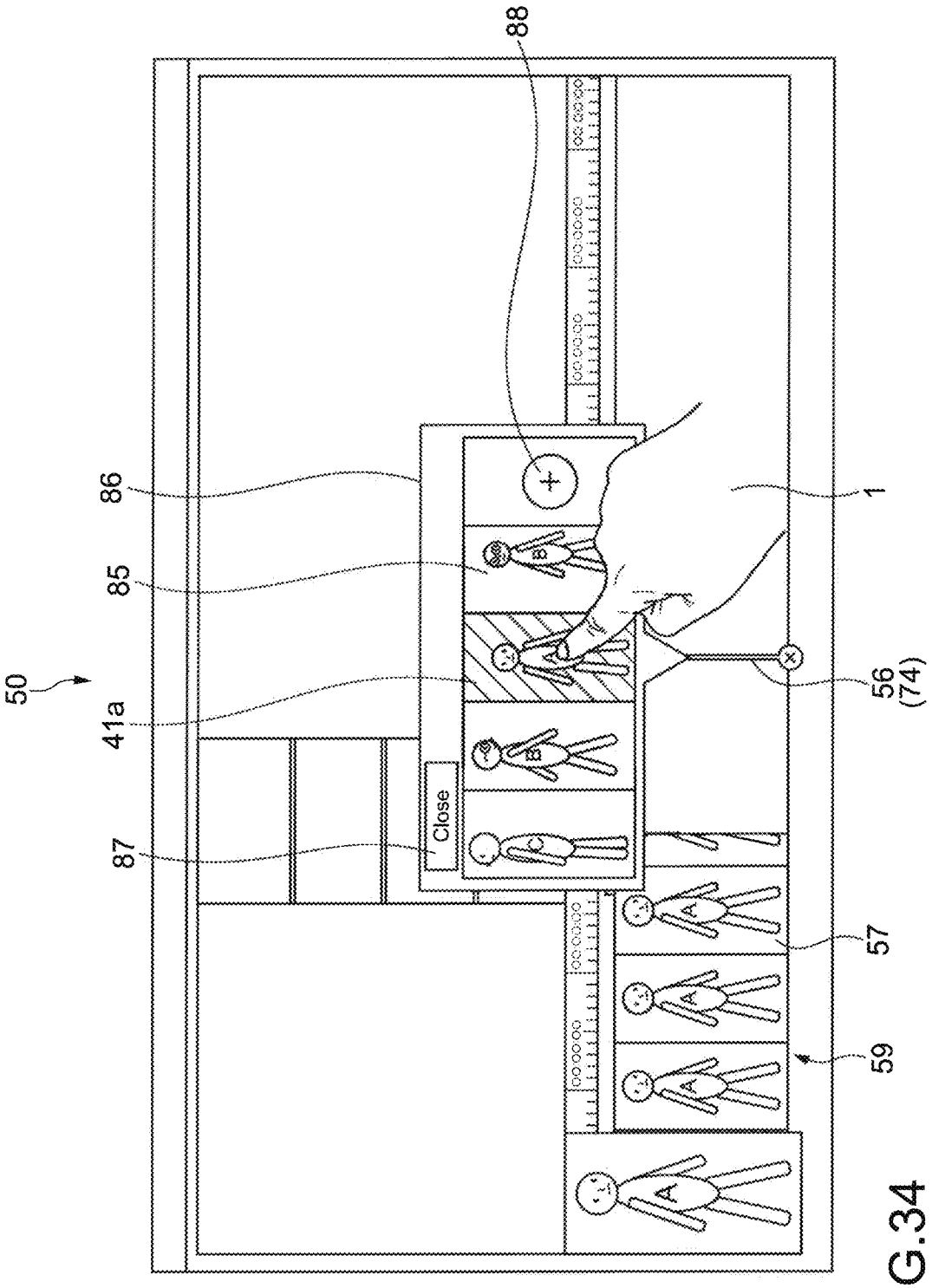



FIG.34

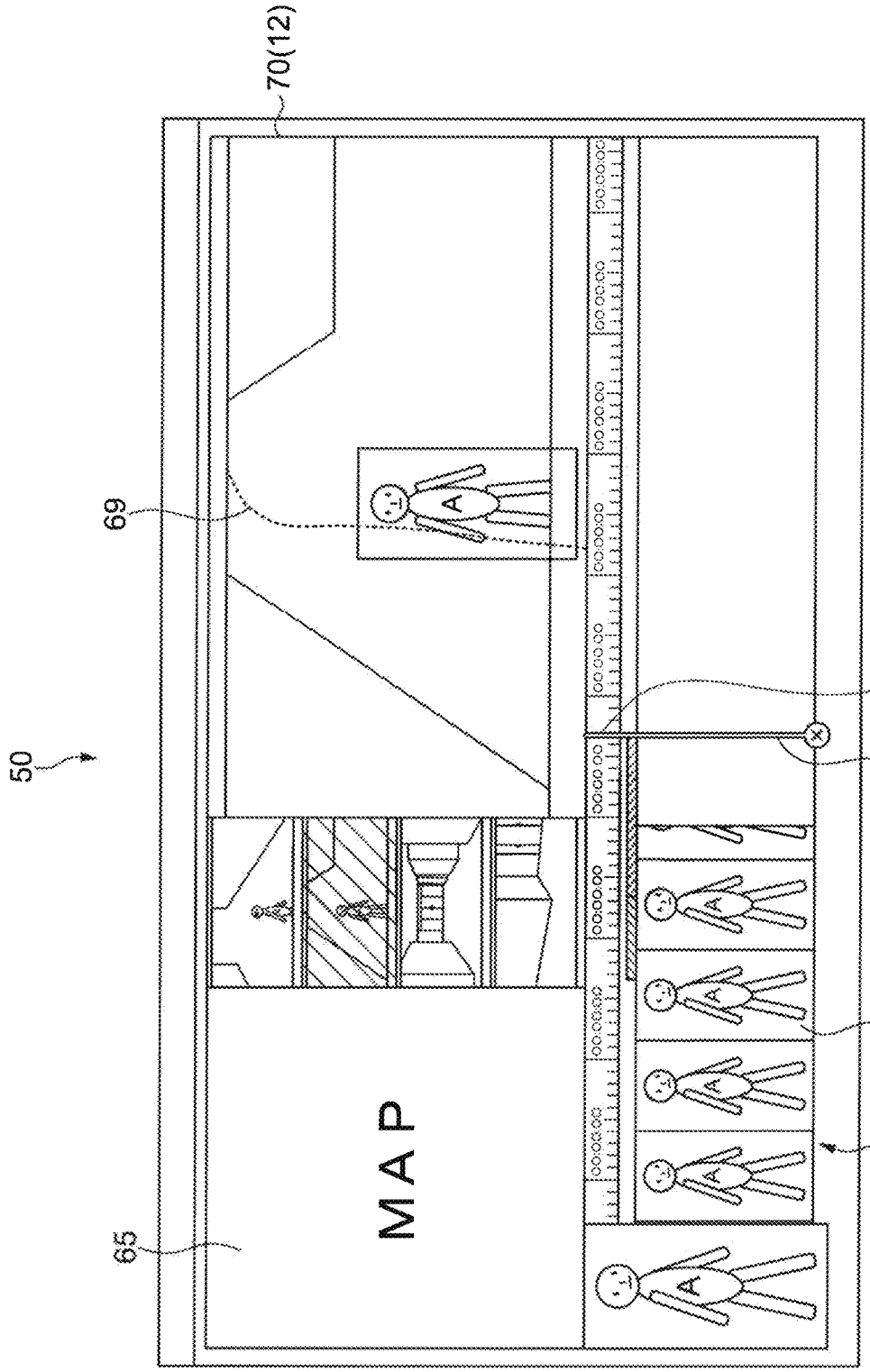



FIG.35

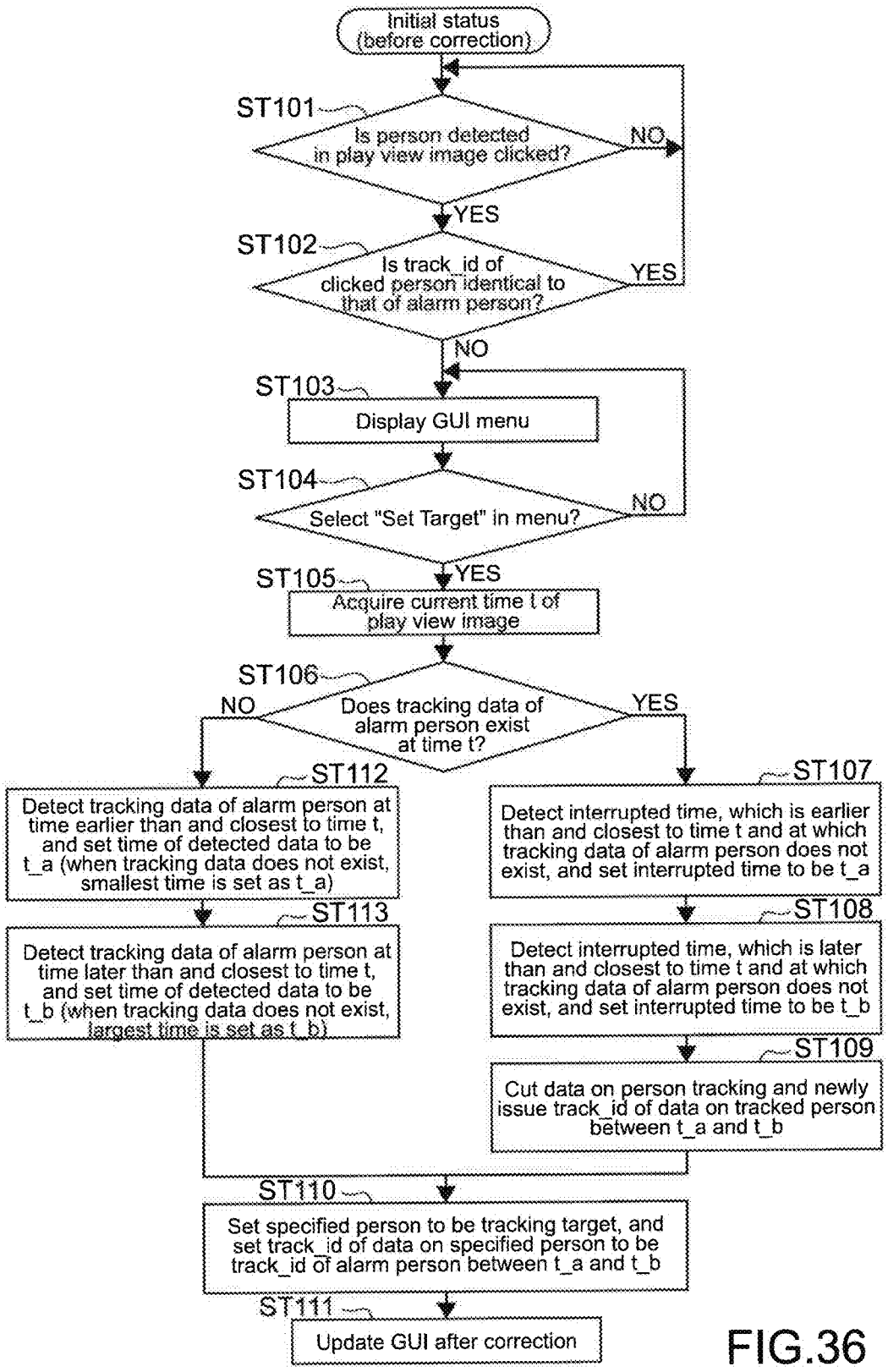

Initial status (before correction)
ST101
Is person detected in play view image clicked?
NO
YES
ST102
Is track_id of clicked person identical to that of alarm person?
YES
NO
ST103
Display GUI menu
ST104
Select "Set Target" in menu?
NO
YES
ST105
Acquire current time t of play view image
ST106
Does tracking data of alarm person exist at time t?
NO
YES
ST112
Detect tracking data of alarm person at time earlier than and closest to time t, and set time of detected data to be t_a (when tracking data does not exist, smallest time is set as t_a)
ST113
Detect tracking data of alarm person at time later than and closest to time t, and set time of detected data to be t_b (when tracking data does not exist, largest time is set as t_b)
ST107
Detect interrupted time, which is earlier than and closest to time t and at which tracking data of alarm person does not exist, and set interrupted time to be t_a
ST108
Detect interrupted time, which is later than and closest to time t and at which tracking data of alarm person does not exist, and set interrupted time to be t_b
ST109
Cut data on person tracking and newly issue track_id of data on tracked person between t_a and t_b
ST110
Set specified person to be tracking target, and set track_id of data on specified person to be track_id of alarm person between t_a and t_b
ST111
Update GUI after correction

FIG.36

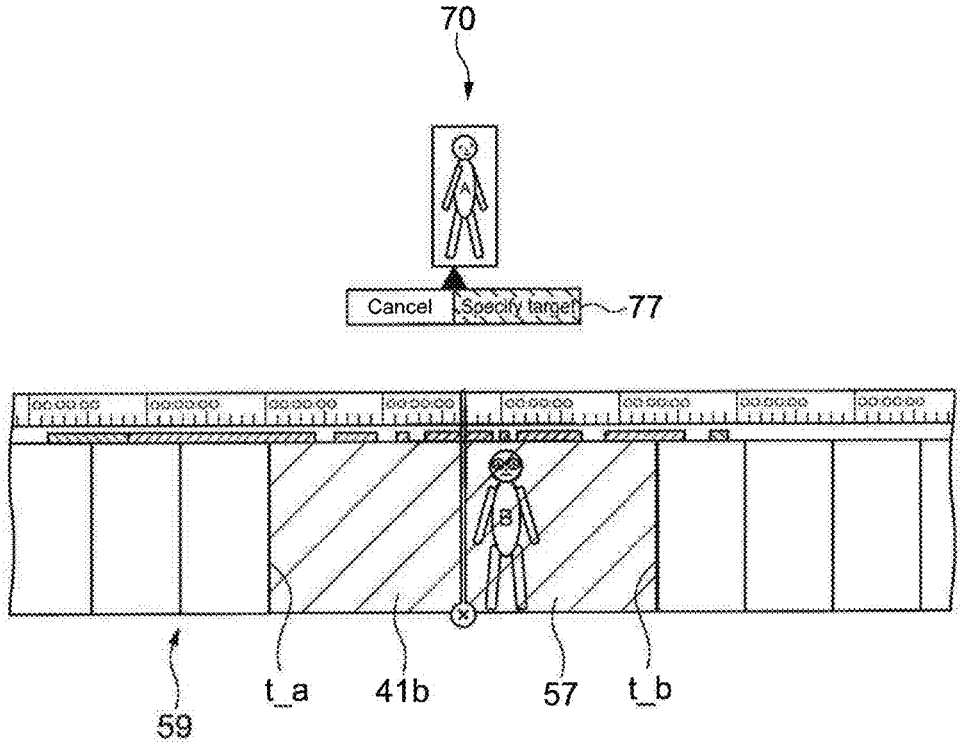

70
Cancel
Specify target
77
A
B
59
t_a
41b
57
t_b

FIG.37

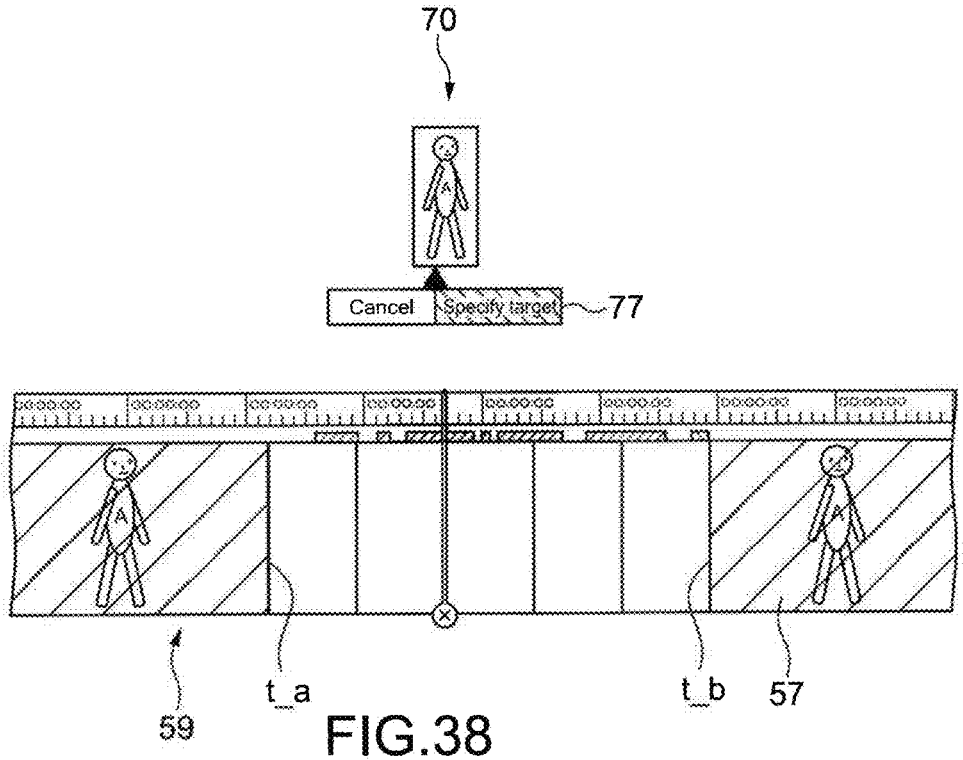

70
Cancel
Specify target
77
A
A
59
t_a
t_b
57

FIG.38

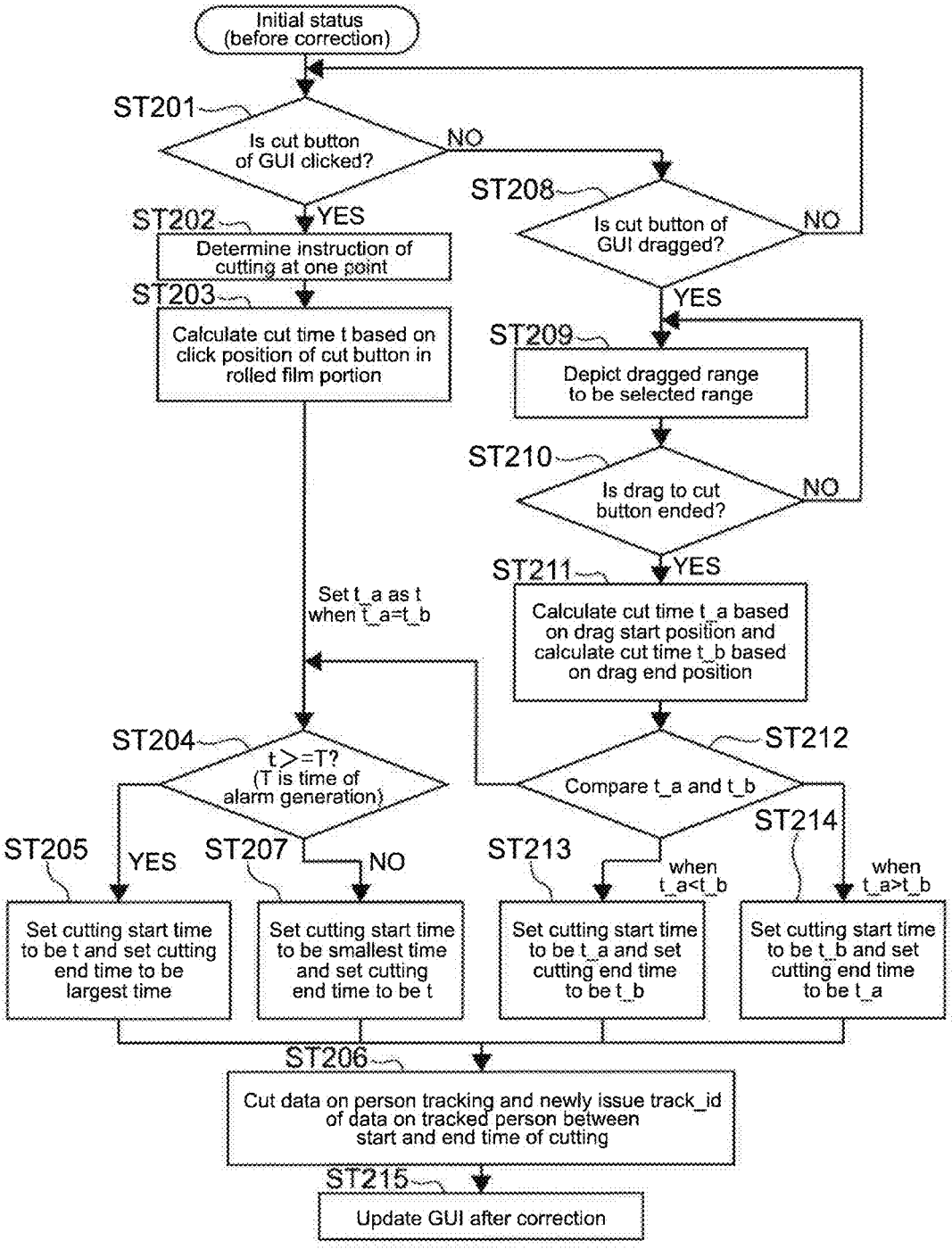

Initial status (before correction)
ST201
Is cut button of GUI clicked?
NO
YES
ST208
Is cut button of GUI dragged?
NO
YES
ST202
Determine instruction of cutting at one point
ST203
Calculate cut time t based on click position of cut button in rolled film portion
ST209
Depict dragged range to be selected range
ST210
Is drag to cut button ended?
NO
YES
ST211
Calculate cut time t_a based on drag start position and calculate cut time t_b based on drag end position
Set t_a as t when t_a=t_b
ST204
t>=T? (T is time of alarm generation)
ST212
Compare t_a and t_b
ST214
ST205
YES
ST207
NO
ST213
when t_a<t_b
when t_a>t_b
Set cutting start time to be t and set cutting end time to be largest time
Set cutting start time to be smallest time and set cutting end time to be t
Set cutting start time to be t_a and set cutting end time to be t_b
Set cutting start time to be t_b and set cutting end time to be t_a
ST206
Cut data on person tracking and newly issue track_id of data on tracked person between start and end time of cutting
ST215
Update GUI after correction

FIG.39

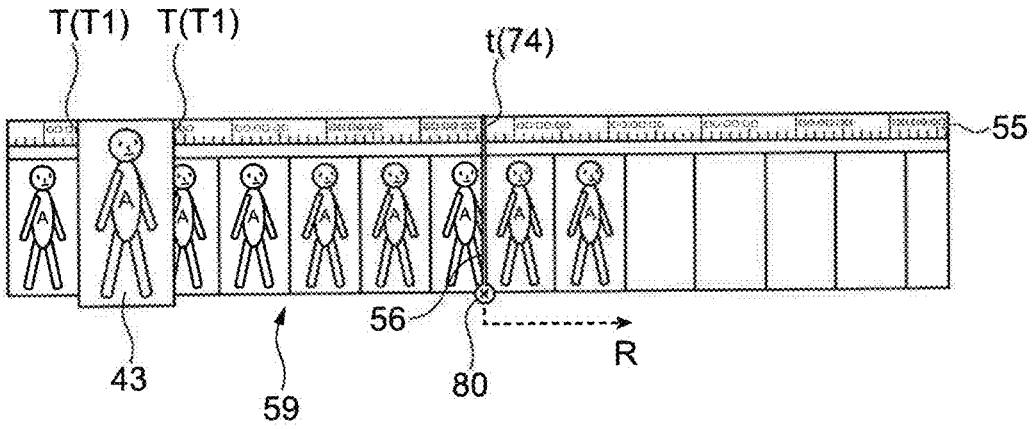



FIG.40A

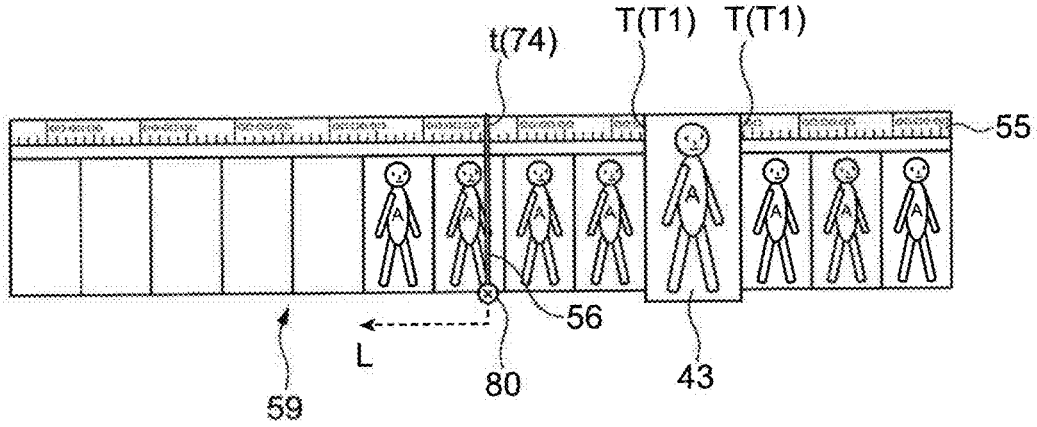



FIG.40B

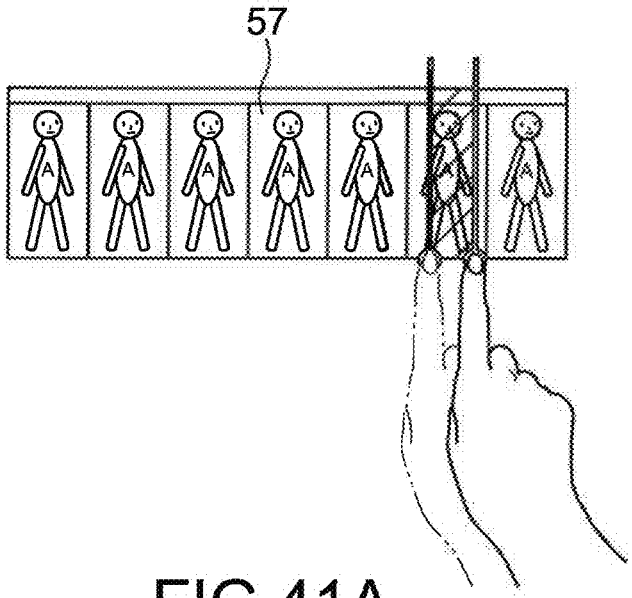



FIG.41A

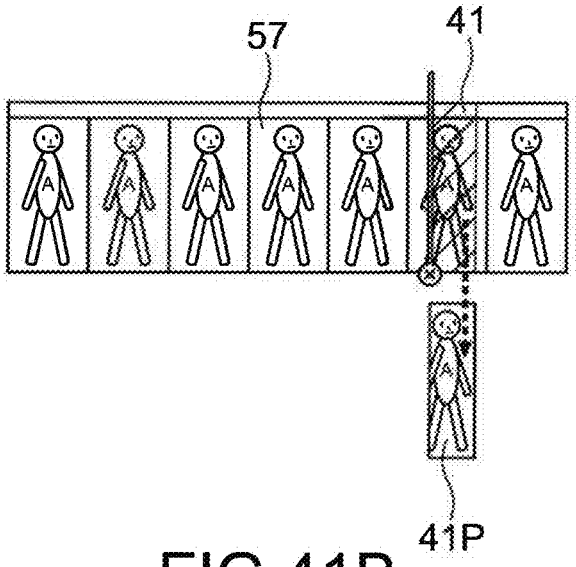



FIG.41B

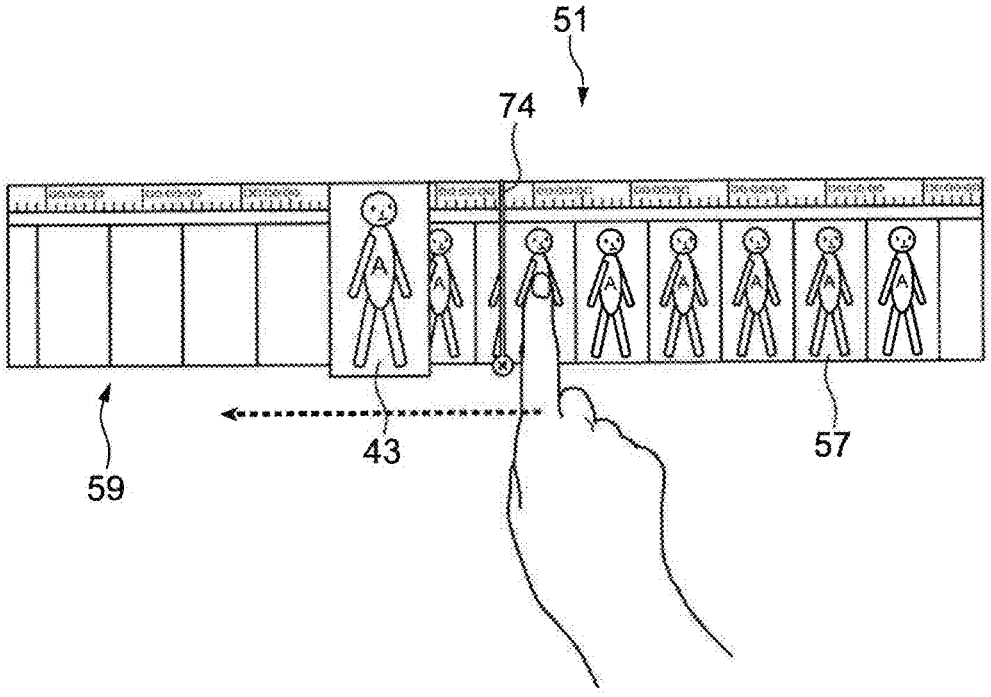



FIG.42A

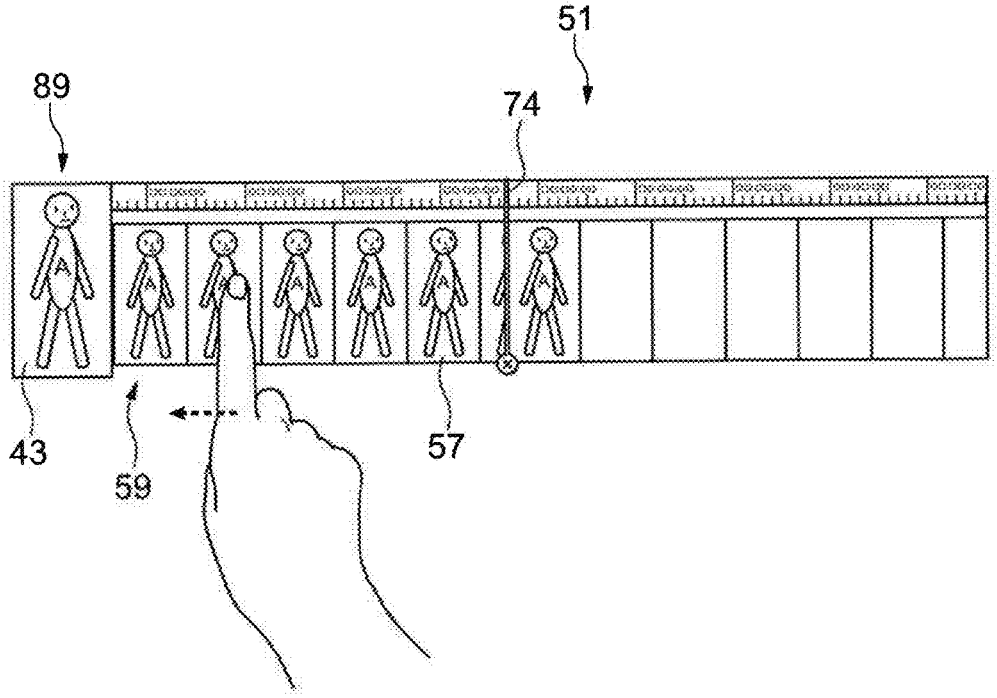



FIG.42B

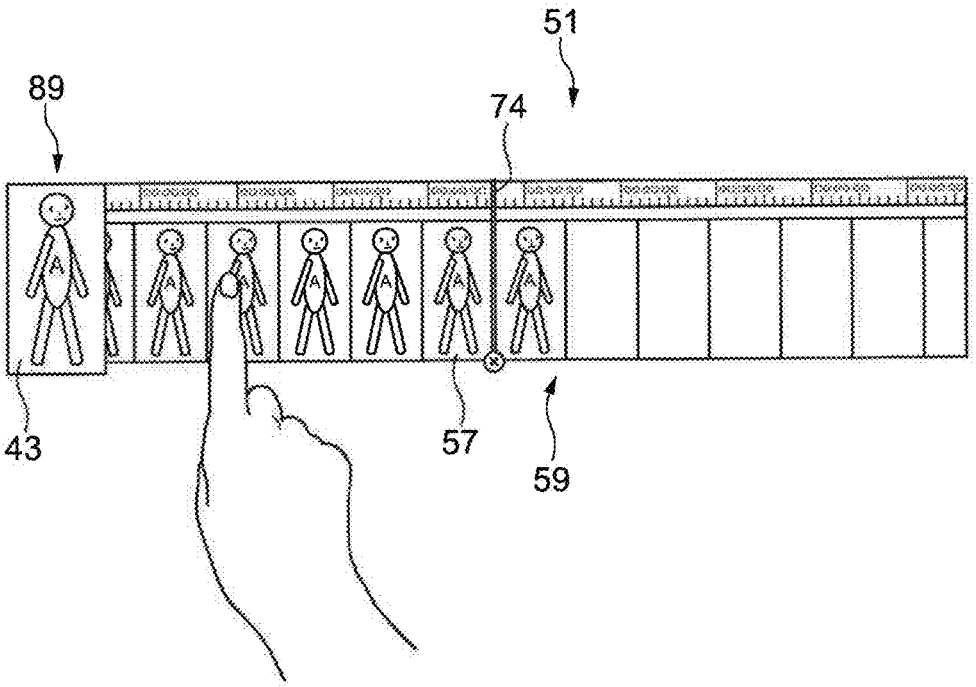



FIG.43A

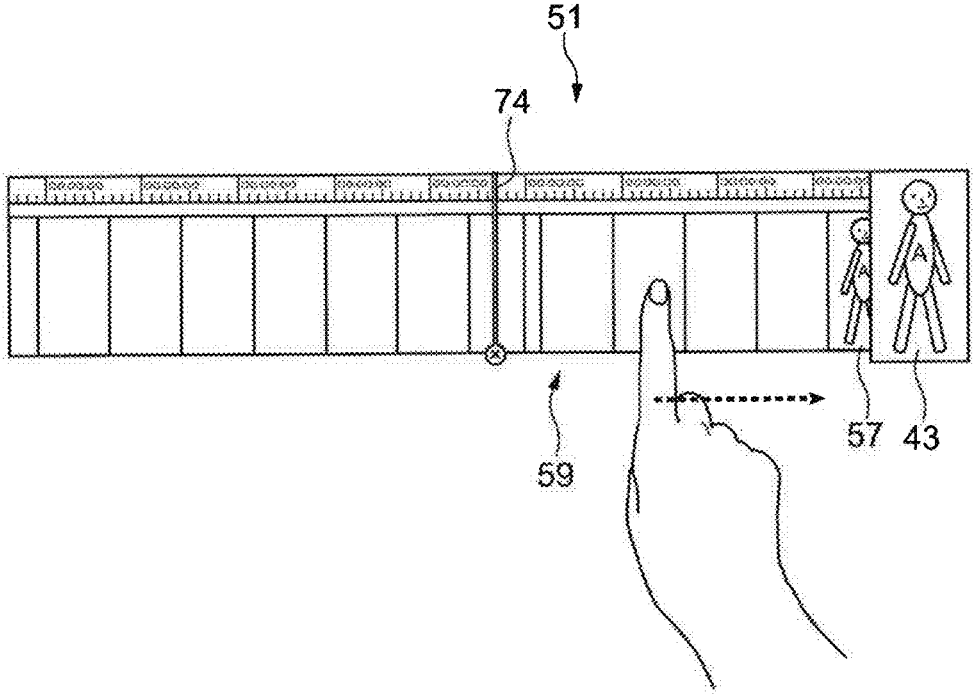



FIG.43B

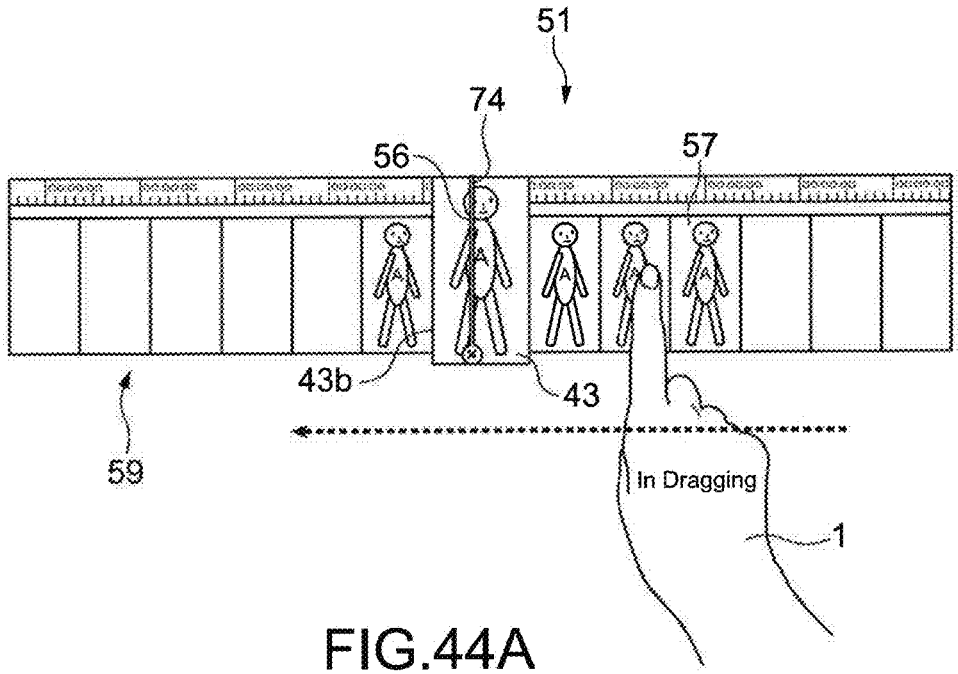



FIG.44A

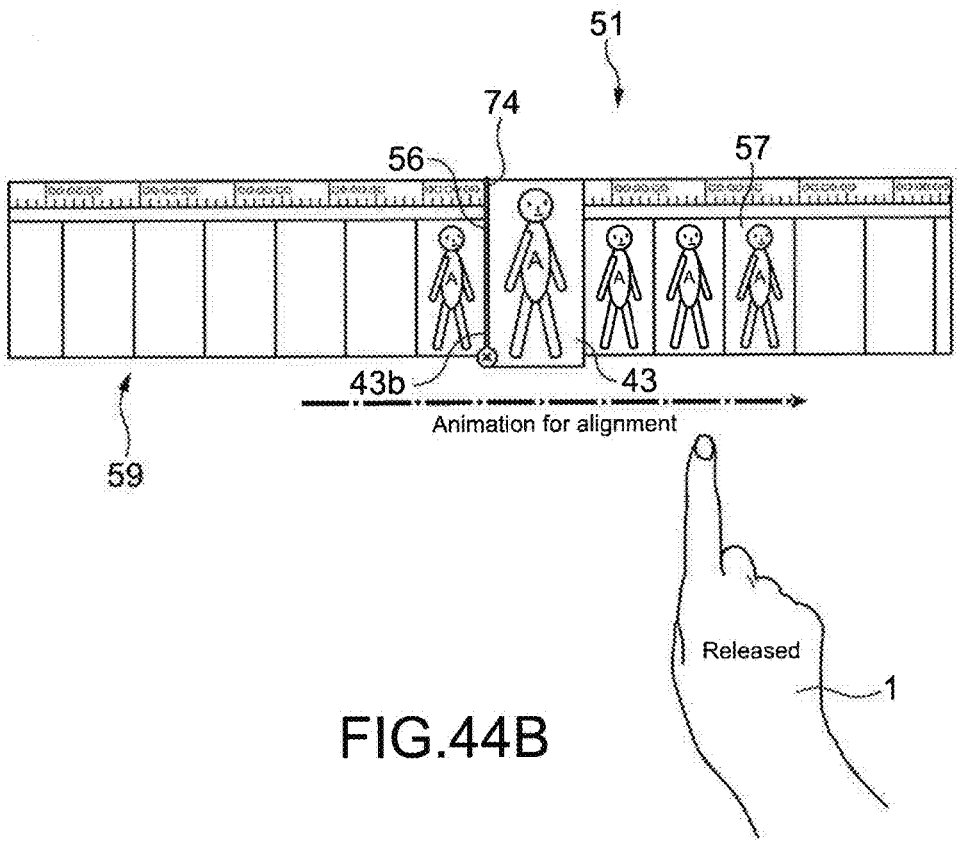



FIG.44B

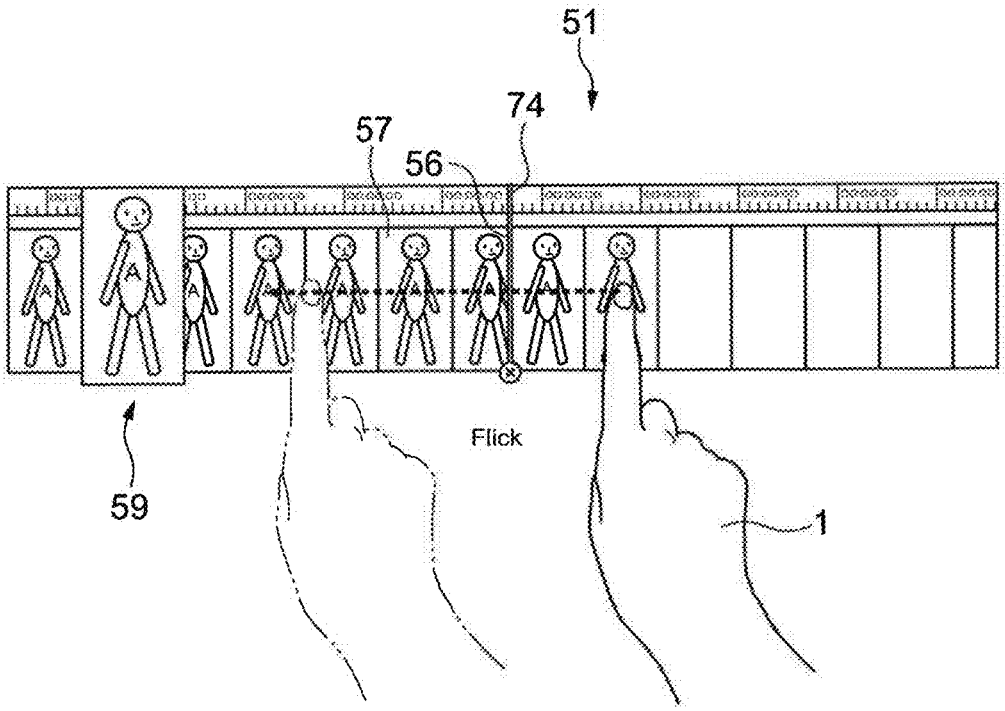



FIG.45

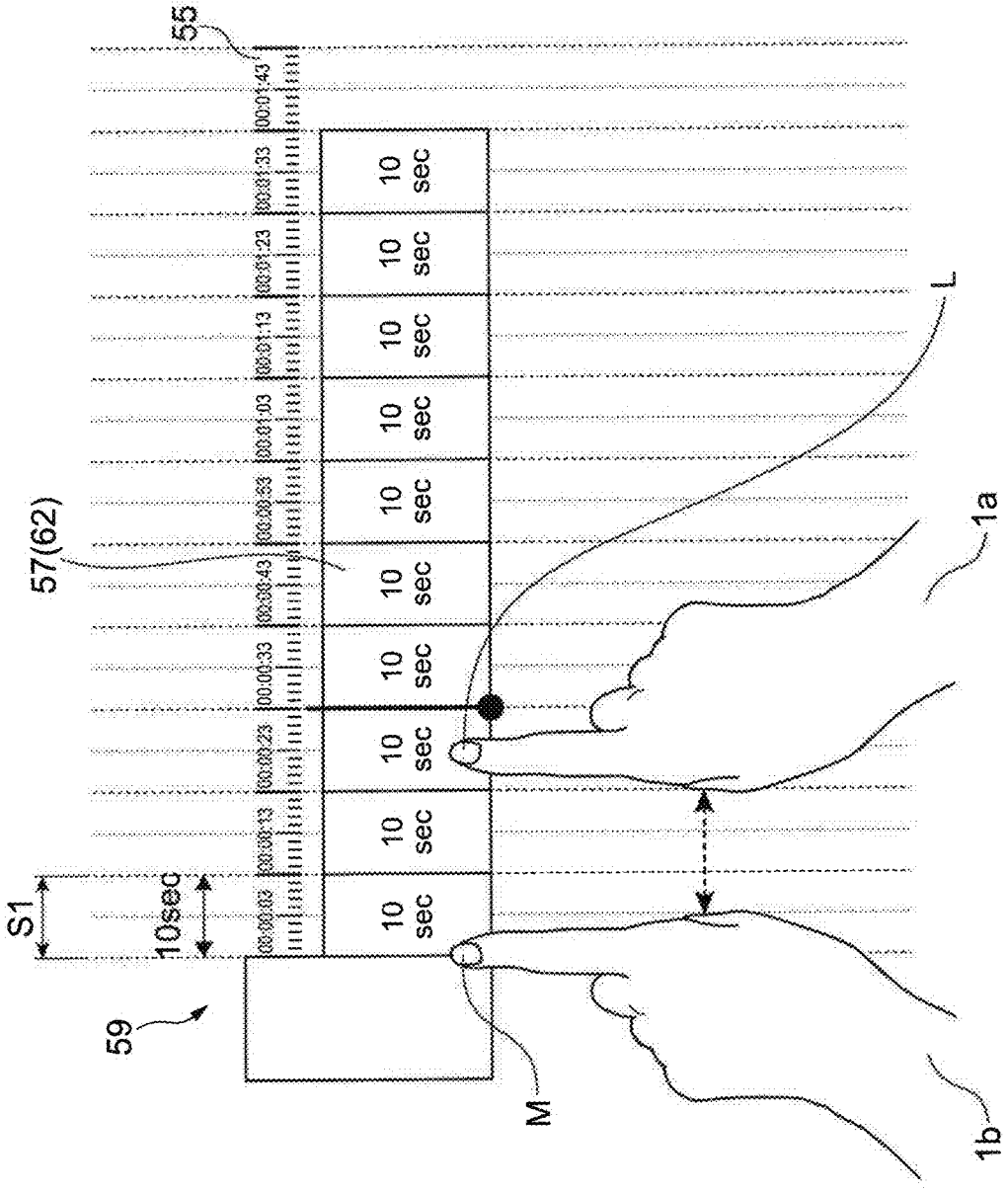

55
00:01:43
00:01:33
00:01:23
00:01:13
00:01:03
00:00:53
00:00:43
00:00:33
00:00:23
00:00:13
00:00:03
10 sec
57(62)
L
1a
S1
10sec
59
M
1b

FIG.46

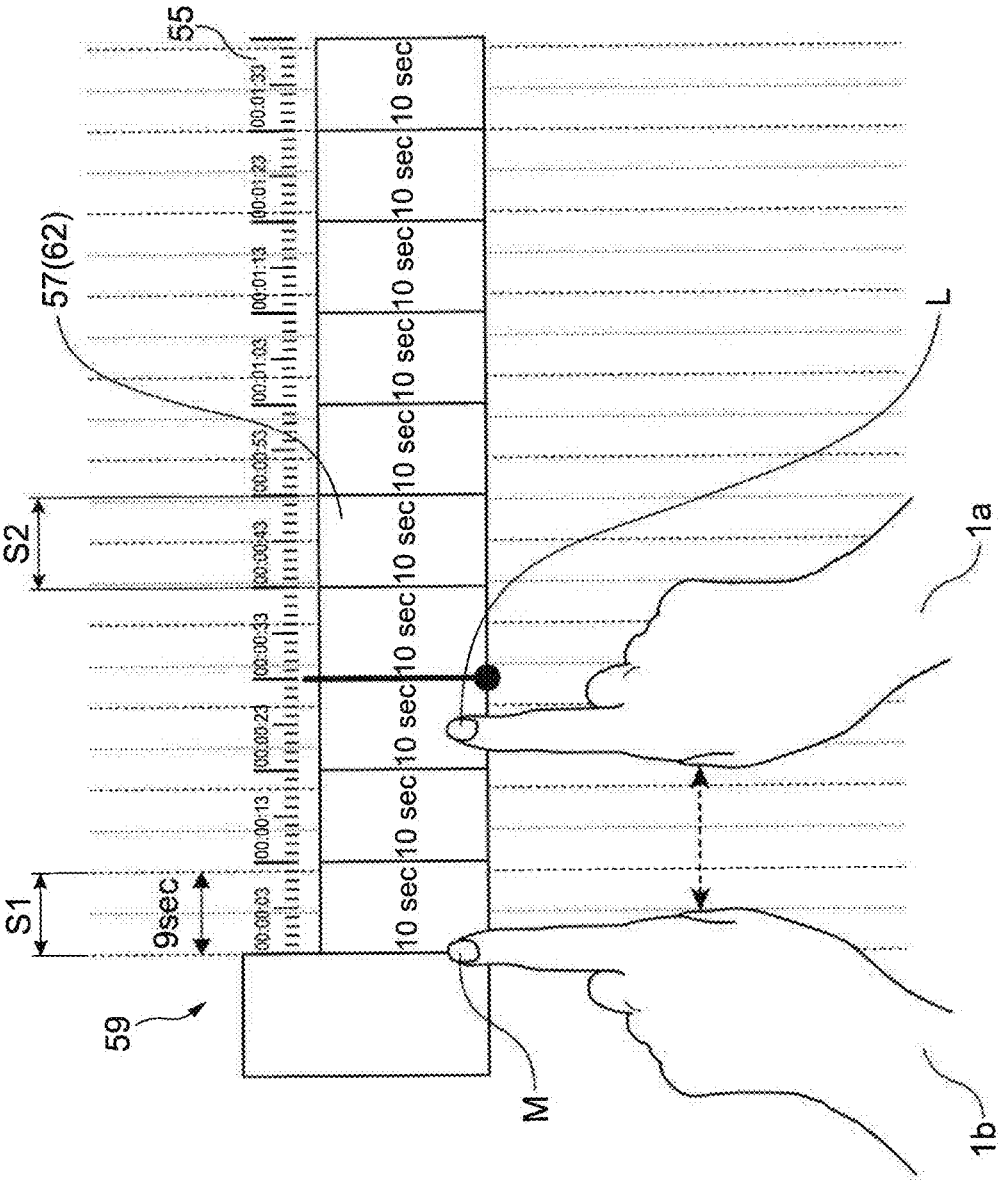

55
57(62)
S2
S1
9sec
59
M
L
1a
1b
10 sec
00:00:03
00:00:13
00:00:23
00:00:33
00:00:43
00:00:53
00:01:03
00:01:13
00:01:23
00:01:33

FIG.47

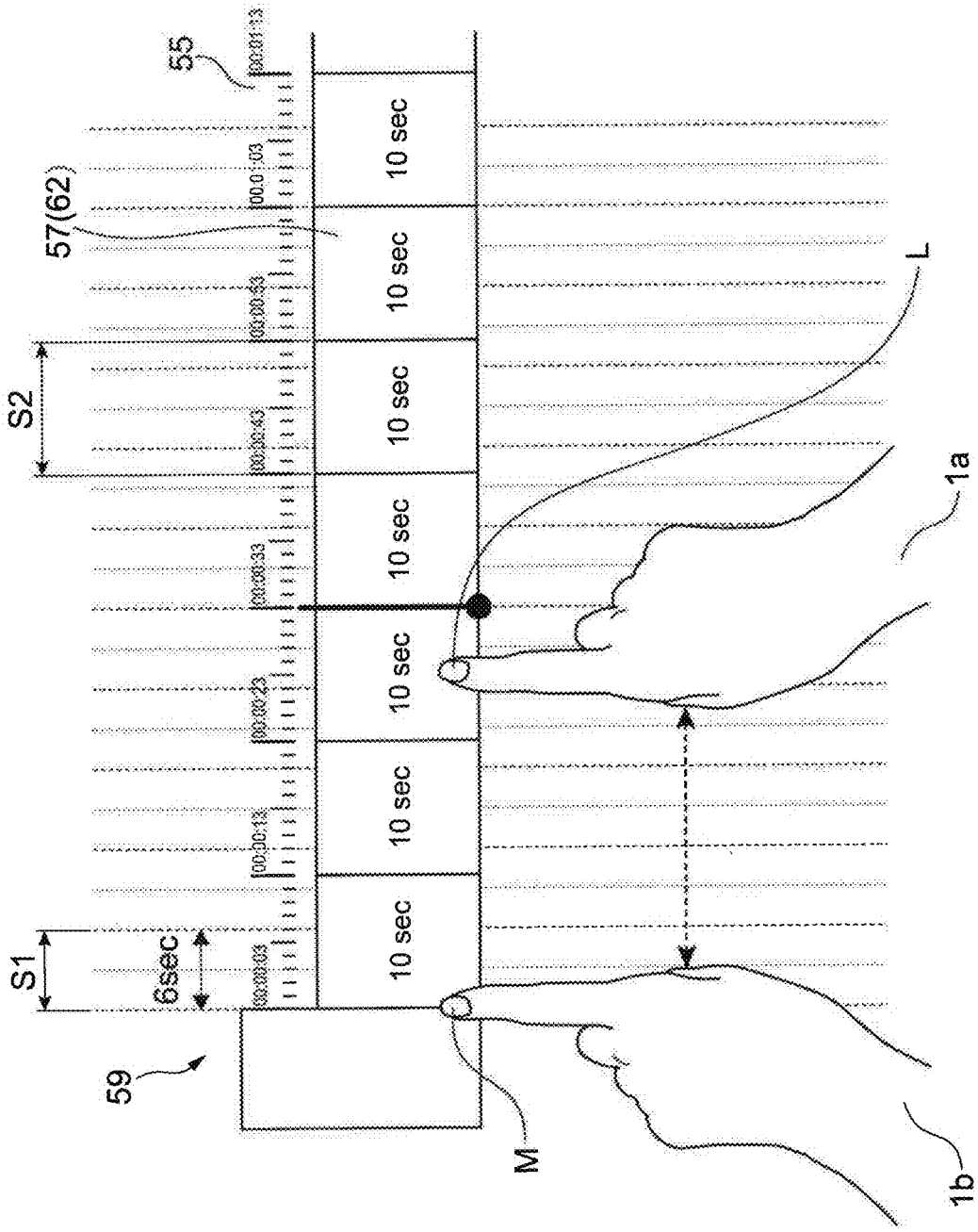

55
57(62)
S2
S1
6sec
59
10 sec
10 sec
10 sec
10 sec
10 sec
10 sec
10 sec
L
1a
M
1b

FIG.48

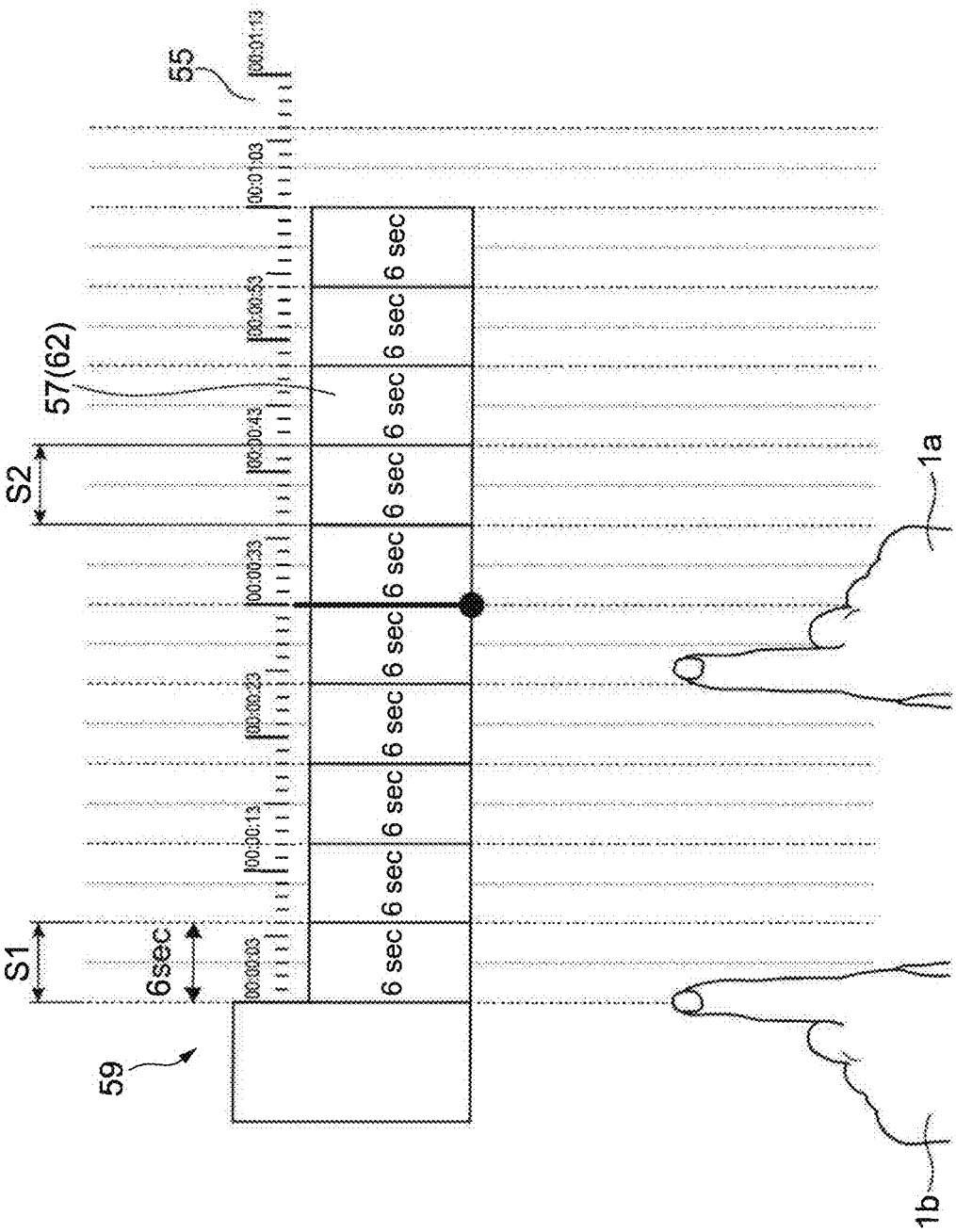

55
00:01:13
00:01:03
00:00:53
00:00:43
00:00:33
00:00:23
00:00:13
00:00:03
57(62)
S2
S1
6sec
59
6 sec
1a
1b

FIG.49

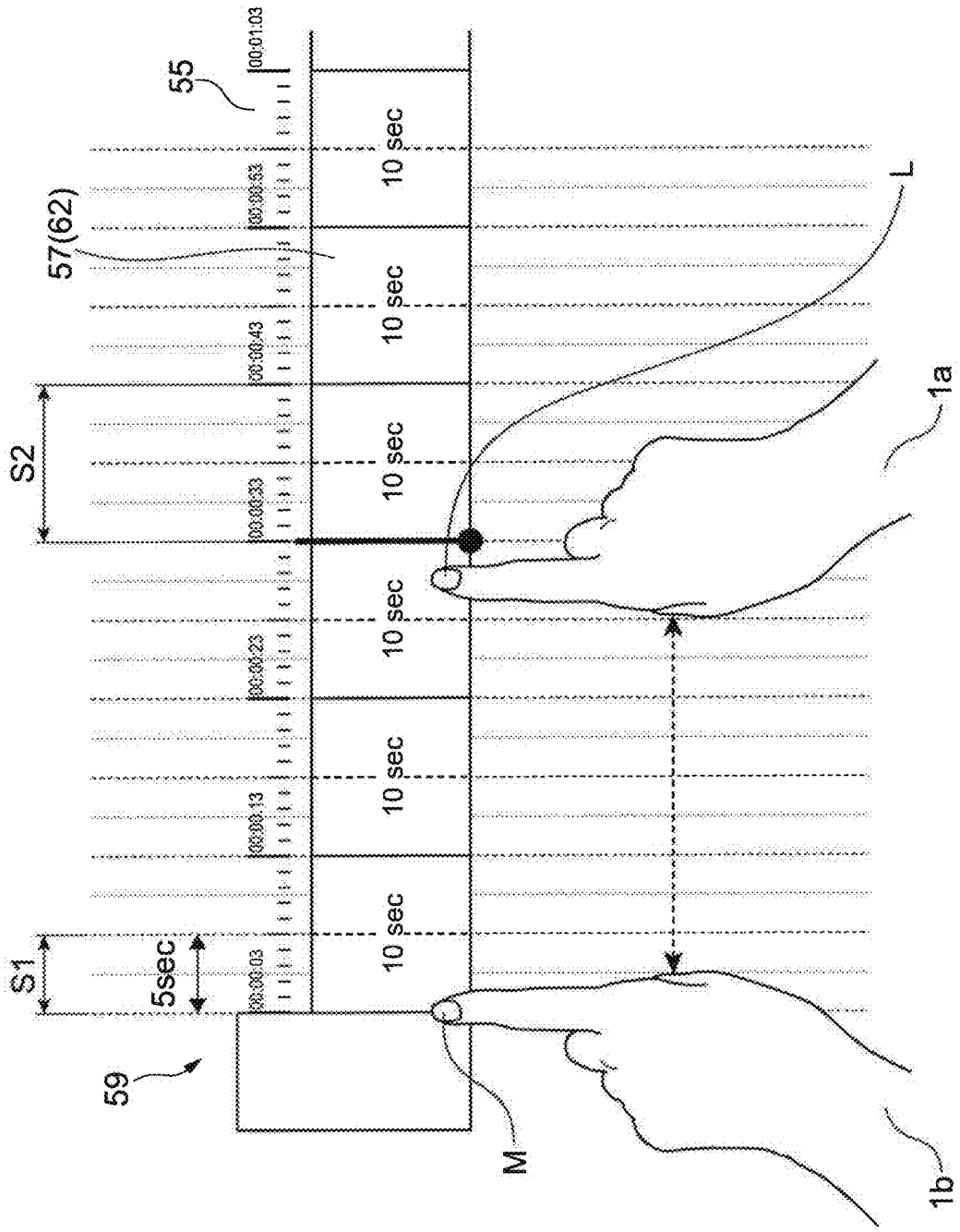

55
00:01:03
00:00:53
00:00:43
00:00:33
00:00:23
00:00:13
00:00:03
57(62)
S2
S1
5sec
59
10 sec
L
1a
M
1b

FIG.50

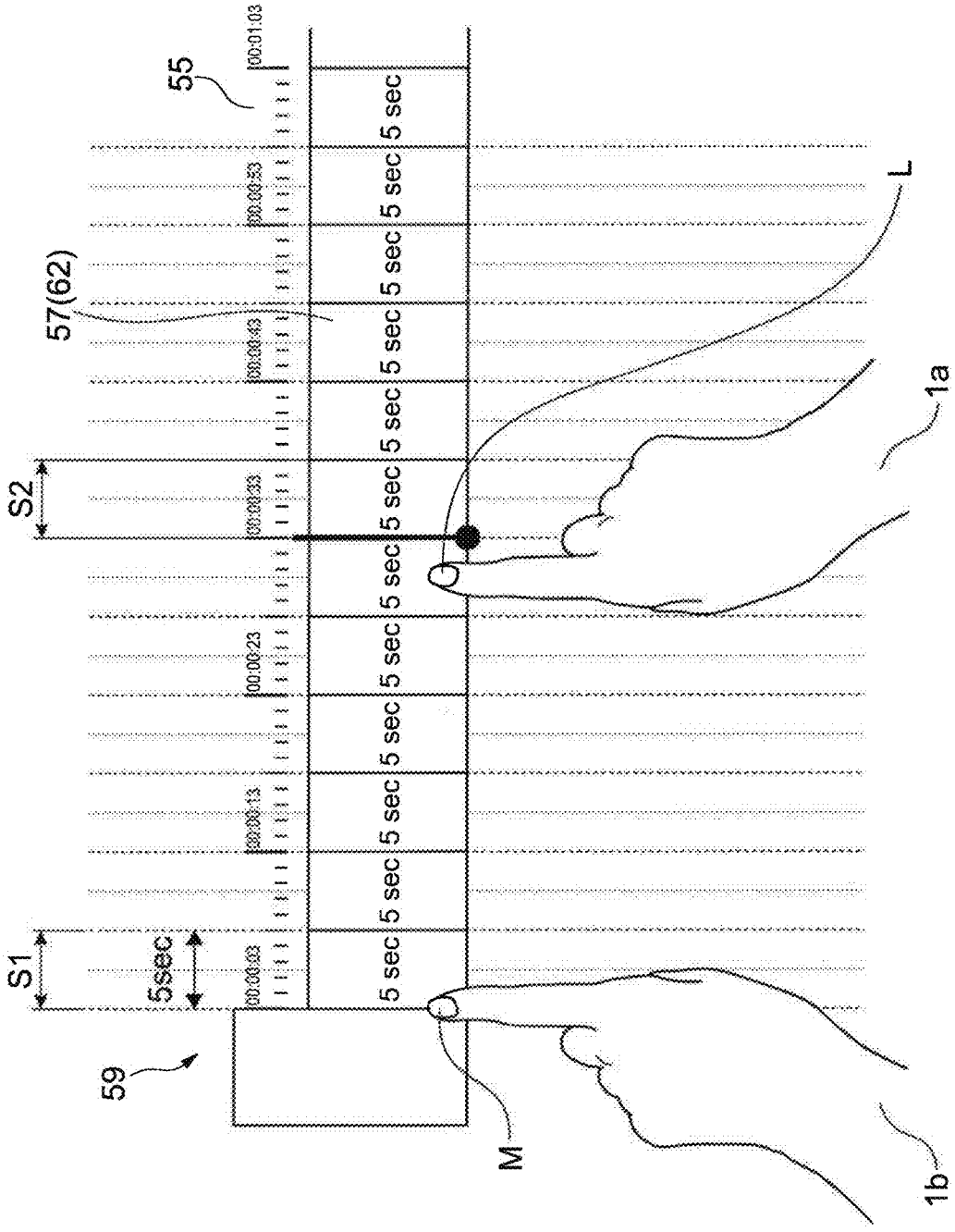

55
00:01:03
00:00:53
00:00:43
00:00:33
00:00:23
00:00:13
00:00:03
57(62)
5 sec
L
1a
S2
S1
5sec
59
M
1b

FIG.51

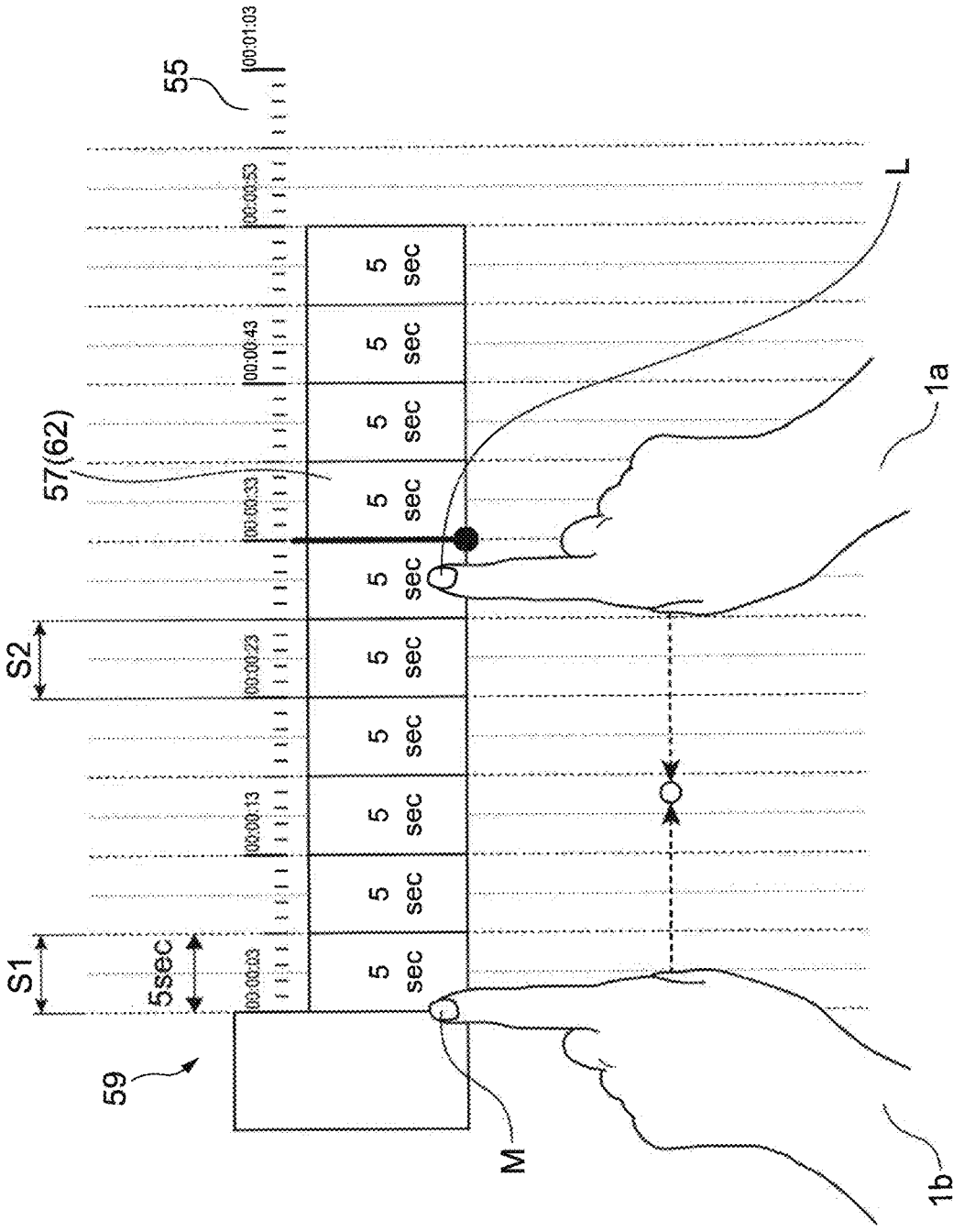

55
00:01:03
00:00:53
00:00:43
00:00:33
00:00:23
00:00:13
00:00:03
57(62)
5 sec
S2
S1
5sec
59
M
L
1a
1b

FIG.52

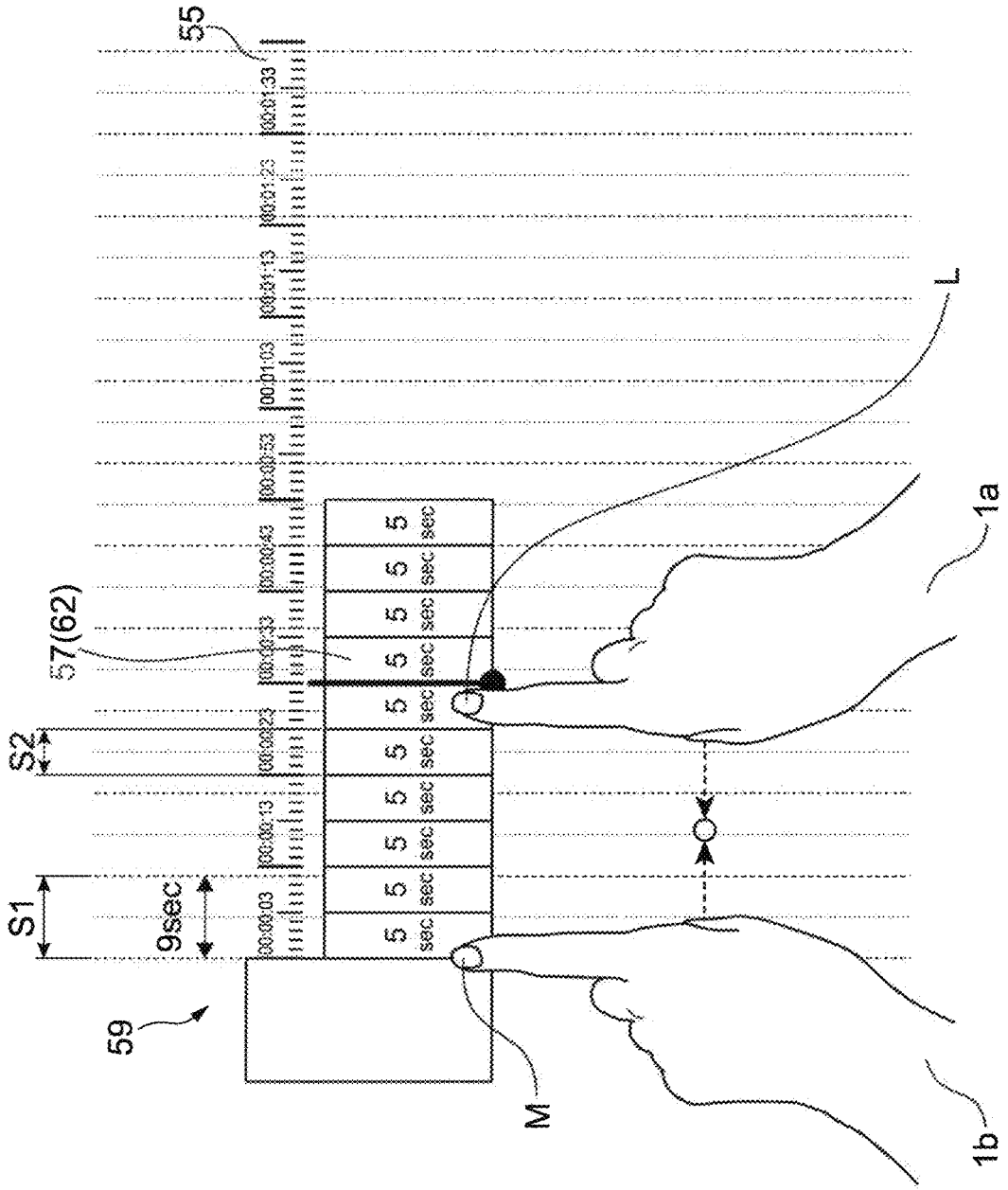

55
00:01:33
00:01:23
00:01:13
00:01:03
00:00:53
00:00:43
00:00:33
00:00:23
00:00:13
00:00:03
5 sec
57(62)
S2
S1
9sec
59
M
L
1a
1b

FIG.53

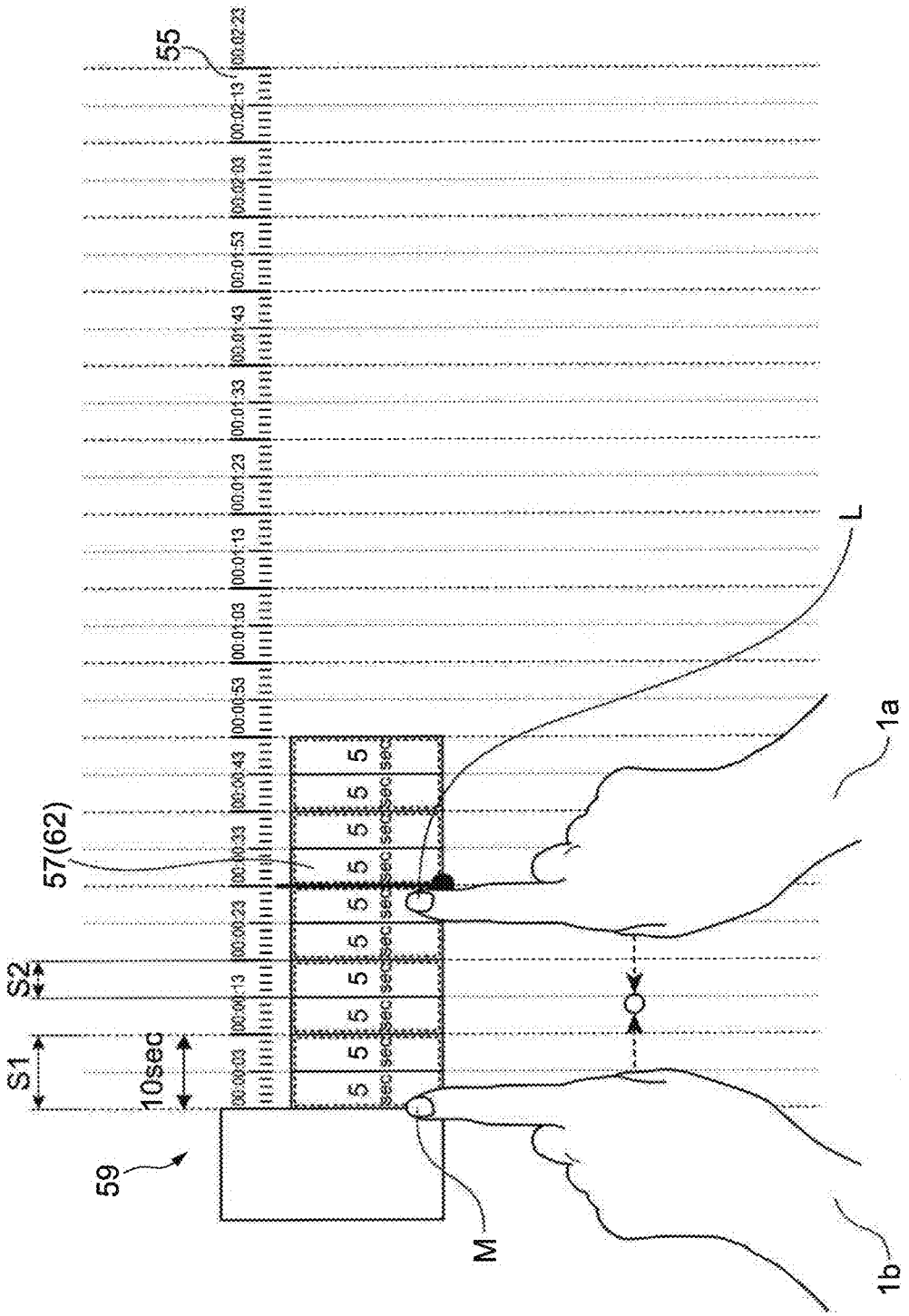

55
00:02:23
00:02:13
00:02:03
00:01:53
00:01:43
00:01:33
00:01:23
00:01:13
00:01:03
00:00:53
00:00:43
00:00:33
00:00:23
00:00:13
00:00:03
5 sec
57(62)
S2
S1
10sec
59
M
L
1a
1b

FIG.54

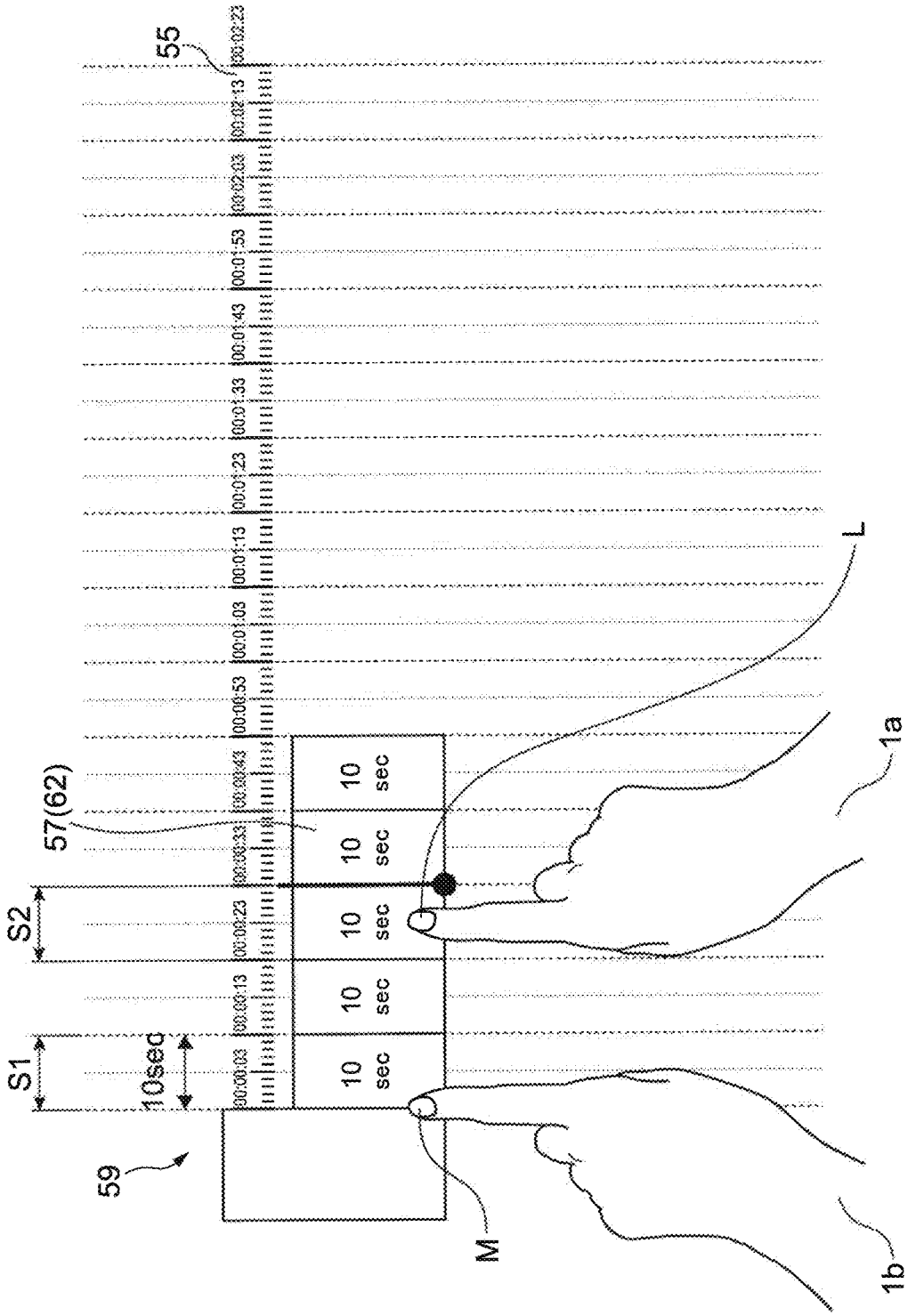

55
00:02:23
00:02:13
00:02:03
00:01:53
00:01:43
00:01:33
00:01:23
00:01:13
00:01:03
00:00:53
00:00:43
00:00:33
00:00:23
00:00:13
00:00:03
57(62)
S2
S1
10sec
10 sec
59
L
1a
M
1b

FIG.55

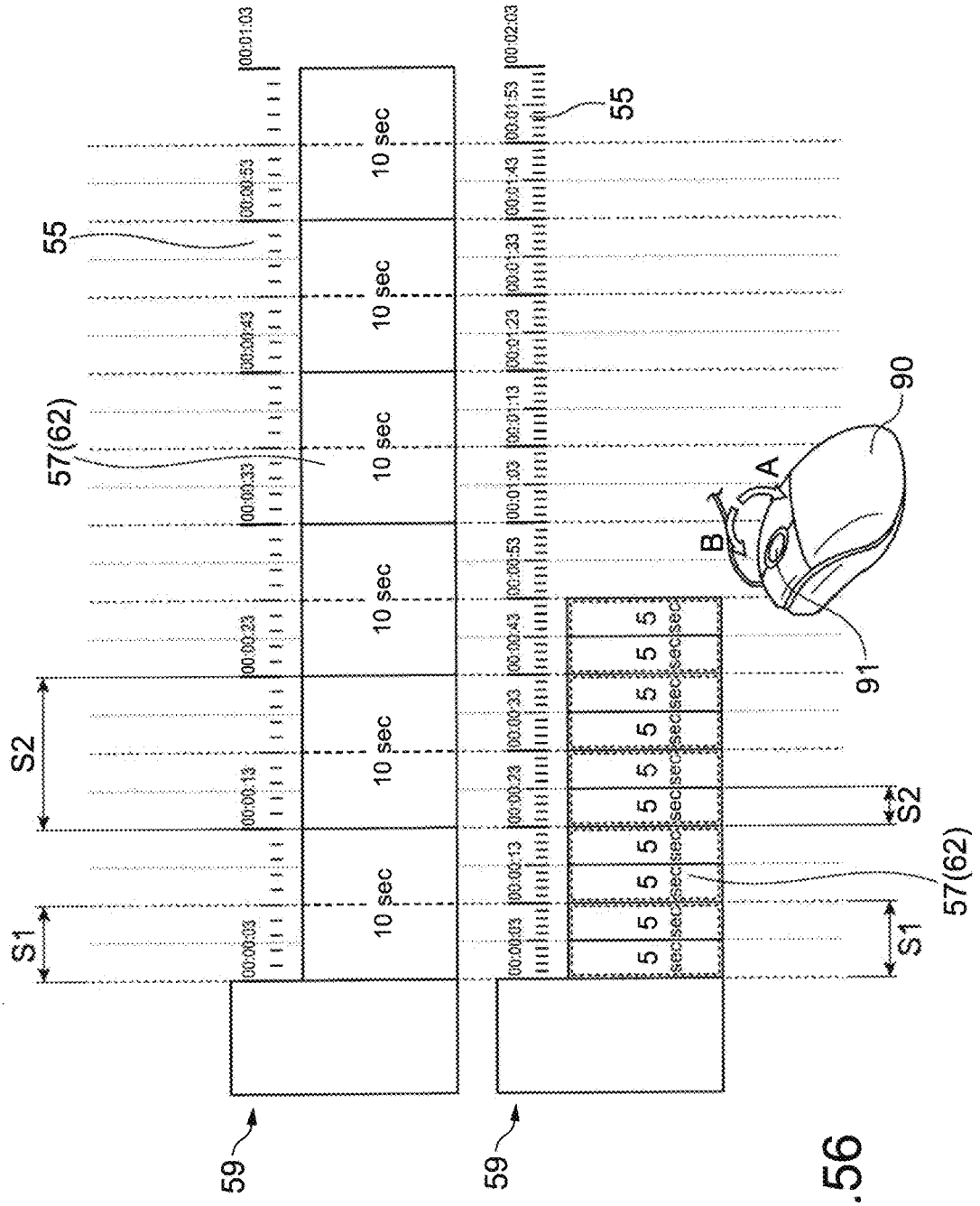



FIG.56

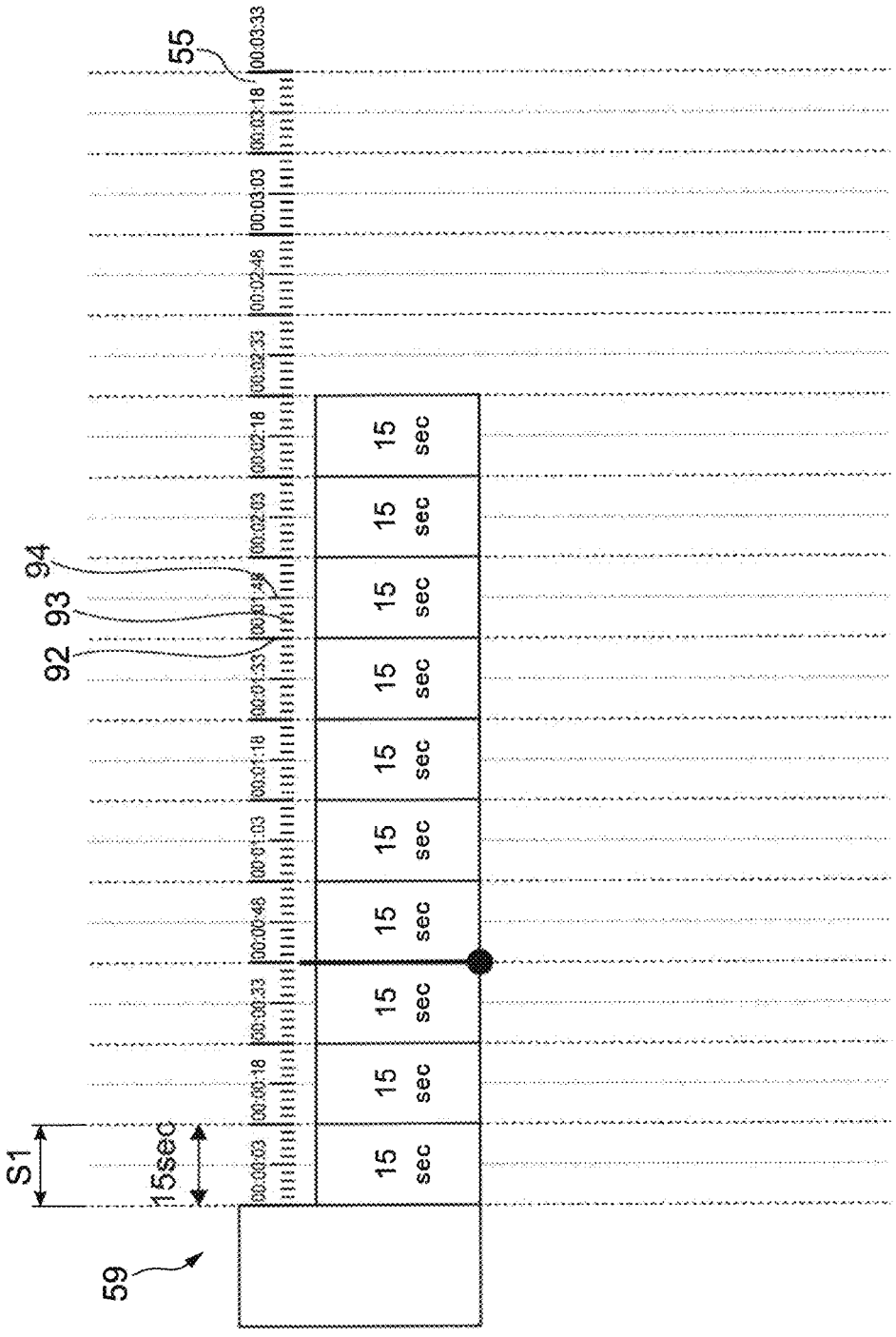



FIG.57

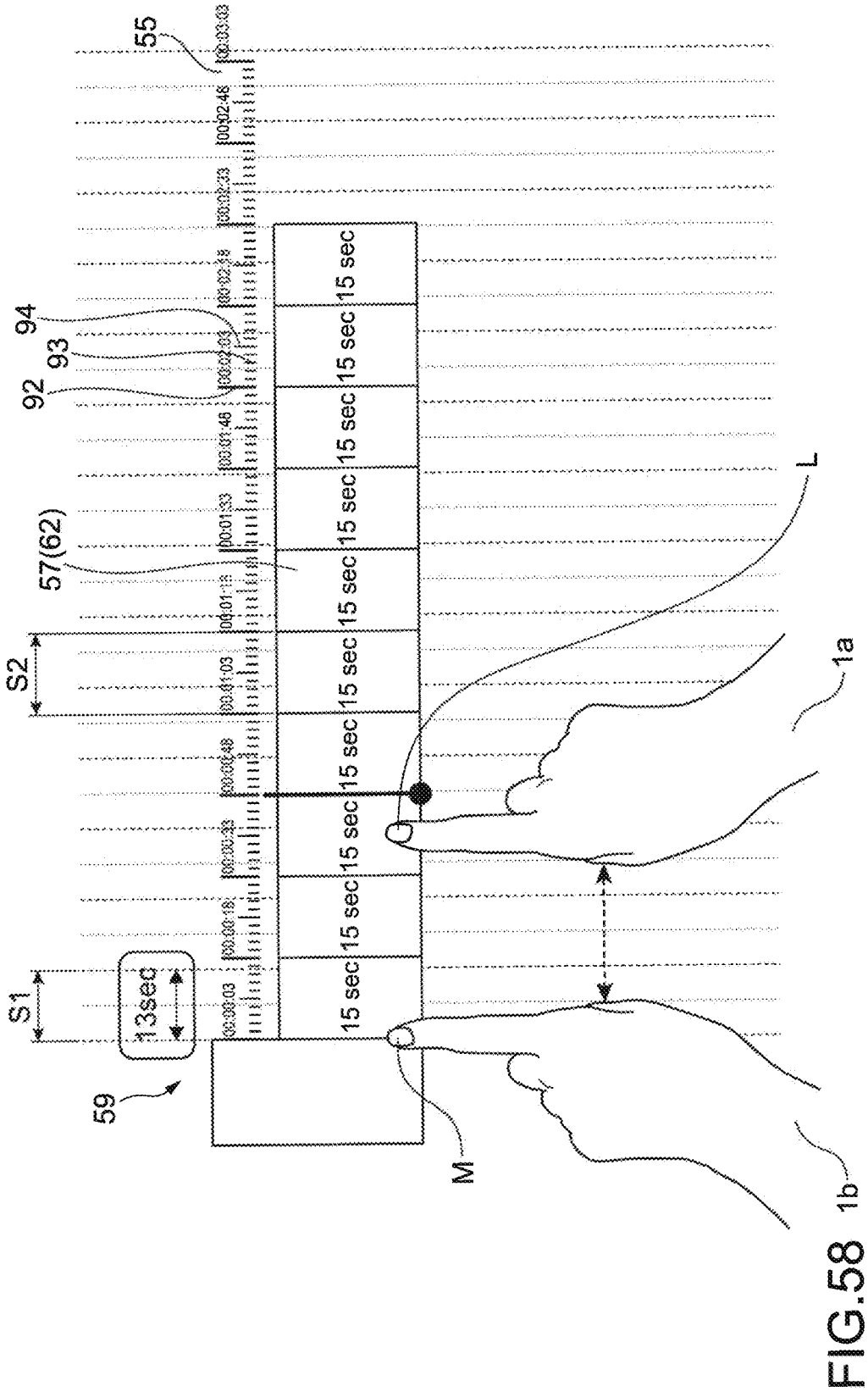



FIG.58

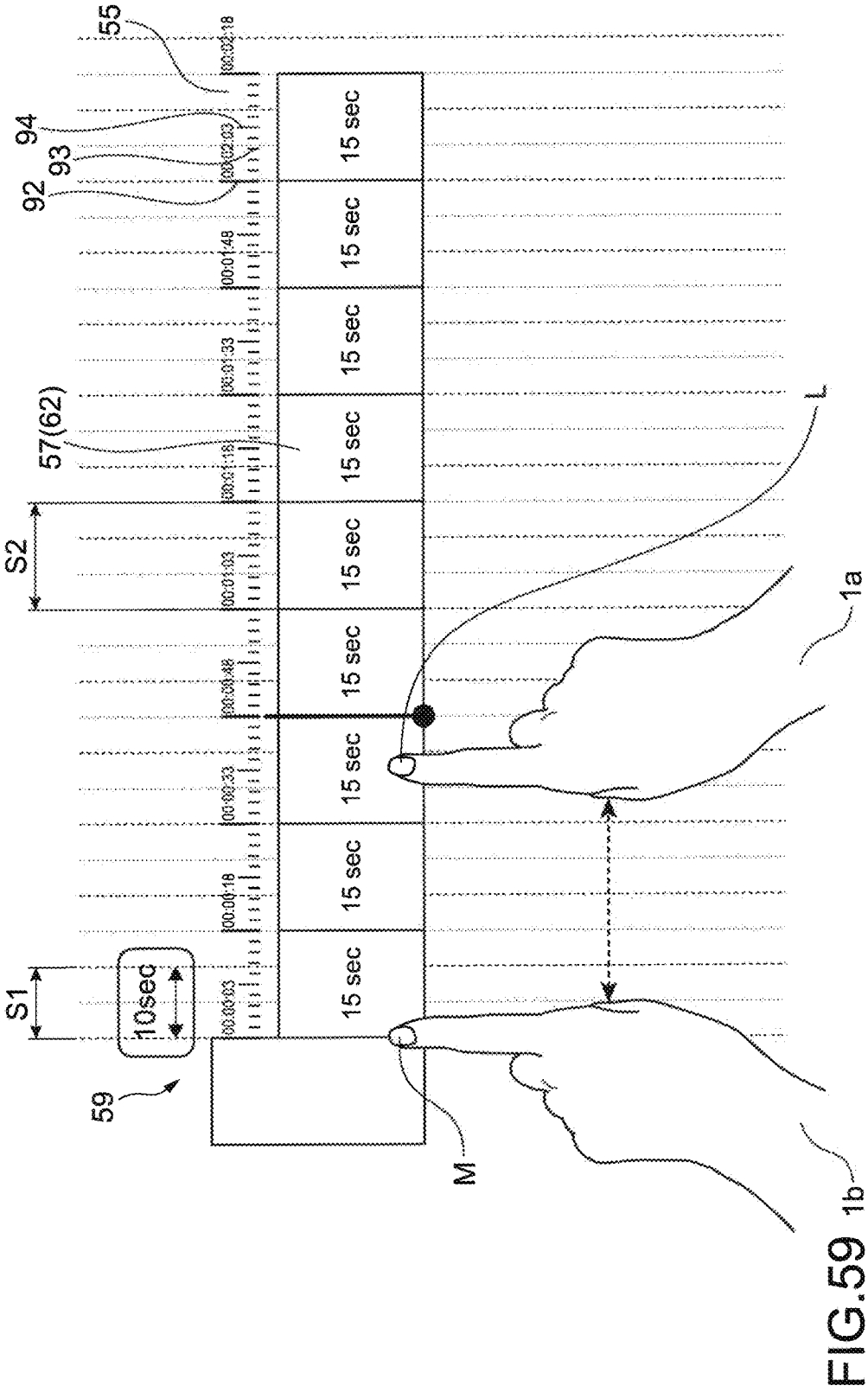



FIG.59

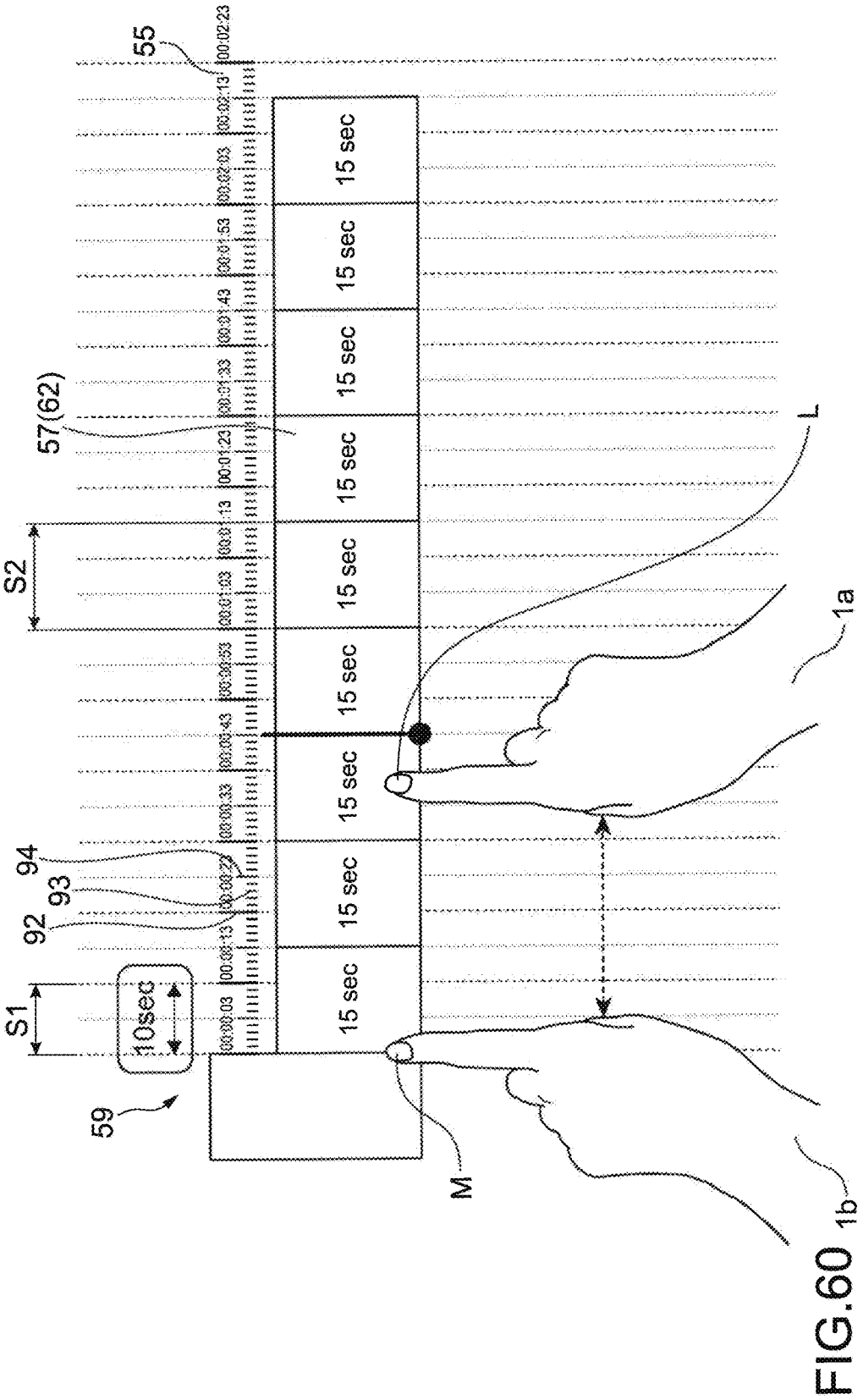

55
00:02:23
00:02:13
00:02:03
00:01:53
00:01:43
00:01:33
00:01:23
00:01:13
00:01:03
00:00:53
00:00:43
00:00:33
00:00:22
00:00:13
00:00:03
15 sec
57(62)
S2
S1
10sec
94
93
92
59
L
1a
M
1b

FIG.60

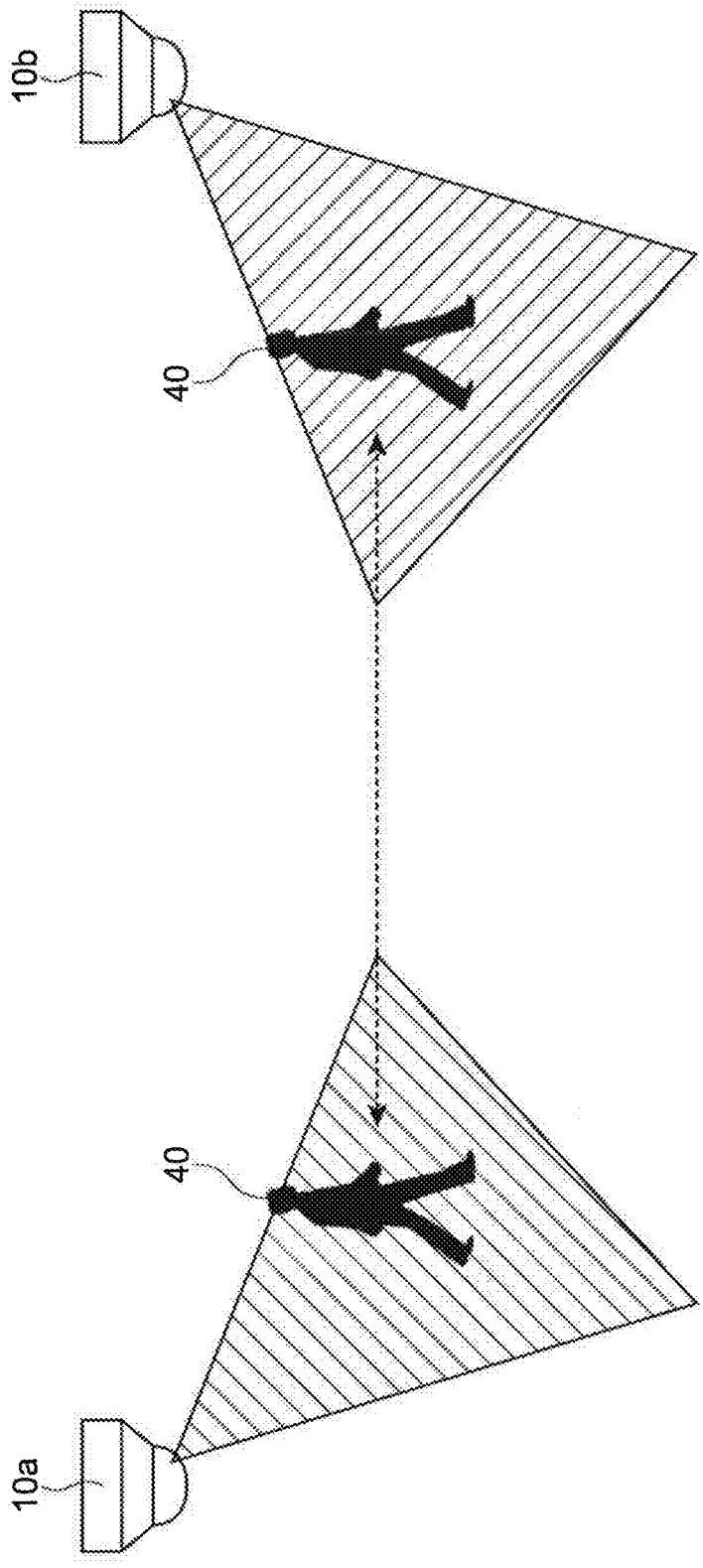



FIG.61

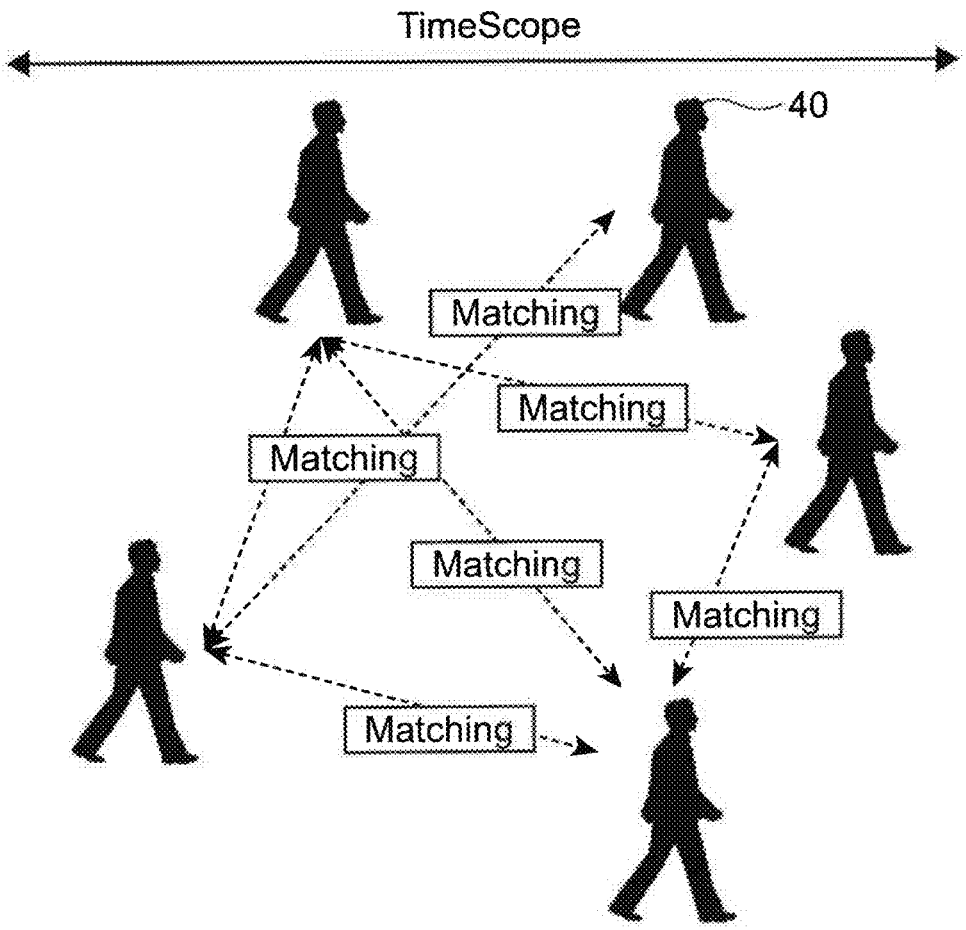
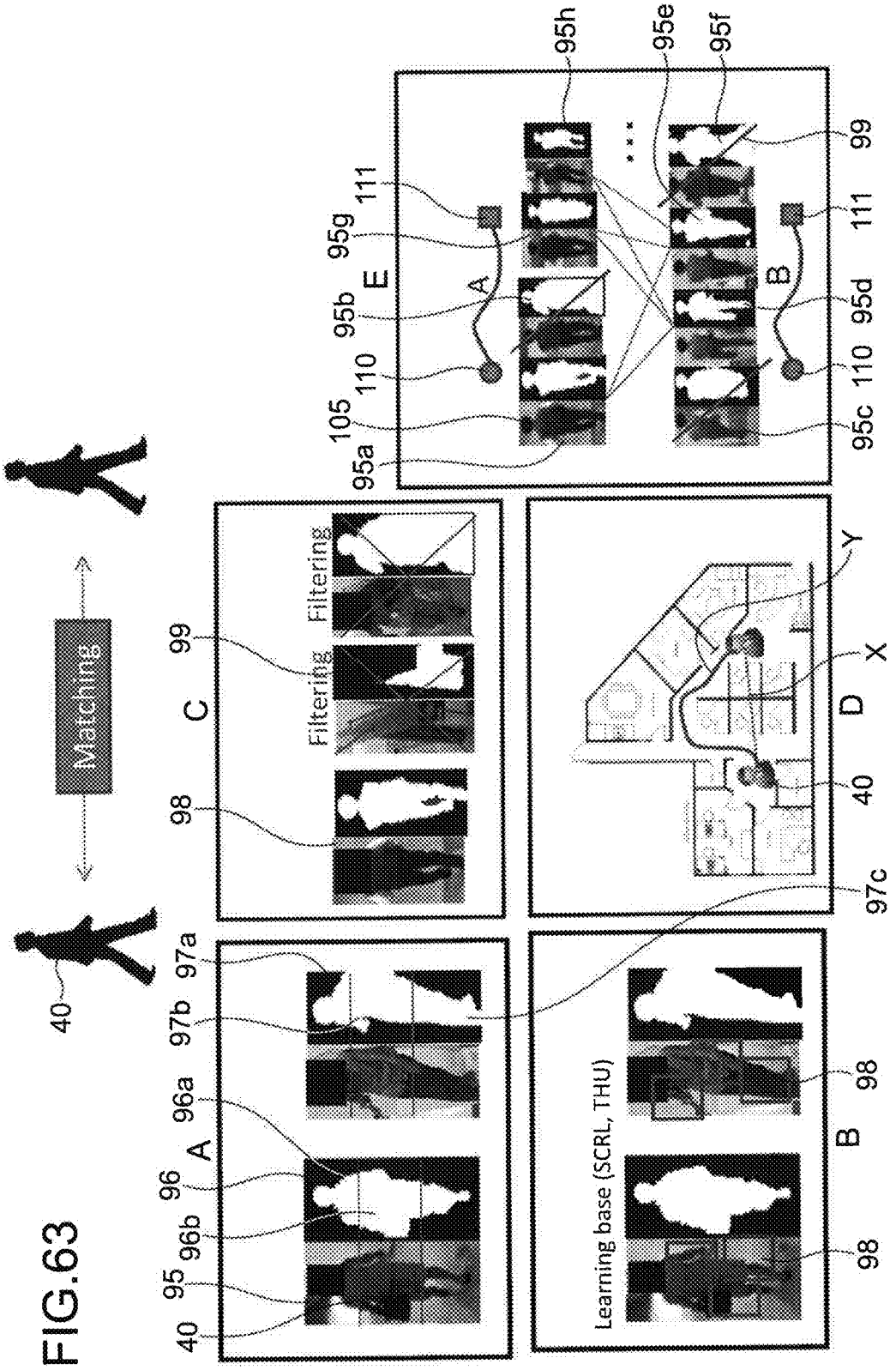

TimeScope
40
Matching
Matching
Matching
Matching
Matching
Matching

FIG.62

FIG.63


Marching
Filtering
Filtering
Learning base (SCRL, THU)
A
B
C
D
E
X
Y
40
95
96
96a
96b
97a
97b
97c
98
99
95a
95b
95c
95d
95e
95f
95g
95h
105
110
111

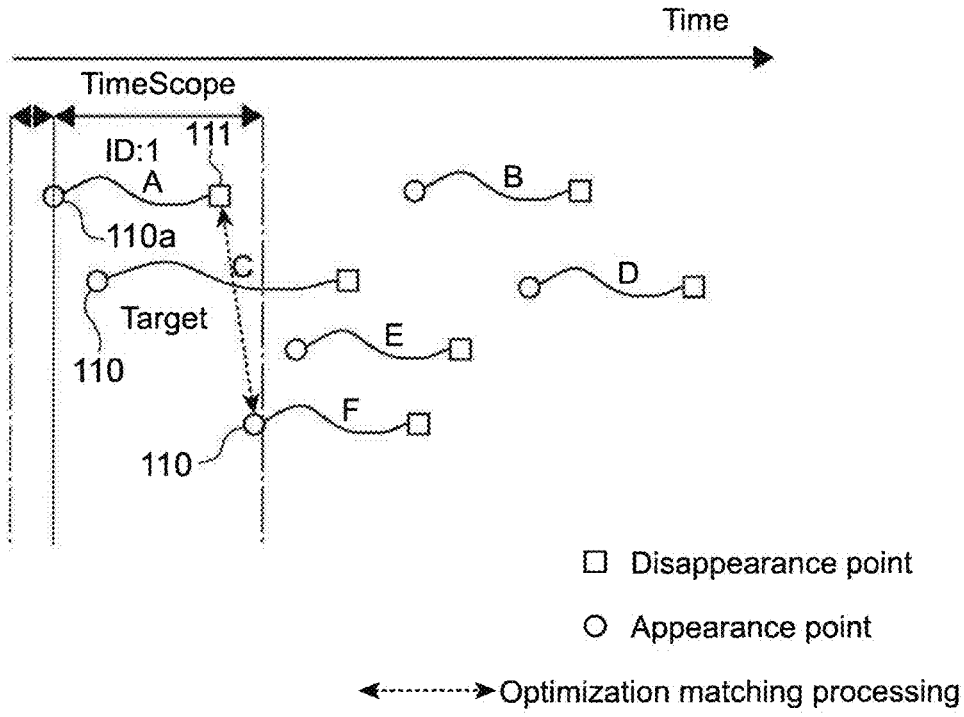

Time
TimeScope
ID:1
111
A
B
110a
C
D
Target
E
110
F
110
Disappearance point
Appearance point
Optimization matching processing

FIG.64

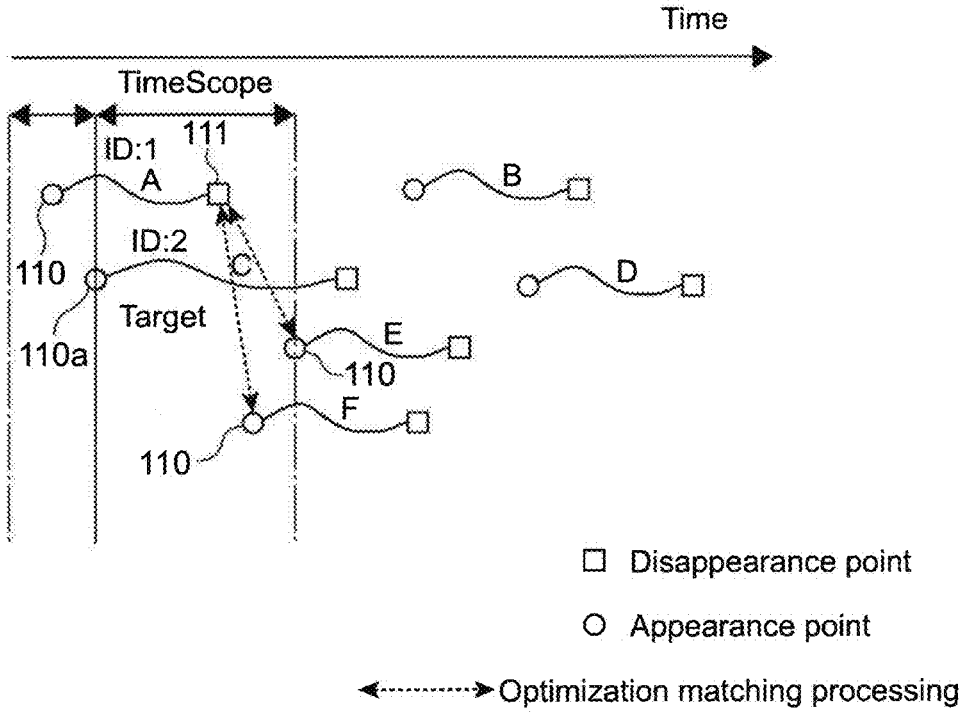

Time
TimeScope
ID:1
111
A
B
ID:2
110
C
D
Target
E
110a
110
F
110
Disappearance point
Appearance point
Optimization matching processing

FIG.65

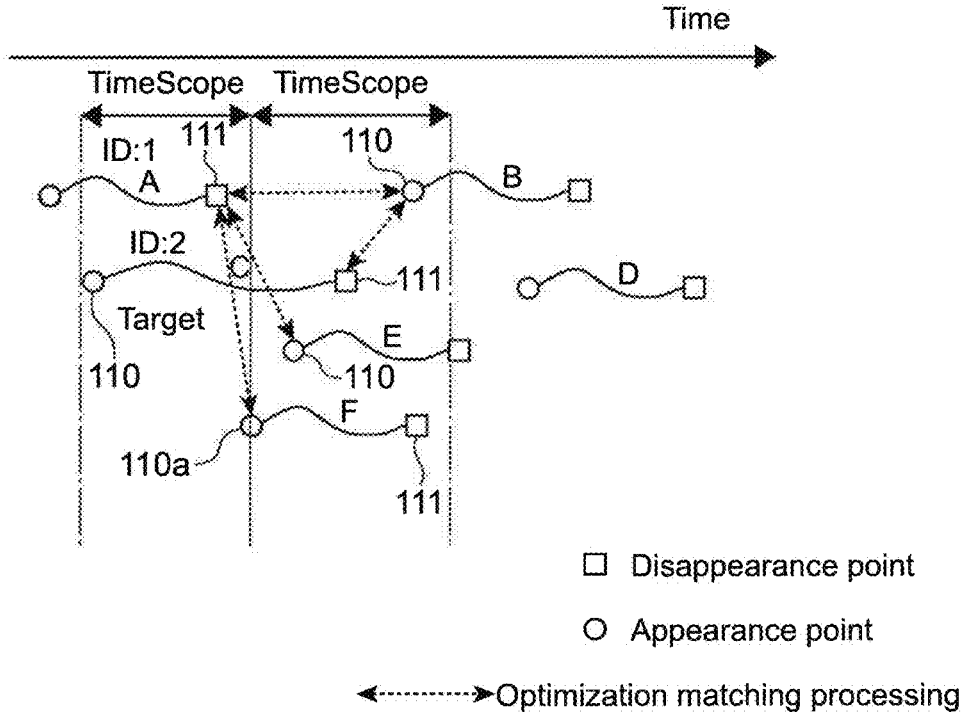

Time
TimeScope
TimeScope
ID:1
111
110
A
B
ID:2
111
D
Target
E
110
110
F
110a
111
Disappearance point
Appearance point
Optimization matching processing

FIG.66

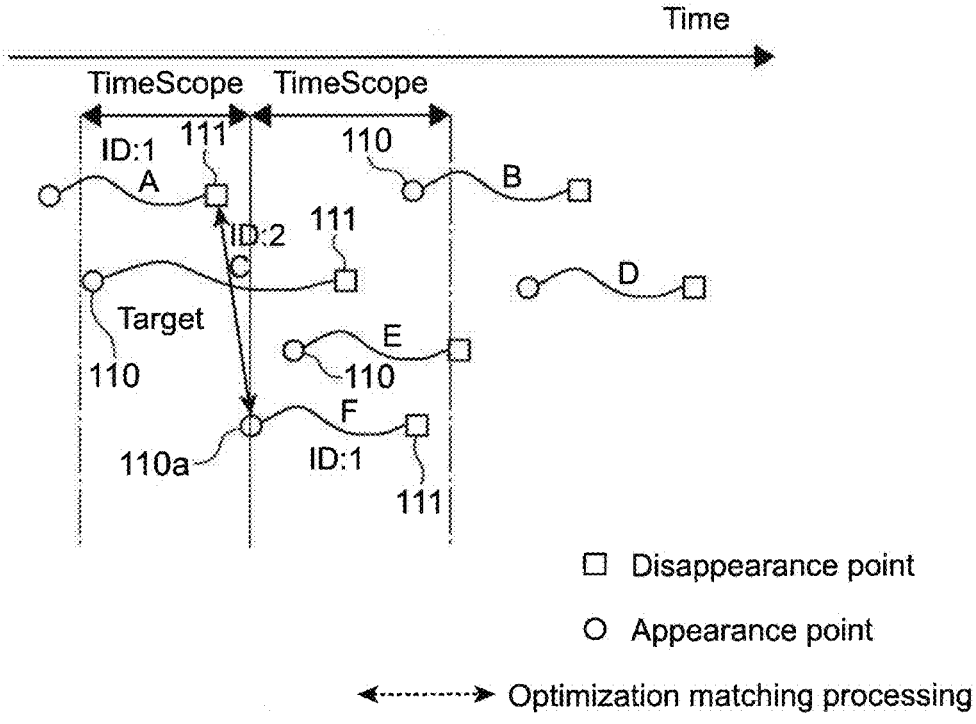

Time
TimeScope
TimeScope
ID:1
111
110
A
B
ID:2
111
D
Target
E
110
110
F
110a
ID:1
111
Disappearance point
Appearance point
Optimization matching processing

FIG.67

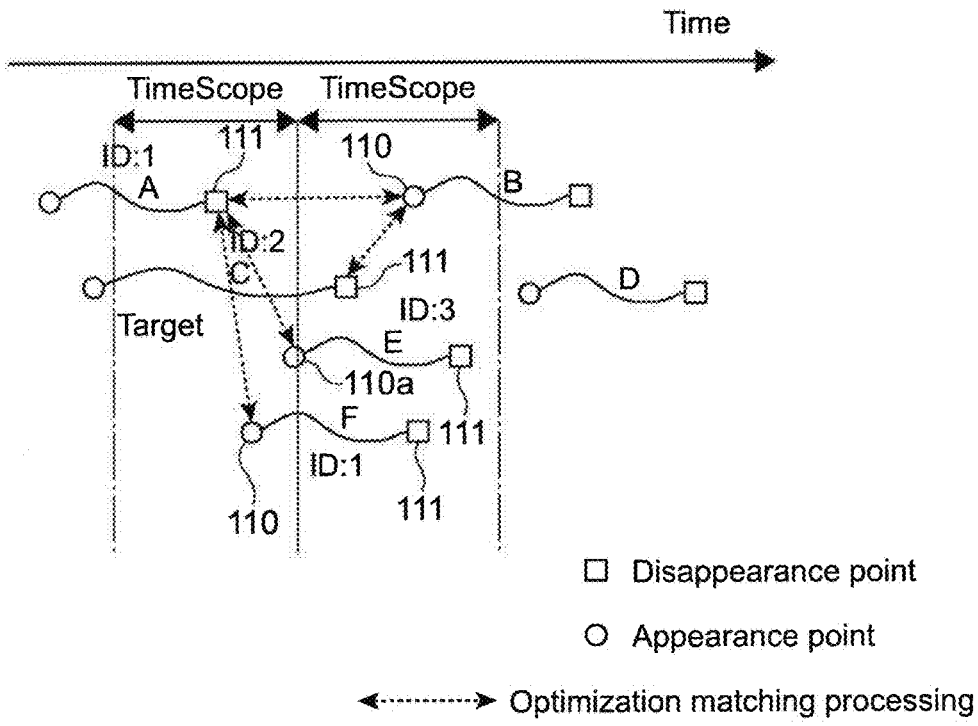

Time
TimeScope
TimeScope
ID:1
A
111
110
B
ID:2
C
111
D
Target
ID:3
E
110a
F
111
ID:1
110
111
Disappearance point
Appearance point
Optimization matching processing

FIG.68

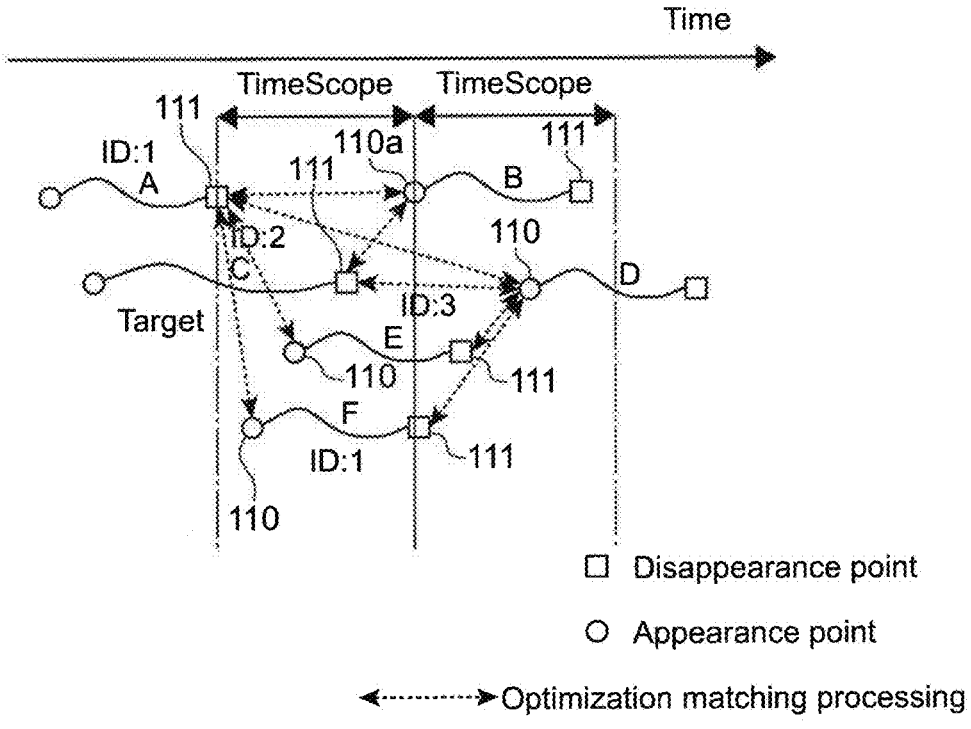

Time
TimeScope
TimeScope
111
ID:1
A
110a
111
111
B
ID:2
C
110
D
Target
ID:3
E
110
111
F
ID:1
111
110
Disappearance point
Appearance point
Optimization matching processing

FIG.69

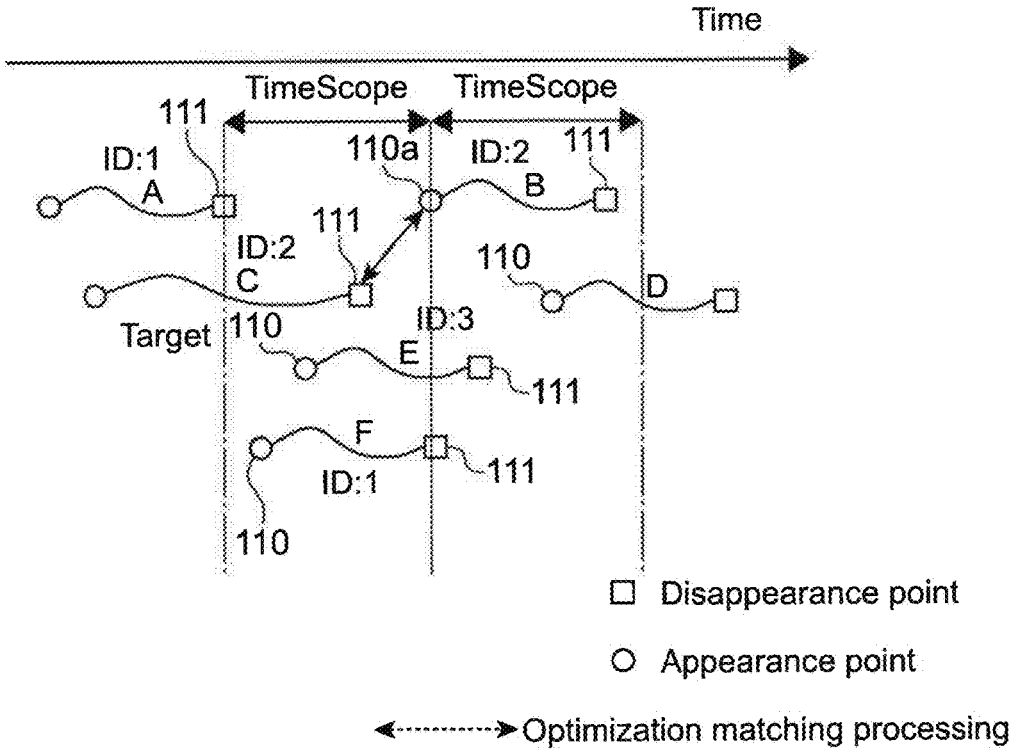

Time
TimeScope
TimeScope
111
ID:1
A
110a
ID:2
111
B
111
ID:2
C
110
D
Target
110
ID:3
E
111
F
ID:1
111
110
Disappearance point
Appearance point
Optimization matching processing

FIG.70

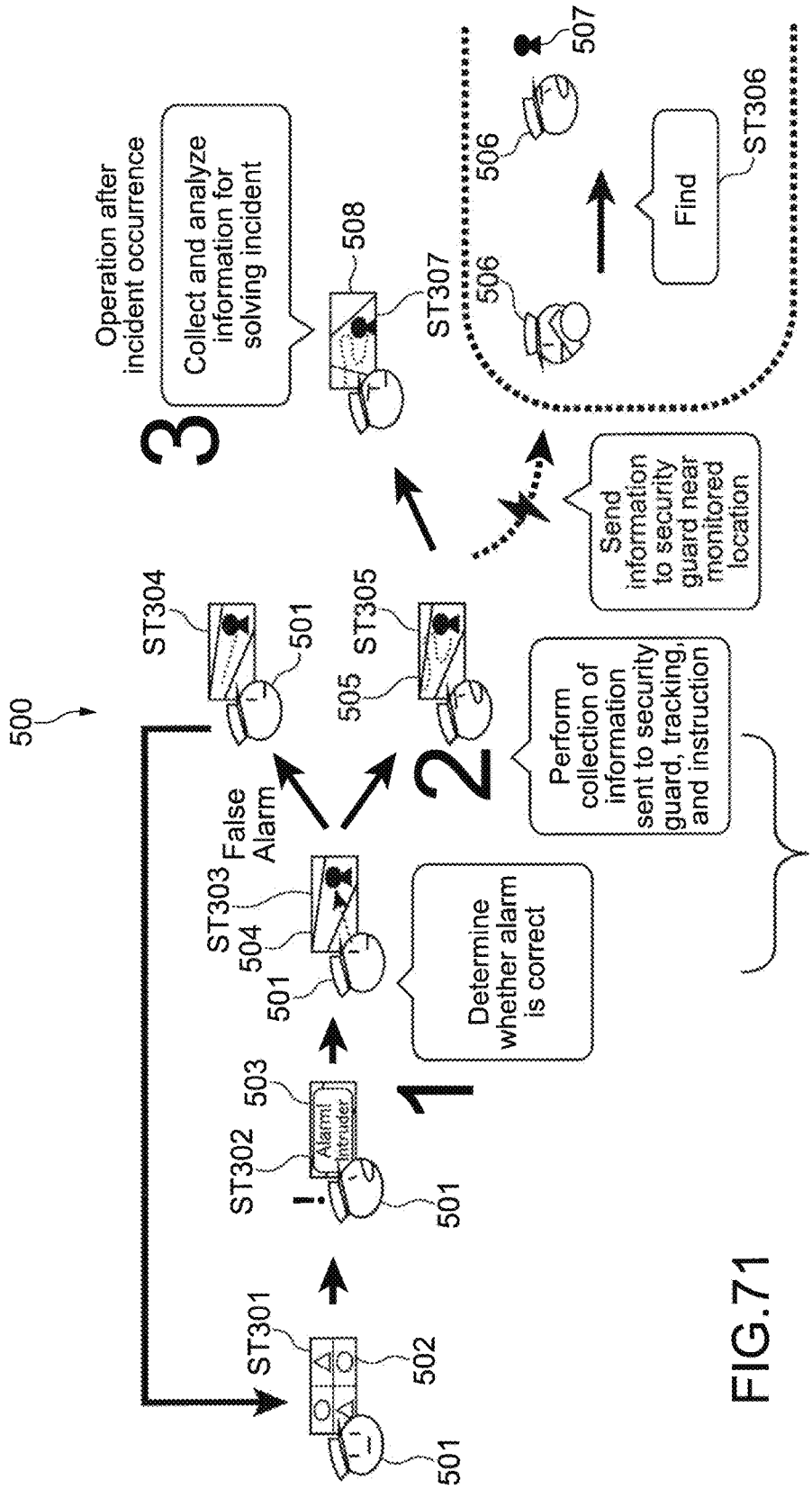

500
ST301
502
501
ST302
503
Alarm! Intruder
501
ST303
504
501
False Alarm
Determine whether alarm is correct
1
ST304
501
ST305
505
2
Perform collection of information sent to security guard, tracking, and instruction
Operation at incident occurrence
Send information to security guard near monitored location
ST307
508
3
Collect and analyze information for solving incident
Operation after incident occurrence
506
507
Find
ST306

FIG.71

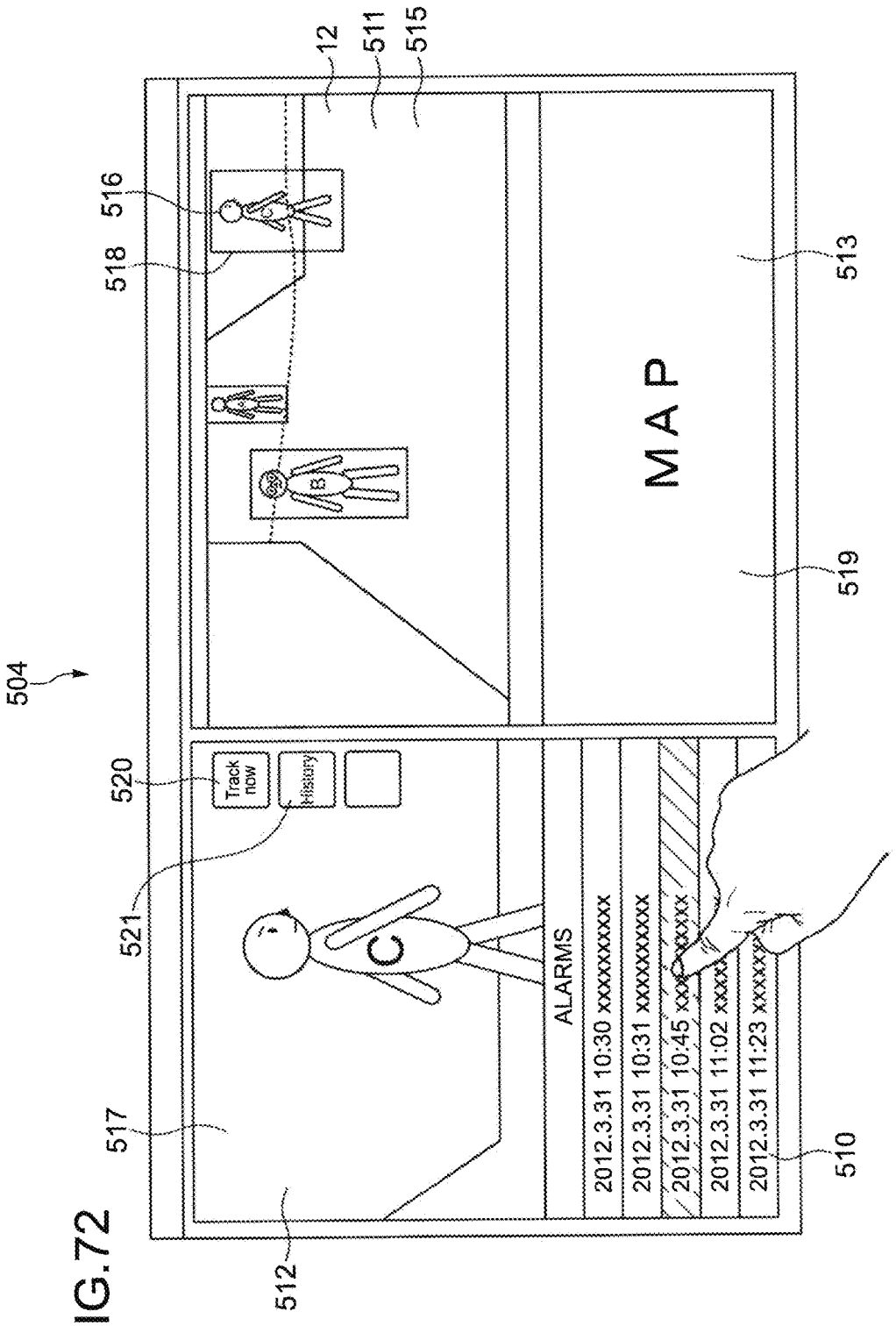

504
512
517
520
521
516
518
12
511
515
513
519
510
MAP
ALARMS
Track now
History
2012.3.31 10:30 xxxxxxxxxx
2012.3.31 10:31 xxxxxxxxxx
2012.3.31 10:45 xxxxxxxxxx
2012.3.31 11:02 xxxxxxxxxx
2012.3.31 11:23 xxxxxxxxxx

FIG.72

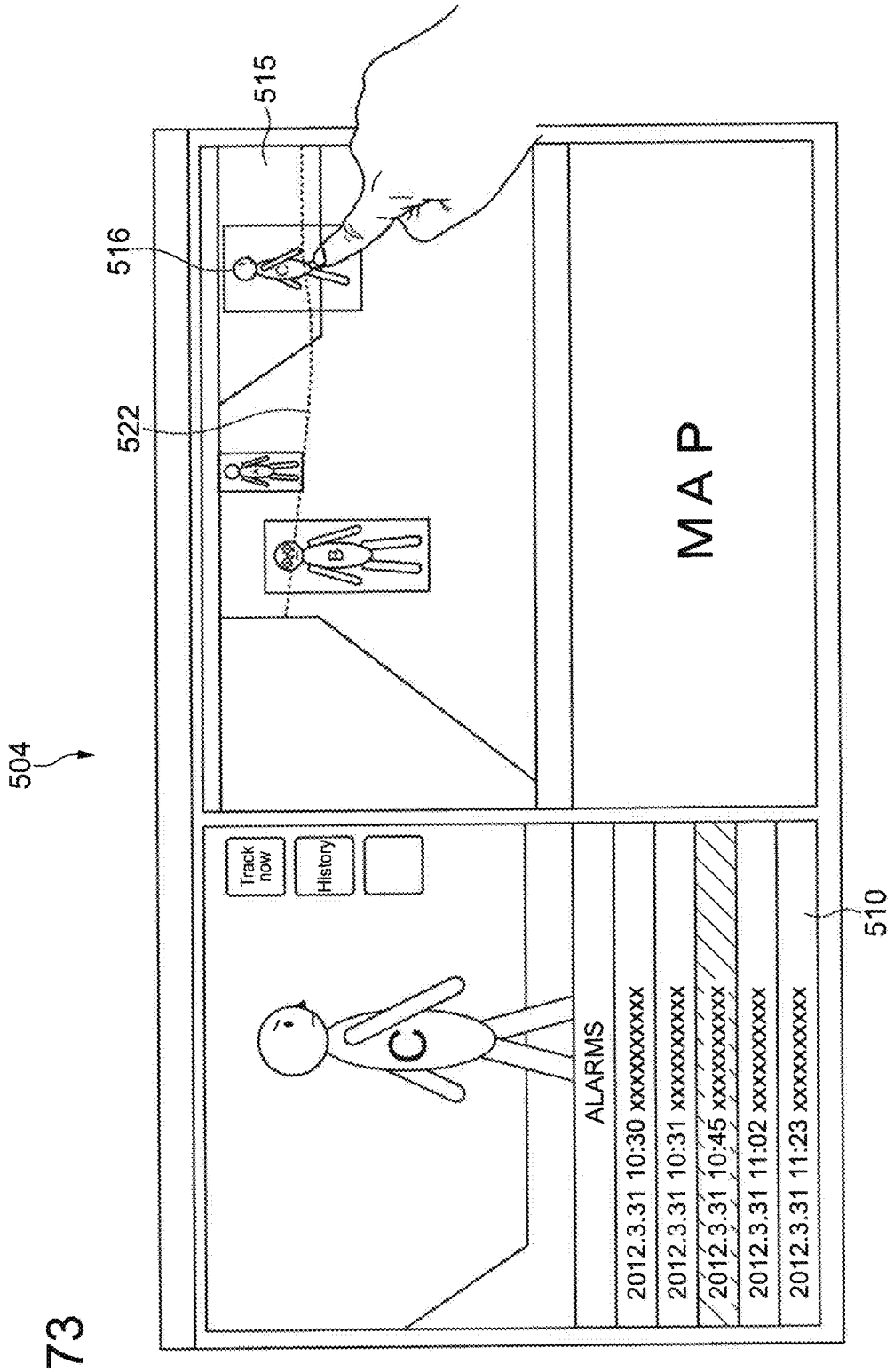

504
515
516
522
MAP
Track now
History
ALARMS
2012.3.31 10:30 xxxxxxxxx
2012.3.31 10:31 xxxxxxxxx
2012.3.31 10:45 xxxxxxxxx
2012.3.31 11:02 xxxxxxxxx
2012.3.31 11:23 xxxxxxxxx
510

FIG.73

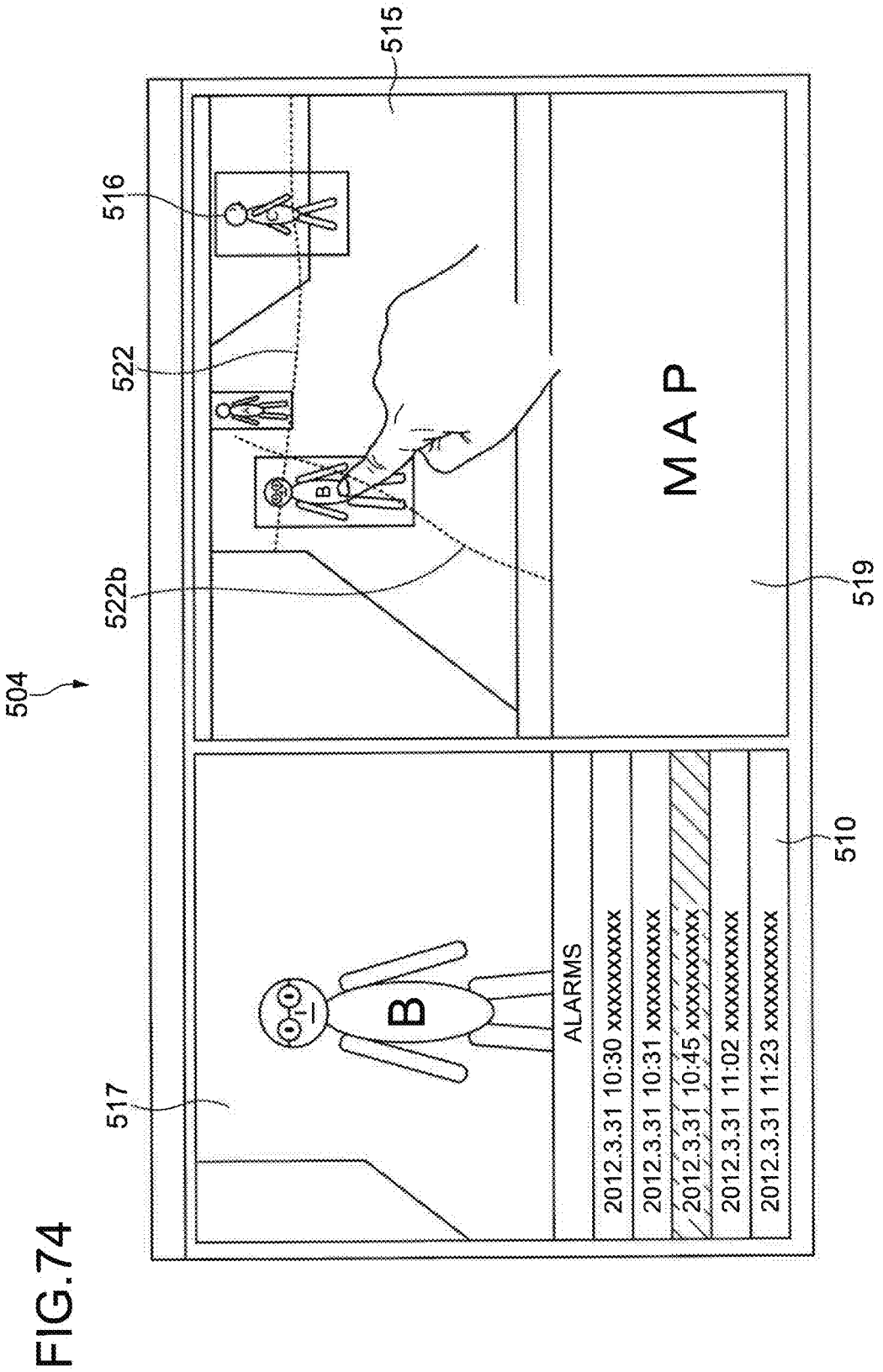

504
515
516
522
522b
519
517
510
MAP
B
ALARMS
2012.3.31 10:30 xxxxxxxxxx
2012.3.31 10:31 xxxxxxxxxx
2012.3.31 10:45 xxxxxxxxxx
2012.3.31 11:02 xxxxxxxxxx
2012.3.31 11:23 xxxxxxxxxx

FIG.74

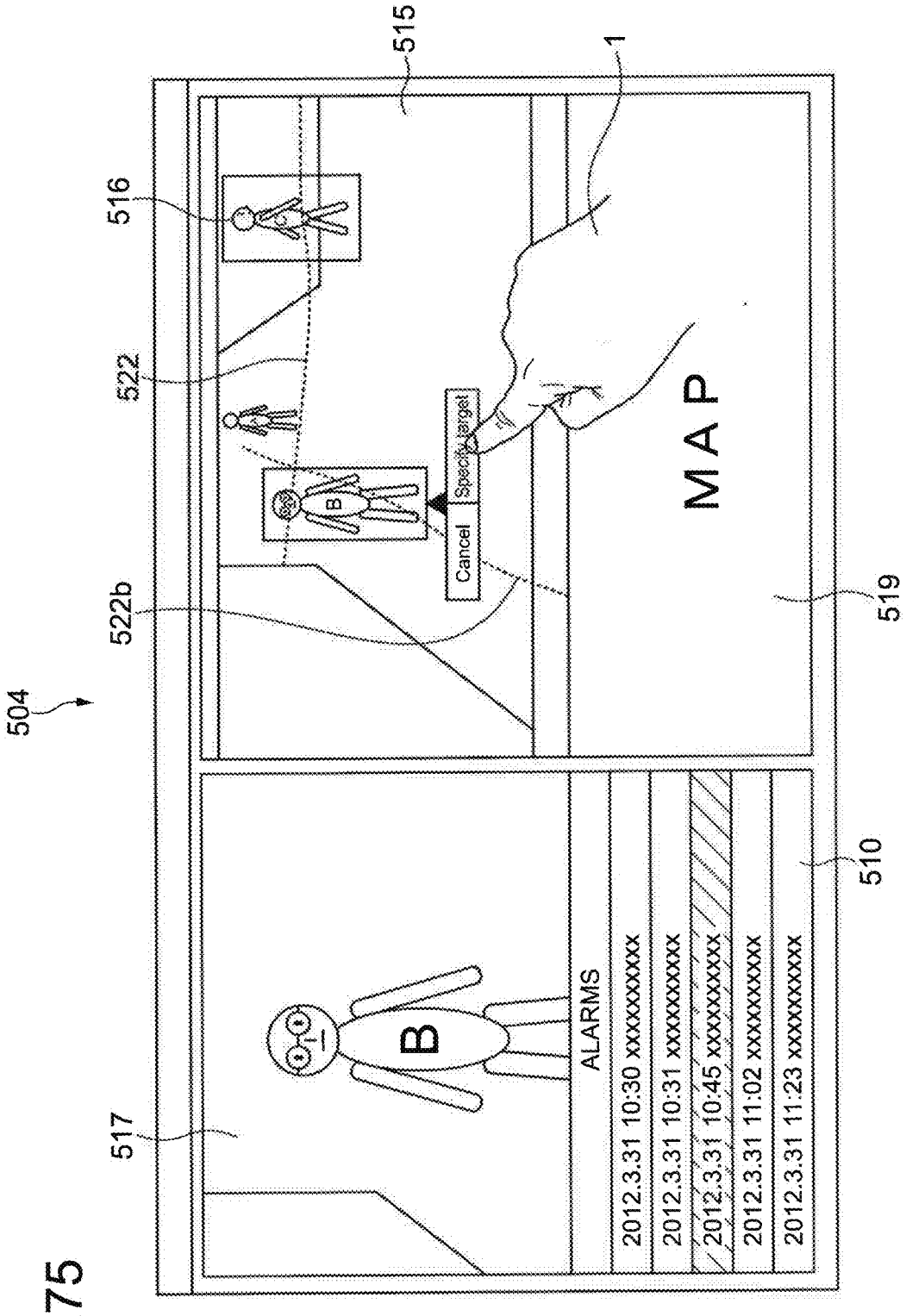

504
515
1
516
522
522b
519
517
510
MAP
Cancel
Specify target
B
ALARMS
2012.3.31 10:30 xxxxxxxxxx
2012.3.31 10:31 xxxxxxxxxx
2012.3.31 10:45 xxxxxxxxxx
2012.3.31 11:02 xxxxxxxxxx
2012.3.31 11:23 xxxxxxxxxx

FIG.75

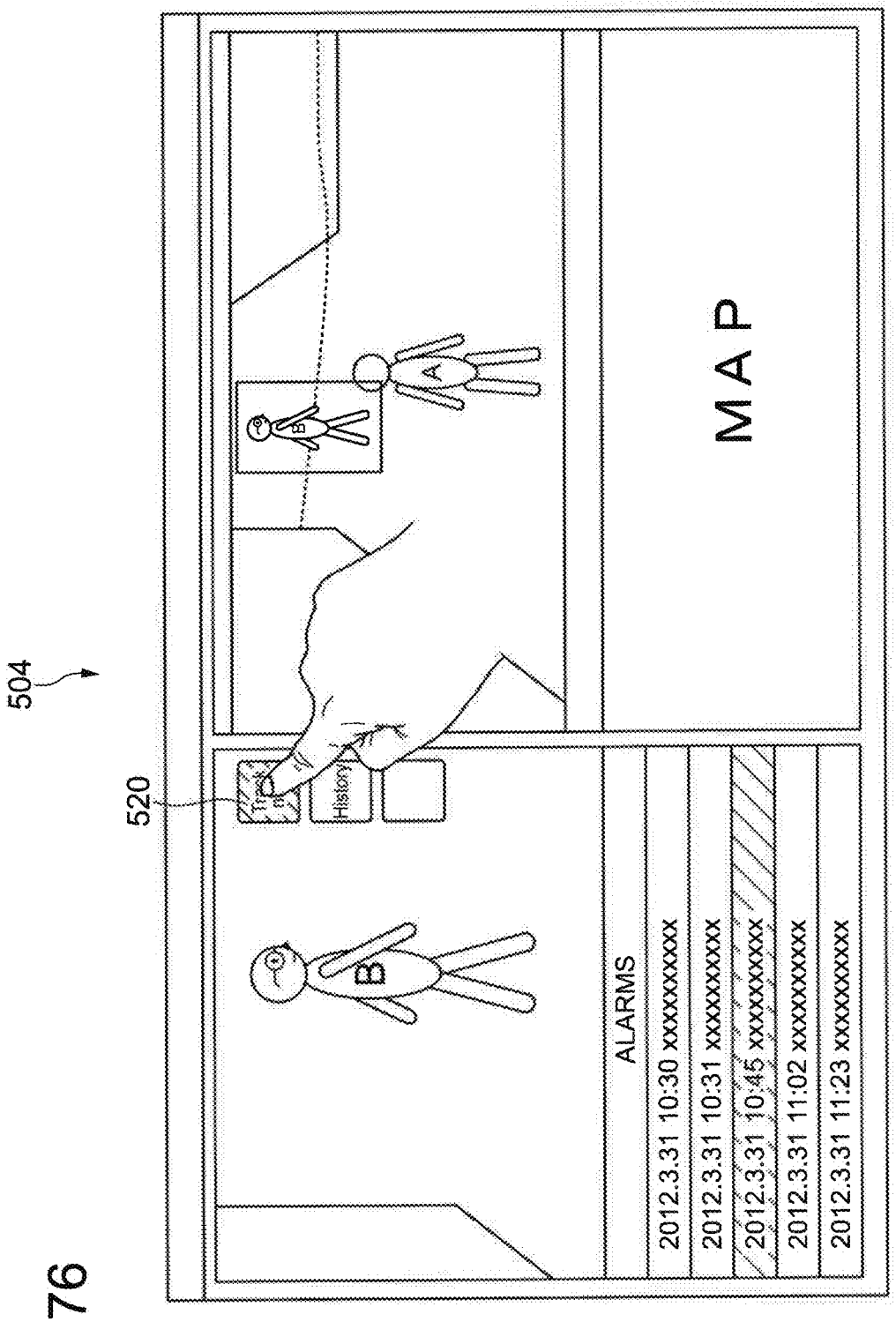

504
520
MAP
ALARMS
2012.3.31 10:30 xxxxxxxxxx
2012.3.31 10:31 xxxxxxxxxx
2012.3.31 10:45 xxxxxxxxxx
2012.3.31 11:02 xxxxxxxxxx
2012.3.31 11:23 xxxxxxxxxx
History
A
B

FIG.76

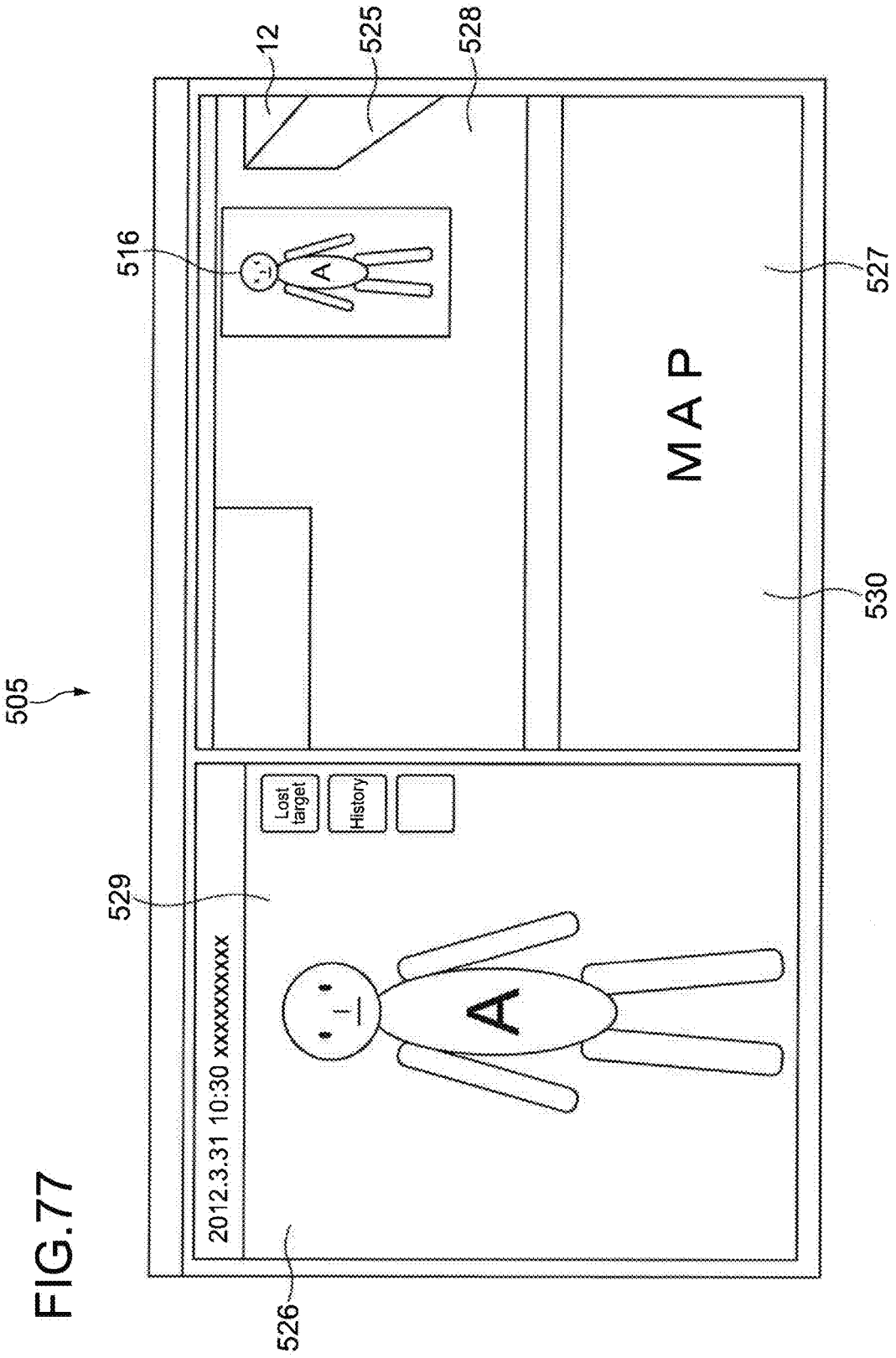

505
12
525
528
516
527
MAP
530
Lost target
History
529
2012.3.31 10:30 xxxxxxxxx
526

FIG.77

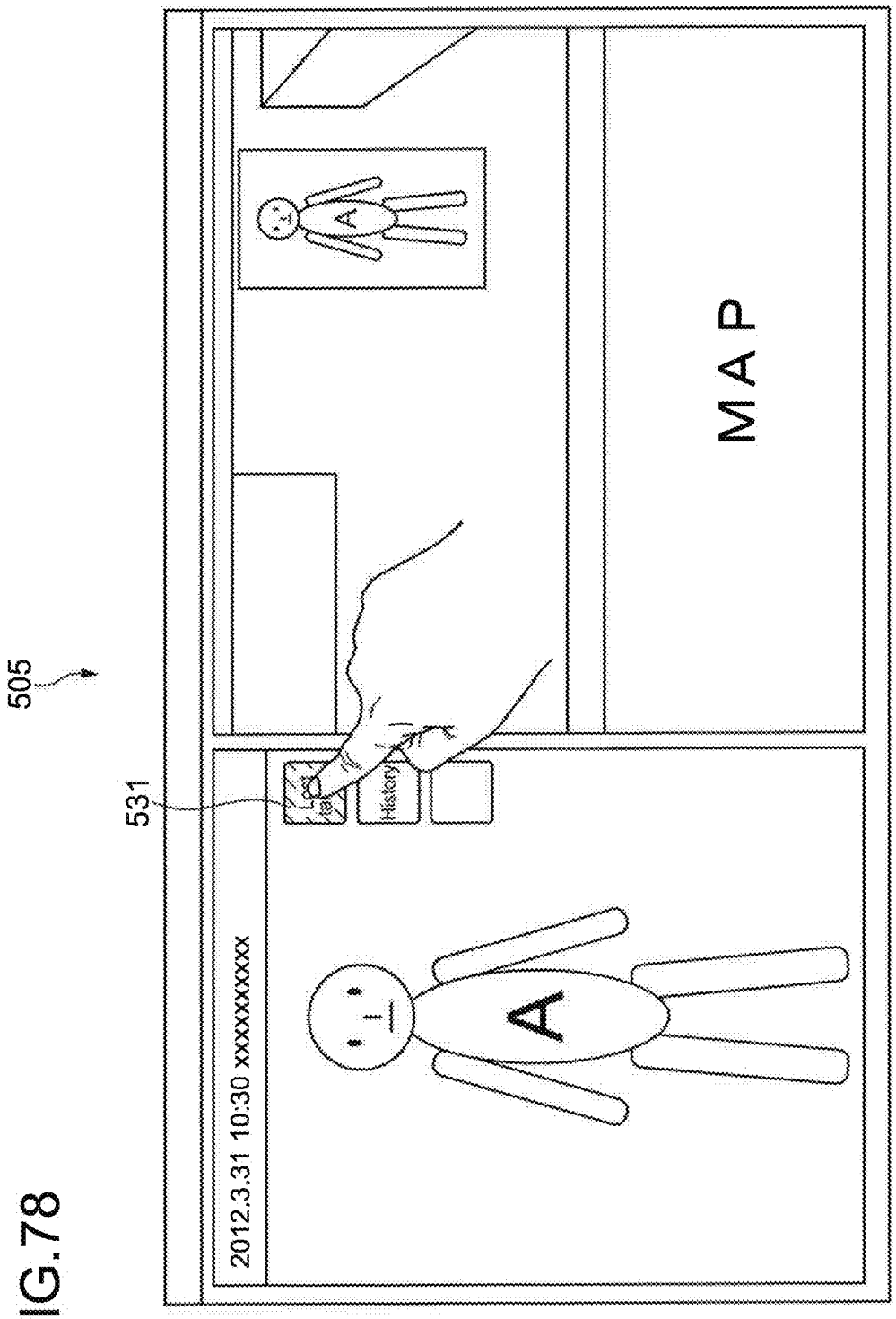



FIG.78

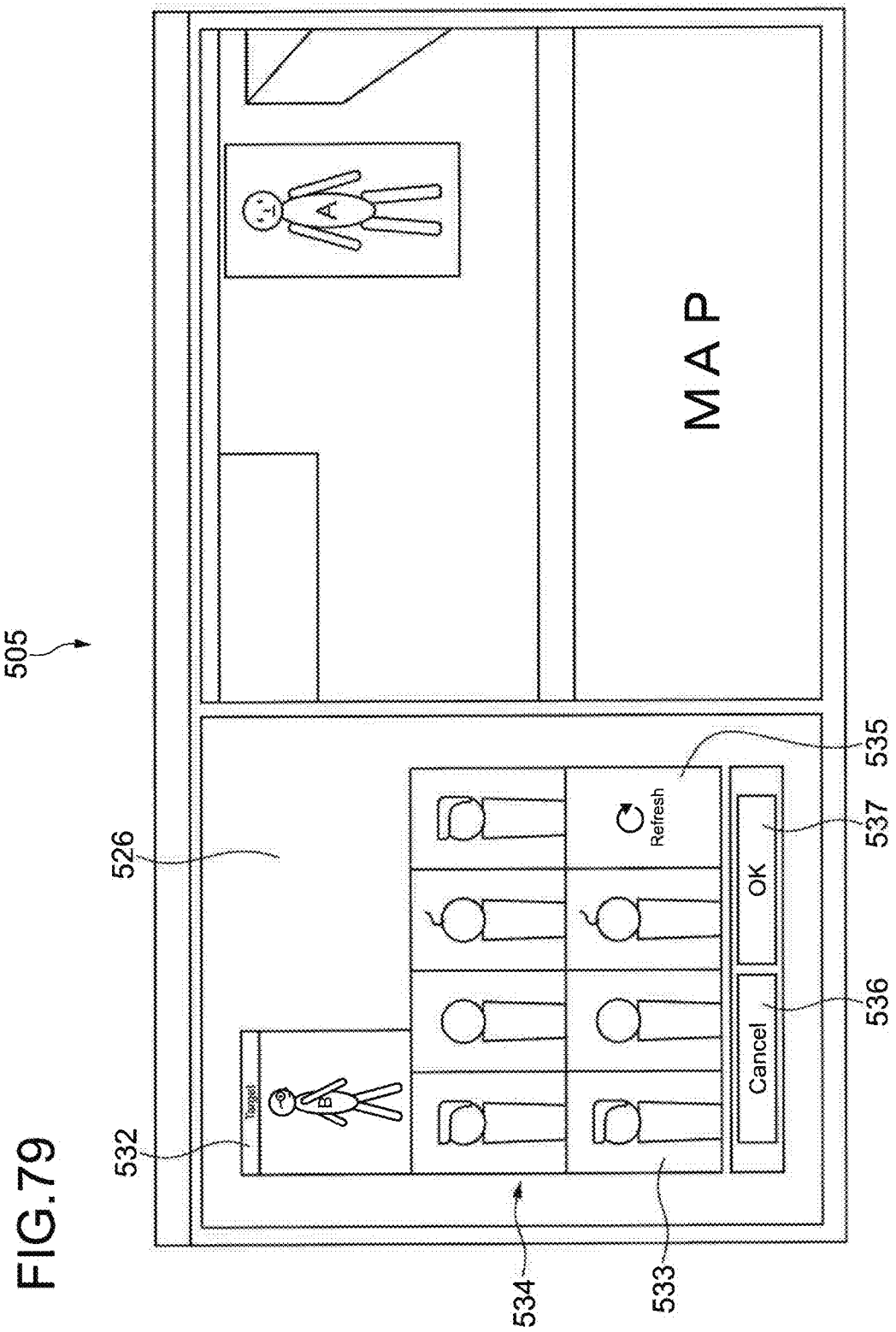



FIG.79

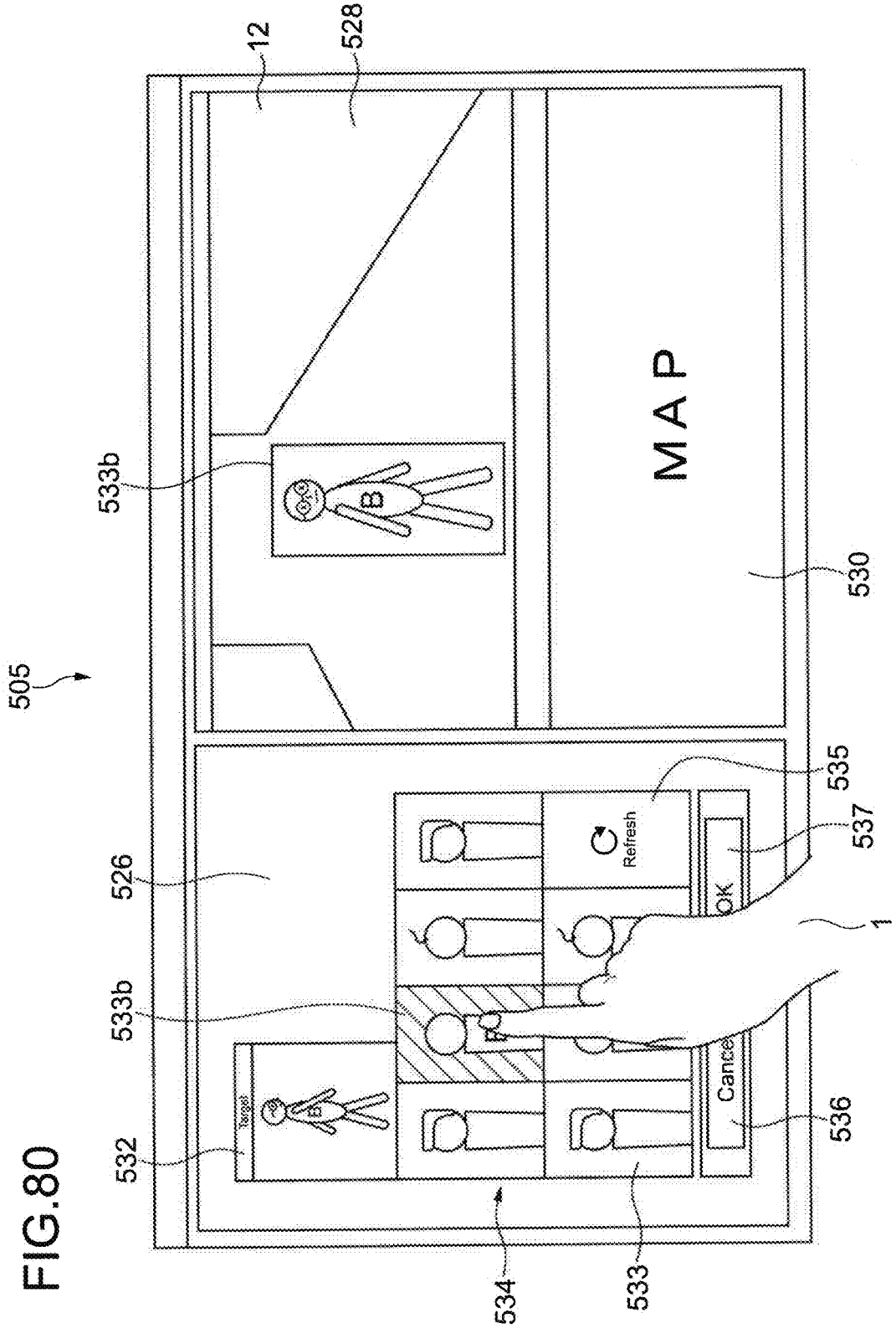

12
528
533b
B
MAP
530
505
535
Refresh
537
OK
526
1
533b
532
Target
Cancel
536
534
533

FIG.80

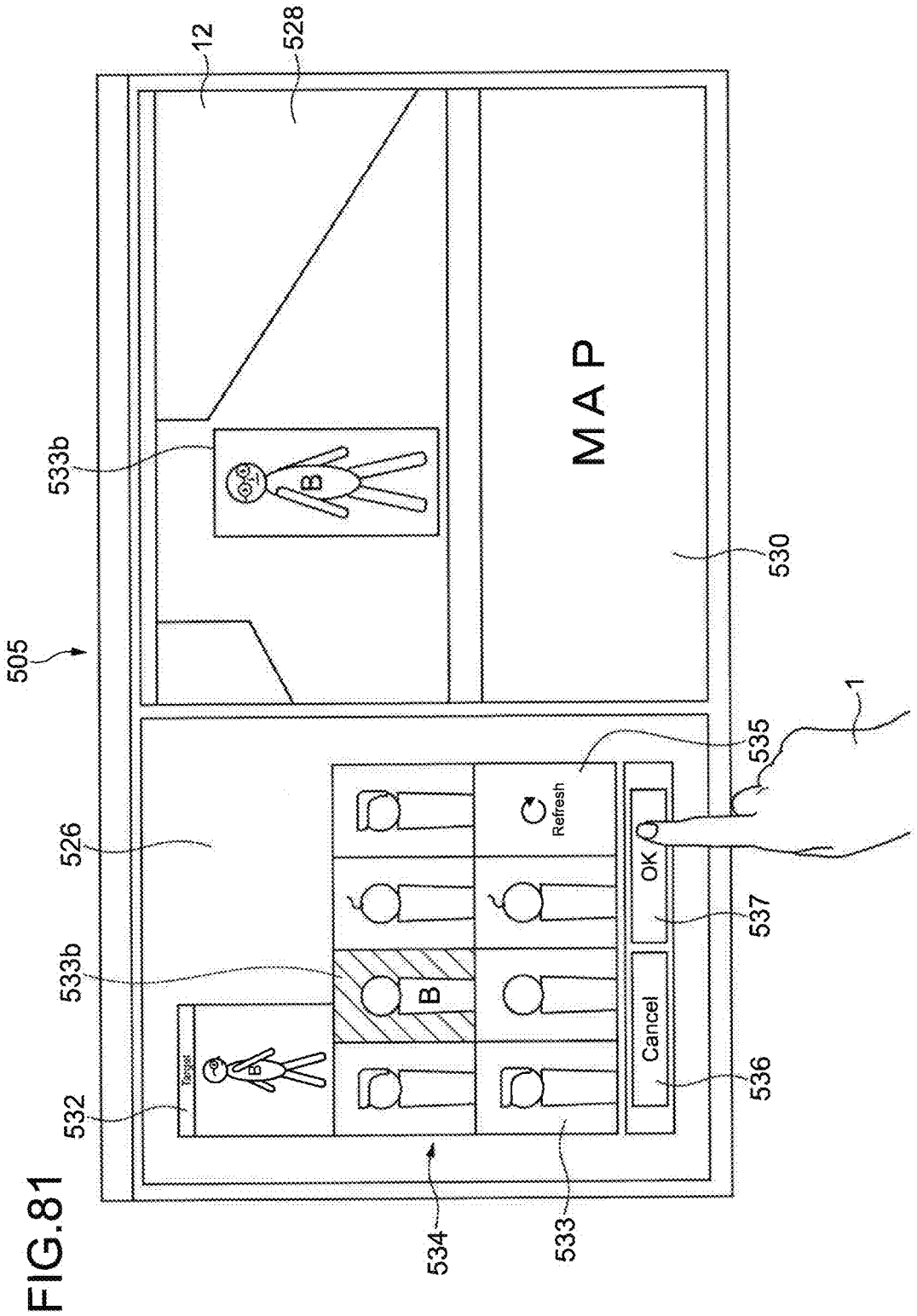

12
528
MAP
533b
530
505
535
1
526
Refresh
OK
537
533b
B
Cancel
536
532
534
533

FIG.81

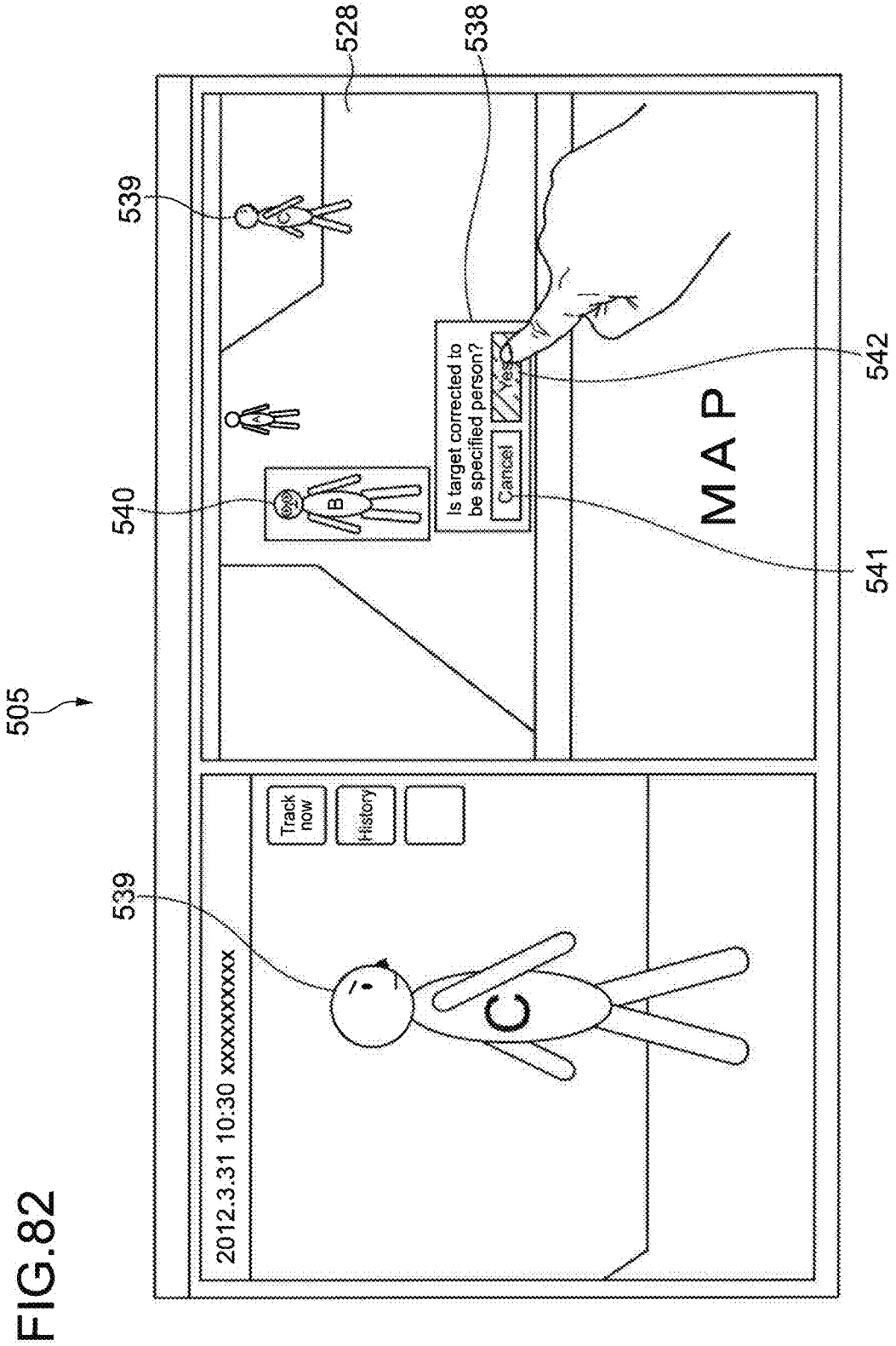

505
528
538
539
540
541
542
539
MAP
Is target corrected to be specified person?
Yes
Cancel
B
Track now
History
2012.3.31 10:30 xxxxxxxxxx
C

FIG.82

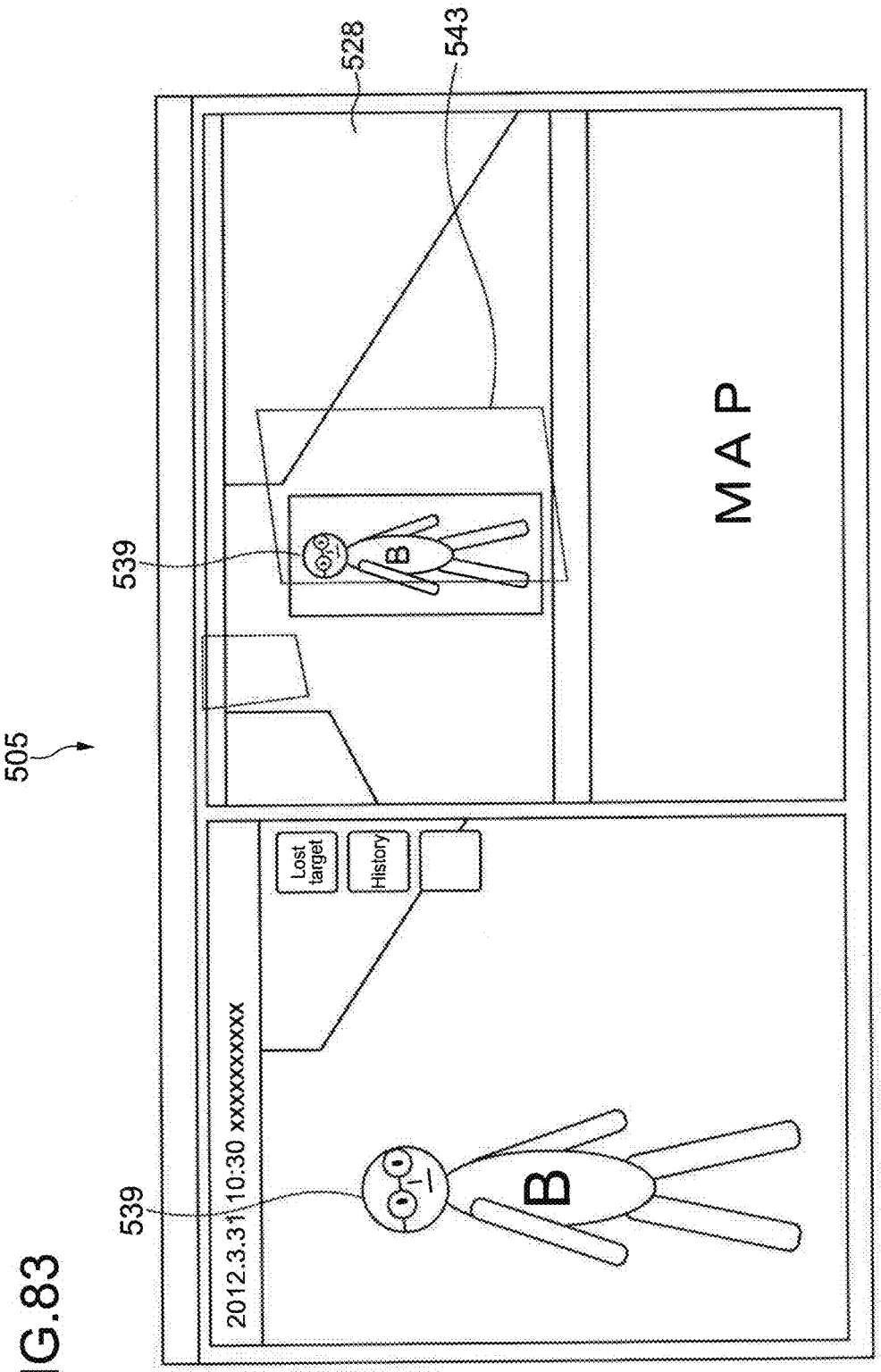

505
528
543
539
539
MAP
B
B
Lost target
History
2012.3.31 10:30 xxxxxxxxx

FIG.83

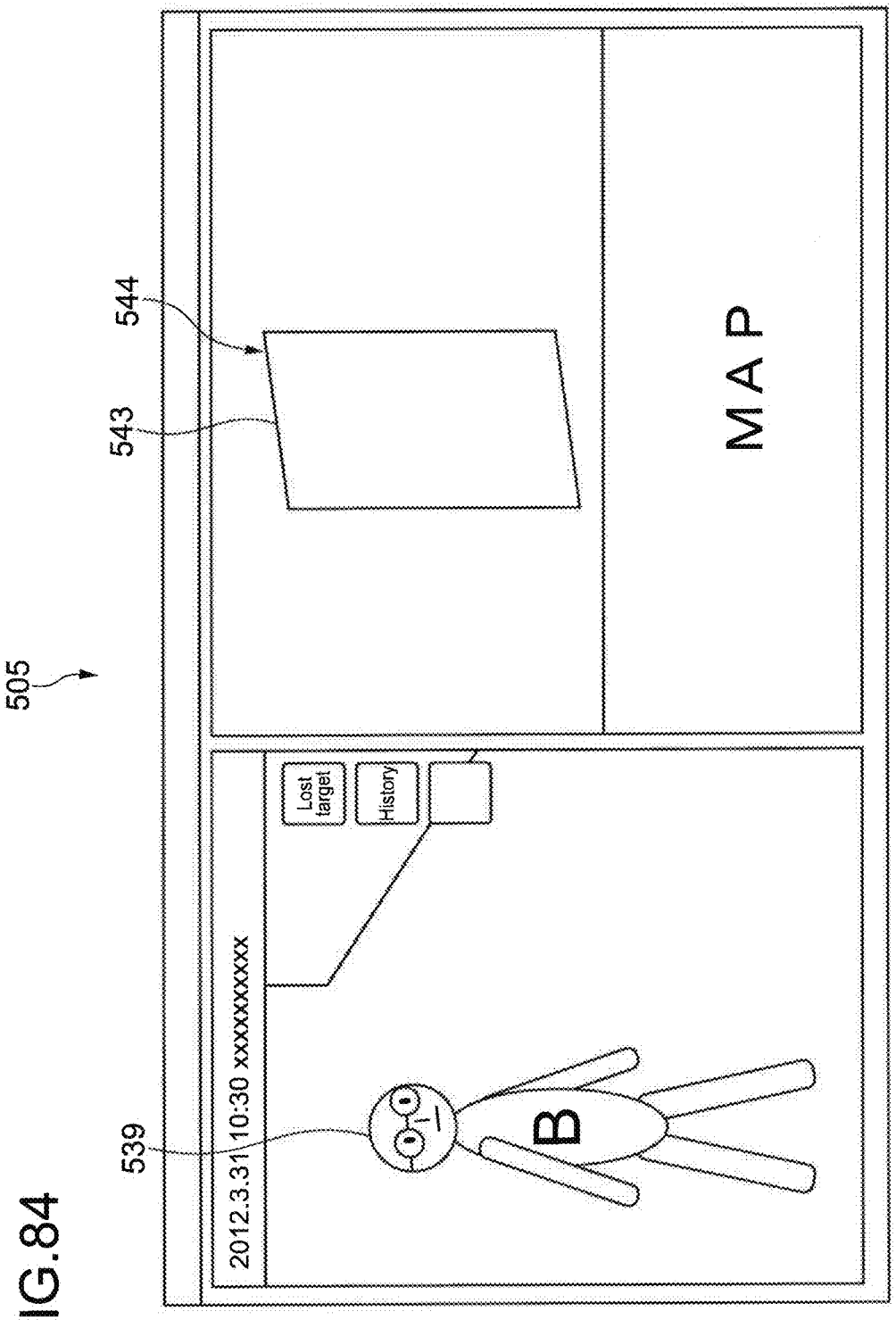

505
544
543
539
MAP
Lost target
History
2012.3.31 10:30 xxxxxxxxxx
B

FIG.84

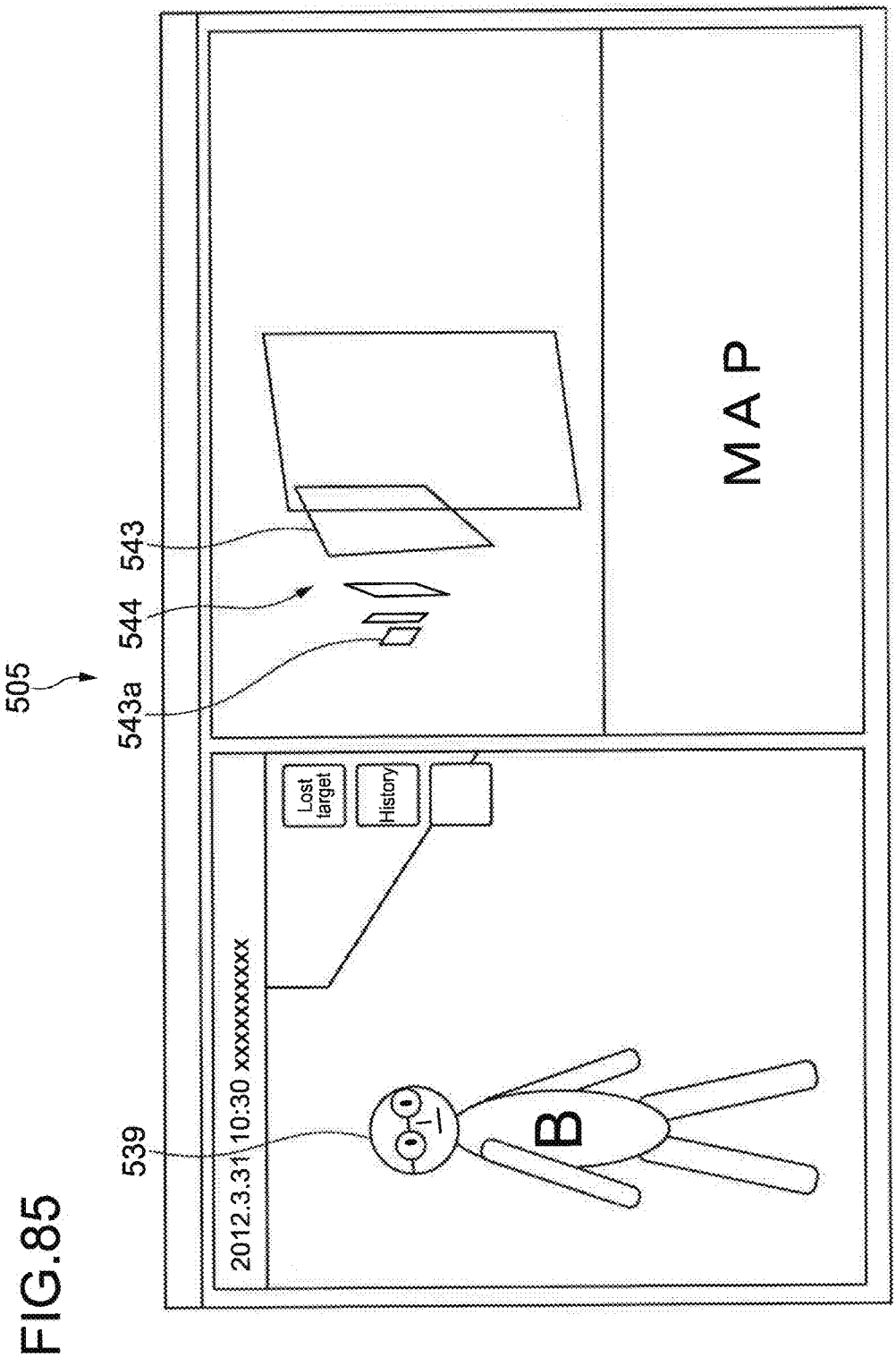

505
543
544
543a
539
MAP
Lost target
History
2012.3.31 10:30 xxxxxxxxxx
B

FIG.85

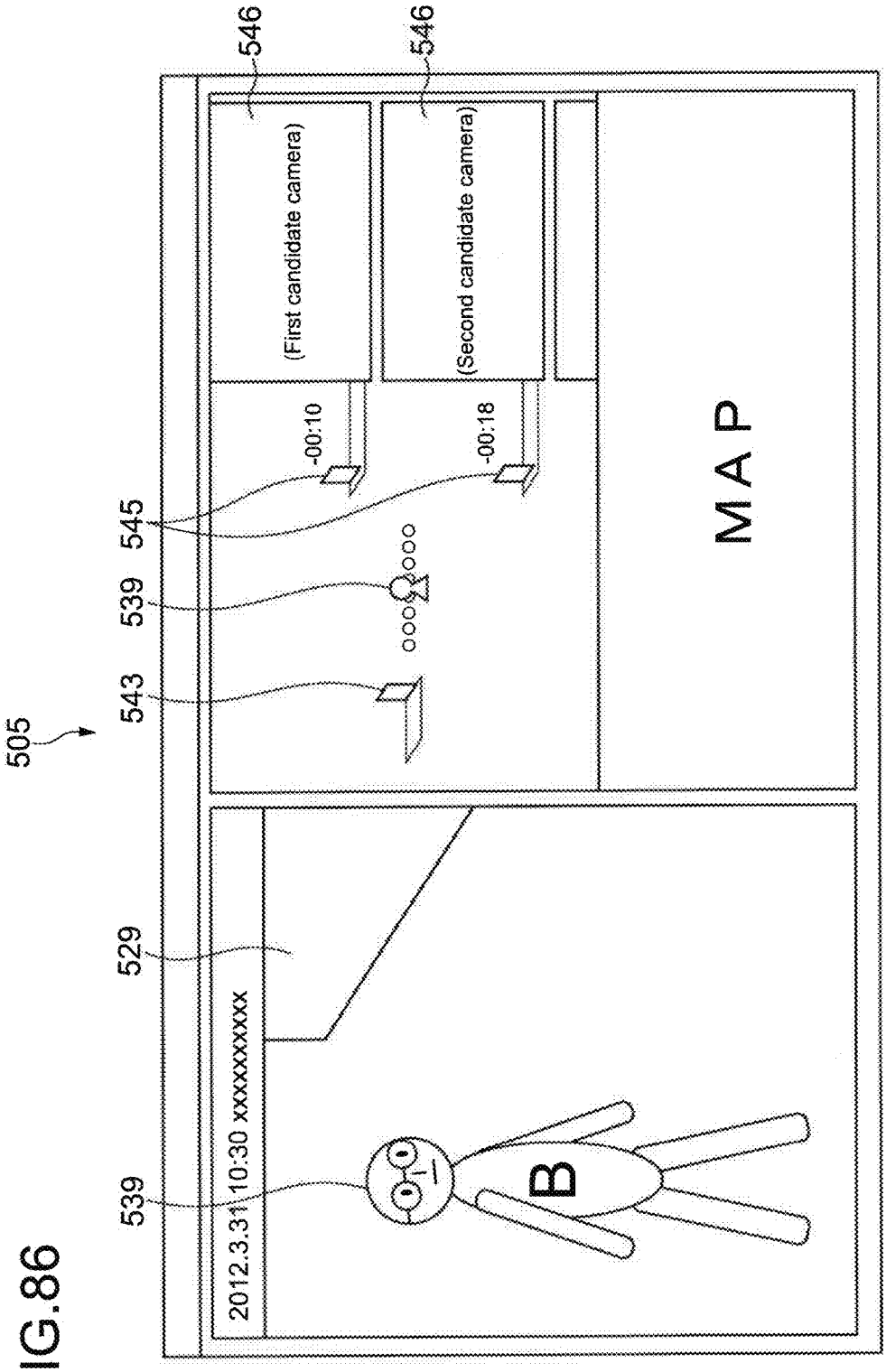

505
543
539
545
529
539
546
546
(First candidate camera)
(Second candidate camera)
-00:10
-00:18
MAP
2012.3.31 10:30 xxxxxxxxx
B

FIG.86

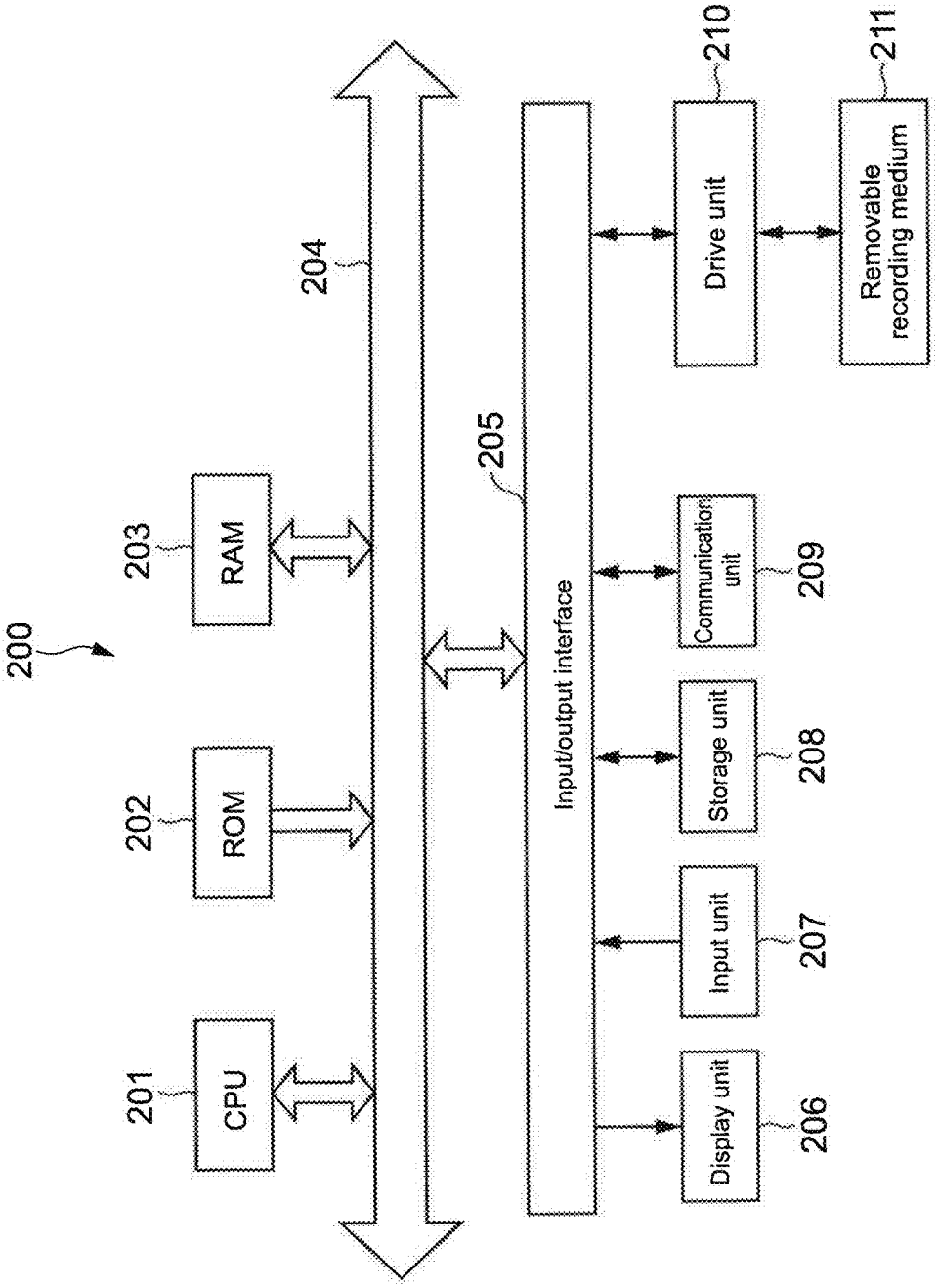

200
201
CPU
202
ROM
203
RAM
204
205
Input/output interface
206
Display unit
207
Input unit
208
Storage unit
209
Communication unit
210
Drive unit
211
Removable recording medium

FIG.87

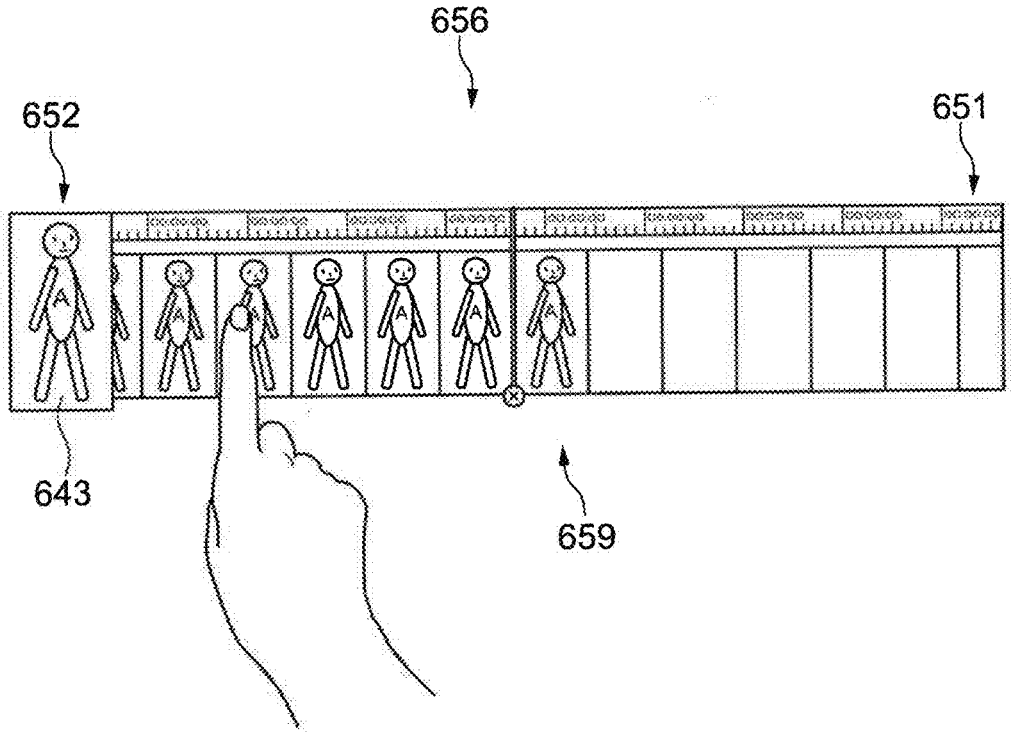



FIG.88

# INFORMATION PROCESSING APPARATUS, INFORMATION PROCESSING METHOD, PROGRAM, AND INFORMATION PROCESSING SYSTEM FOR ACHIEVING A SURVEILLANCE CAMERA SYSTEM

## CROSS REFERENCE TO RELATED APPLICATIONS

The application is a National Stage Patent Application of PCT International Patent Application No. PCT/JP2014/000180 filed on Jan. 16, 2014 under 35 U.S.C. § 371, which claims the benefit of Japanese Priority Patent Application JP 2013-021371 filed Feb. 6, 2013, the entire contents of which are incorporated herein by reference in their entirety.

## TECHNICAL FIELD

The present disclosure relates to an information processing apparatus, an information processing method, a program, and an information processing system that can be used in a surveillance camera system, for example.

## BACKGROUND ART

For example, Patent Literature 1 discloses a technique to easily and correctly specify a tracking target before or during object tracking, which is applicable to a surveillance camera system. In this technique, an object to be a tracking target is displayed in an enlarged manner and other objects are extracted as tracking target candidates. A user merely needs to perform an easy operation of selecting a target (tracking target) to be displayed in an enlarged manner from among the extracted tracking target candidates, to obtain a desired enlarged display image, i.e., a zoomed-in image (see, for example, paragraphs [0010], [0097], and the like of the specification of Patent Literature 1).

## CITATION LIST

### Patent Literature

[PTL 1]
Japanese Patent Application Laid-open No. 2009-251940

## SUMMARY

### Technical Problem

Techniques to achieve a useful surveillance camera system as disclosed in Patent Literature 1 are expected to be provided.

In view of the circumstances as described above, it is desirable to provide an information processing apparatus, an information processing method, a program, and an information processing system that are capable of achieving a useful surveillance camera system.

### Solution to Problem

According to an embodiment of the present disclosure, there is provided an image processing apparatus including: an obtaining unit configured to obtain a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments contains at least one image frame within which a specific target object is found to be captured; and a providing unit configured to provide image frames of the obtained plurality of segments for display along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.



According to another embodiment of the present disclosure, there is provided an image processing method including: obtaining a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments contains at least one image frame within which a specific target object is found to be captured; and providing image frames of the obtained plurality of segments for display along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

According to another embodiment of the present disclosure, there is provided a non-transitory computer-readable medium having embodied thereon a program, which when executed by a computer causes the computer to perform a method, the method including: obtaining a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments contains at least one image frame within which a specific target object is found to be captured; and providing image frames of the obtained plurality of segments for display along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

### Advantageous Effects of Invention

As described above, according to the present disclosure, it is possible to achieve a useful surveillance camera system.

## BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a block diagram showing a configuration example of a surveillance camera system including an information processing apparatus according to an embodiment of the present disclosure.

FIG. **2** is a schematic diagram showing an example of moving image data generated in an embodiment of the present disclosure.

FIG. **3** is a functional block diagram showing the surveillance camera system according to an embodiment of the present disclosure.

FIG. **4** is a diagram showing an example of person tracking metadata generated by person detection processing.

FIGS. **5**A and **5**B are each diagrams for describing the person tracking metadata.

FIG. **6** is a schematic diagram showing the outline of the surveillance camera system according to an embodiment of the present disclosure.

FIG. **7** is a schematic diagram showing an example of a UI (user interface) screen generated by a server apparatus according to an embodiment of the present disclosure.

FIG. **8** is a diagram showing an example of a user operation on the UI screen and processing corresponding to the operation.

FIG. **9** is a diagram showing an example of a user operation on the UI screen and processing corresponding to the operation.

FIG. **10** is a diagram showing another example of an operation to change a point position.

FIG. **11** is a diagram showing the example of the operation to change the point position.

FIG. **12** is a diagram showing the example of the operation to change the point position.

FIG. **13** is a diagram showing another example of the operation to change the point position.

FIG. **14** is a diagram showing the example of the operation to change the point position.

FIG. **15** is a diagram showing the example of the operation to change the point position.

FIG. **16** is a diagram for describing a correction of one or more identical thumbnail images.

FIG. **17** is a diagram for describing the correction of one or more identical thumbnail images.

FIG. **18** is a diagram for describing the correction of one or more identical thumbnail images.

FIG. **19** is a diagram for describing the correction of one or more identical thumbnail images.

FIG. **20** is a diagram for describing another example of the correction of one or more identical thumbnail images.

FIG. **21** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **22** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **23** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **24** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **25** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **26** is a diagram for describing another example of the correction of the one or more identical thumbnail images.

FIG. **27** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **28** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **29** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **30** is a diagram for describing the example of the correction of the one or more identical thumbnail images.

FIG. **31** is a diagram for describing how candidates are displayed by using a candidate browsing button.

FIG. **32** is a diagram for describing how candidates are displayed by using the candidate browsing button.

FIG. **33** is a diagram for describing how candidates are displayed by using the candidate browsing button.

FIG. **34** is a diagram for describing how candidates are displayed by using the candidate browsing button.

FIG. **35** is a diagram for describing how candidates are displayed by using the candidate browsing button.

FIG. **36** is a flowchart showing in detail an example of processing to correct the one or more identical thumbnail images.

FIG. **37** is a diagram showing an example of a UI screen when "Yes" is detected in Step **106** of FIG. **36**.

FIG. **38** is a diagram showing an example of the UI screen when "No" is detected in Step **106** of FIG. **36**.

FIG. **39** is a flowchart showing another example of the processing to correct the one or more identical thumbnail images.

FIGS. **40**A and **40**B are each a diagram for describing the processing shown in FIG. **39**.

FIGS. **41**A and **41**B are each a diagram for describing the processing shown in FIG. **39**.

FIGS. **42**A and **42**B are each a diagram for describing another example of a configuration and an operation of a rolled film image.

FIGS. **43**A and **43**B are each a diagram for describing the example of the configuration and the operation of the rolled film image.

FIGS. **44**A and **44**B are each a diagram for describing the example of the configuration and the operation of the rolled film image.

FIG. **45** is a diagram for describing the example of the configuration and the operation of the rolled film image.

FIG. **46** is a diagram for describing a change in standard of a rolled film portion.

FIG. **47** is a diagram for describing a change in standard of the rolled film portion.

FIG. **48** is a diagram for describing a change in standard of the rolled film portion.

FIG. **49** is a diagram for describing a change in standard of the rolled film portion.

FIG. **50** is a diagram for describing a change in standard of the rolled film portion.

FIG. **51** is a diagram for describing a change in standard of the rolled film portion.

FIG. **52** is a diagram for describing a change in standard of the rolled film portion.

FIG. **53** is a diagram for describing a change in standard of the rolled film portion.

FIG. **54** is a diagram for describing a change in standard of the rolled film portion.

FIG. **55** is a diagram for describing a change in standard of the rolled film portion.

FIG. **56** is a diagram for describing a change in standard of the rolled film portion.

FIG. **57** is a diagram for describing a change in standard of graduations indicated on a time axis.

FIG. **58** is a diagram for describing a change in standard of graduations indicated on the time axis.

FIG. **59** is a diagram for describing a change in standard of graduations indicated on the time axis.

FIG. **60** is a diagram for describing a change in standard of graduations indicated on the time axis.

FIG. **61** is a diagram for describing an example of an algorithm of person tracking under an environment using a plurality of cameras.

FIG. **62** is a diagram for describing the example of the algorithm of person tracking under the environment using the plurality of cameras.

FIG. **63** is a diagram including photographs, showing an example of one-to-one matching processing.

FIG. **64** is a schematic diagram showing an application example of the algorithm of person tracking according to an embodiment of the present disclosure.

FIG. **65** is a schematic diagram showing an application example of the algorithm of person tracking according to an embodiment of the present disclosure.

FIG. **66** is a schematic diagram showing an application example of the algorithm of person tracking according to an embodiment of the present disclosure.

FIG. **67** is a schematic diagram showing an application example of the algorithm of person tracking according to an embodiment of the present disclosure.

FIG. **68** is a schematic diagram showing an application example of the algorithm of person tracking according to an embodiment of the present disclosure.

FIG. **69** is a schematic diagram showing an application example of the algorithm of person tracking according to an embodiment of the present disclosure.

FIG. **70** is a schematic diagram showing an application example of the algorithm of person tracking according to an embodiment of the present disclosure.

FIG. **71** is a diagram for describing the outline of a surveillance system using the surveillance camera system according to an embodiment of the present disclosure.

FIG. **72** is a diagram showing an example of an alarm screen.

FIG. **73** is a diagram showing an example of an operation on the alarm screen and processing corresponding to the operation.

FIG. **74** is a diagram showing an example of an operation on the alarm screen and processing corresponding to the operation.

FIG. **75** is a diagram showing an example of an operation on the alarm screen and processing corresponding to the operation.

FIG. **76** is a diagram showing an example of an operation on the alarm screen and processing corresponding to the operation.

FIG. **77** is a diagram showing an example of a tracking screen.

FIG. **78** is a diagram showing an example of a method of correcting a target on a tracking screen.

FIG. **79** is a diagram showing an example of the method of correcting a target on the tracking screen.

FIG. **80** is a diagram showing an example of the method of correcting a target on the tracking screen.

FIG. **81** is a diagram showing an example of the method of correcting a target on the tracking screen.

FIG. **82** is a diagram showing an example of the method of correcting a target on the tracking screen.

FIG. **83** is a diagram for describing other processing executed on the tracking screen.

FIG. **84** is a diagram for describing the other processing executed on the tracking screen.

FIG. **85** is a diagram for describing the other processing executed on the tracking screen.

FIG. **86** is a diagram for describing the other processing executed on the tracking screen.

FIG. **87** is a schematic block diagram showing a configuration example of a computer to be used as a client apparatus and a server apparatus.

FIG. **88** is a diagram showing a rolled film image according to another embodiment.

## DESCRIPTION OF EMBODIMENTS

Hereinafter, embodiments of the present disclosure will be described with reference to the drawings.

(Surveillance Camera System)

FIG. **1** is a block diagram showing a configuration example of a surveillance camera system including an information processing apparatus according to an embodiment of the present disclosure.

A surveillance camera system **100** includes one or more cameras **10**, a server apparatus **20**, and a client apparatus **30**. The server apparatus **20** is an information processing apparatus according to an embodiment. The one or more cameras **10** and the server apparatus **20** are connected via a network **5**. Further, the server apparatus **20** and the client apparatus **30** are also connected via the network **5**.

The network **5** is, for example, a LAN (Local Area Network) or a WAN (Wide Area Network). The type of the network **5**, the protocols used for the network **5**, and the like are not limited. The two networks **5** shown in FIG. **1** do not need to be identical to each other.

The camera **10** is a camera capable of capturing a moving image, such as a digital video camera. The camera **10** generates and transmits moving image data to the server apparatus **20** via the network **5**.

FIG. **2** is a schematic diagram showing an example of moving image data generated in an embodiment. The moving image data **11** is constituted of a plurality of temporally successive frame images **12**. The frame images **12** are generated at a frame rate of 30 fps (frame per second) or 60 fps, for example. Note that the moving image data **11** may be generated for each field by interlaced scanning. The camera **10** corresponds to an imaging apparatus according to an embodiment.

As shown in FIG. **2**, the plurality of frame images **12** are generated along a time axis. The frame images **12** are generated from the left side to the right side when viewed in FIG. **2**. The frame images **12** located on the left side correspond to the first half of the moving image data **11**, and the frame images **12** located on the right side correspond to the second half of the moving image data **11**.

In an embodiment, the plurality of cameras **10** are used. Consequently, the plurality of frame images **12** captured with the plurality of cameras **10** are transmitted to the server apparatus **20**. The plurality of frame images **12** correspond to a plurality of captured images in an embodiment.

The client apparatus **30** includes a communication unit **31** and a GUI (graphical user interface) unit **32**. The communication unit **31** is used for communication with the server apparatus **20** via the network **5**. The GUI unit **32** displays the moving image data **11**, GUIs for various operations, and other information. For example, the communication unit **31** receives the moving image data **11** and the like transmitted from the server apparatus **20** via the network **5**. The moving image and the like are output to the GUI unit **32** and displayed on a display unit (not shown) by a predetermined GUI.

Further, an operation from a user is input in the GUI unit **32** via the GUI displayed on the display unit. The GUI unit **32** generates instruction information based on the input operation and outputs the instruction information to the communication unit **31**. The communication unit **31** transmits the instruction information to the server apparatus **20** via the network **5**. Note that a block to generate the instruction information based on the input operation and output the information may be provided separately from the GUI unit **32**.

For example, the client apparatus **30** is a PC (Personal Computer) or a tablet-type portable terminal, but the client apparatus **30** is not limited to them.

The server apparatus **20** includes a camera management unit **21**, a camera control unit **22**, and an image analysis unit **23**. The camera control unit **22** and the image analysis unit **23** are connected to the camera management unit **21**. Additionally, the server apparatus **20** includes a data management unit **24**, an alarm management unit **25**, and a storage unit **208** that stores various types of data. Further, the server apparatus **20** includes a communication unit **27** used for communication with the client apparatus **30**. The communication unit **27** is connected to the camera control unit **22**, the image analysis unit **23**, the data management unit **24**, and the alarm management unit **25**.

The communication unit **27** transmits various types of information and the moving image data **11**, which are output from the blocks connected to the communication unit **27**, to the client apparatus **30** via the network **5**. Further, the communication unit **27** receives the instruction information transmitted from the client apparatus **30** and outputs the instruction information to the blocks of the server apparatus **20**. For example, the instruction information may be output

to the blocks via a control unit (not shown) to control the operation of the server apparatus **20**. In an embodiment, the communication unit **27** functions as an instruction input unit to input an instruction from the user.

The camera management unit **21** transmits a control signal, which is supplied from the camera control unit **22**, to the cameras **10** via the network **5**. This allows various operations of the cameras **10** to be controlled. For example, the operations of pan and tilt, zoom, focus, and the like of the cameras are controlled.

Further, the camera management unit **21** receives the moving image data **11** transmitted from the cameras **10** via the network **5** and then outputs the moving image data **11** to the image analysis unit **23**. Preprocessing such as noise processing may be executed as appropriate. The camera management unit **21** functions as an image input unit in an embodiment.

The image analysis unit **23** analyzes the moving image data **11** supplied from the respective cameras **10** for each frame image **12**. The image analysis unit **23** analyzes the types and the number of objects appearing in the frame images **12**, the movements of the objects, and the like. In an embodiment, the image analysis unit **23** detects a predetermined object from each of the plurality of temporally successive frame images **12**. Herein, a person is detected as the predetermined object. For a plurality of persons appearing in the frame images **12**, the detection is performed for each of the persons. The method of detecting a person from the frame images **12** is not limited, and a well-known technique may be used.

Further, the image analysis unit **23** generates an object image. The object image is a partial image of each frame image **12** in which a person is detected, and includes the detected person. Typically, the object image is a thumbnail image of the detected person. The method of generating the object image from the frame image **12** is not limited. The object image is generated for each of the frame images **12** so that one or more object images are generated.

Further, the image analysis unit **23** can calculate a difference between two images. In an embodiment, the image analysis unit **23** detects differences between the frame images **12**. Furthermore, the image analysis unit **23** detects a difference between a predetermined reference image and each of the frame images **12**. The technique used for calculating a difference between two images is not limited. Typically, a difference in luminance value between two images is calculated as the difference. Additionally, the difference may be calculated using the sum of absolute differences in luminance value, a normalized correlation coefficient related to a luminance value, frequency components, and the like. A technique used in pattern matching and the like may be used as appropriate.

Further, the image analysis unit **23** determines whether the detected object is a person to be monitored. For example, a person who fraudulently gets access to a secured door or the like, a person whose data is not stored in a database, and the like are determined as a person to be monitored. The determination on a person to be monitored may be executed by an operation input by a security guard who uses the surveillance camera system **100**. In addition, the conditions, algorithms, and the like for determining the detected person as a suspicious person are not limited.

Further, the image analysis unit **23** can execute a tracking of the detected object. Specifically, the image analysis unit **23** detects a movement of the object and generates its tracking data. For example, position information of the object that is a tracking target is calculated for each successive frame image **12**. The position information is used as tracking data of the object. The technique used for tracking of the object is not limited, and a well-known technique may be used.

The image analysis unit **23** according to an embodiment functions as part of a detection unit, a first generation unit, a determination unit, and a second generation unit. Those functions do not need to be achieved by one block, and a block for achieving each of the functions may be separately provided.

The data management unit **24** manages the moving image data **11**, data of the analysis results by the image analysis unit **23**, and instruction data transmitted from the client apparatus **30**, and the like. Further, the data management unit **24** manages video data of past moving images and meta information data stored in the storage unit **208**, data on an alarm indication provided from the alarm management unit **25**, and the like.

In an embodiment, the storage unit **208** stores information that is associated with the generated thumbnail image, i.e., information on an image capture time of the frame image **12** that is a source to generate the thumbnail image, and identification information for identifying the object included in the thumbnail image. The frame image **12** that is a source to generate the thumbnail image corresponds to a captured image including the object image. As described above, the object included in the thumbnail image is a person in an embodiment.

The data management unit **24** arranges one or more images having the same identification information stored in the storage unit **208** from among one or more object images, based on the image capture time information stored in association with each image. The one or more images having the same identification information correspond to an identical object image. For example, one or more identical object images are arranged along the time axis in the order of the image capture time. This allows a sufficient observation of a time-series movement or a movement history of a predetermined object. In other words, a highly accurate tracking is enabled.

As will be described later in detail, the data management unit **24** selects a reference object image from one or more object images, to use it as a reference. Additionally, the data management unit **24** outputs data of the time axis displayed on the display unit of the client apparatus **30** and a pointer indicating a predetermined position on the time axis. Additionally, the data management unit **24** selects an identical object image that corresponds to a predetermined position on the time axis indicated by the pointer, and reads the object information that is information associated with the identical object image from the storage unit **208** and outputs the object information. Additionally, the data management unit **24** corrects one or more identical object images according to a predetermined instruction input by an input unit.

In an embodiment, the image analysis unit **23** outputs tracking data of a predetermined object to the data management unit **24**. The data management unit **24** generates a movement image expressing a movement of the object based on the tracking data. Note that a block to generate the movement image may be provided separately and the data management unit **24** may output tracking data to the block.

Additionally, in an embodiment, the storage unit **208** stores information on a person appearing in the moving image data **11**. For example, the storage unit **208** preliminarily stores data of a person on a company and a building in which the surveillance camera system **100** is used. When a predetermined person is detected and selected, for

example, the data management unit **24** reads the data of the person from the storage unit **208** and outputs the data. For a person whose data is not stored, such as an outsider, data indicating that the data of the person is not stored may be output as information of the person.

Additionally, the storage unit **208** stores an association between the position on the movement image and each of the plurality of frame images **12**. According to an instruction to select a predetermined position on the movement image based on the association, the data management unit **24** outputs a frame image **12**, which is associated with the selected predetermined position and is selected from the plurality of frame images **12**.

In an embodiment, the data management unit **24** functions as part of an arrangement unit, a selection unit, first and second output units, a correction unit, and a second generation unit.

The alarm management unit **25** manages an alarm indication for the object in the frame image **12**. For example, based on an instruction from the user and the analysis results by the image analysis unit **23**, a predetermined object is detected to be an object of interest, such as a suspicious person. The detected suspicious person and the like are displayed with an alarm indication. At that time, the type of alarm indication, a timing of executing the alarm indication, and the like are managed. Further, the history and the like of the alarm indication are managed.

FIG. **3** is a functional block diagram showing the surveillance camera system **100** according to an embodiment. The plurality of cameras **10** transmit the moving image data **11** via the network **5**. Segmentation for person detection is executed (in the image analysis unit **23**) for the moving image data **11** transmitted from the respective cameras **10**. Specifically, image processing is executed for each of the plurality of frame images **12** that constitute the moving image data **11**, to detect a person.

FIG. **4** is a diagram showing an example of person tracking metadata generated by person detection processing. As described above, a thumbnail image **41** is generated from the frame image **12** from which a person **40** is detected. Person tracking metadata **42** shown in FIG. **4**, associated with the thumbnail image **41**, is stored. The details of the person tracking metadata **42** are as follows.

The "object_id" represents an ID of the thumbnail image **41** of the detected person **40** and has a one-to-one relationship with the thumbnail image **41**.

The "tracking_id" represents a tracking ID, which is determined as an ID of the same person **40**, and corresponds to the identification information.

The "camera_id" represents an ID of the camera **10** with which the frame image **12** is captured.

The "timestamp" represents a time and date at which the frame image **12** in which the person **40** appears is captured, and corresponds to the image capture time information.

The "LTX", "LTY", "RBX", and "RBY" represent the positional coordinates of the thumbnail image **41** in the frame image **12** (normalization).

The "MapX" and "MapY" each represent position information of the person **40** in a map (normalization).

FIGS. **5**A and **5**B are each diagrams for describing the person tracking metadata **42**, (LTX, LTY, RBX, RBY). As shown in FIG. **5**A, the upper left end point **13** of the frame image **12** is set to be coordinates (0, 0). Further, the lower right end point **14** of the frame image **12** is set to be coordinates (1, 1). The coordinates (LTX, LTY) at the upper left end point of the thumbnail image **41** and the coordinates (RBX, RBY) at the lower right end point of the thumbnail image **41** in such a normalized state are stored as the person tracking metadata **42**. As shown in FIG. **5**B, for a plurality of persons **40** in the frame image **12**, a thumbnail image **41** of each of the persons **40** is generated and data of positional coordinates (LTX, LTY, RBX, RBY) is stored in association with the thumbnail image **41**.

As shown in FIG. **3**, the person tracking metadata **42** is generated for each moving image data **11** and collected to be stored in the storage unit **208**. Meanwhile, the thumbnail image **41** generated from the frame image **12** is also stored, as video data, in the storage unit **208**.

FIG. **6** is a schematic diagram showing the outline of the surveillance camera system **100** according to an embodiment. As shown in FIG. **6**, the person tracking metadata **42**, the thumbnail image **41**, system data for achieving an embodiment of the present disclosure, and the like, which are stored in the storage unit **208**, are read out as appropriate. The system data includes map information to be described later and information on the cameras **10**, for example. Those pieces of data are used to provide a service relating to an embodiment of the present disclosure by the server apparatus **20** according to a predetermined instruction from the client apparatus **30**. In such a manner, interactive processing is allowed between the server apparatus **20** and the client apparatus **30**.

Note that the person detection processing may be executed as preprocessing when the cameras **10** transmit the moving image data **11**. Specifically, irrespective of use of the services or applications relating to an embodiment of the present disclosure by the client apparatus **30**, the generation of the thumbnail image **41**, the generation of the person tracking metadata **42**, and the like may be preliminarily executed by the blocks surrounded by a broken line **3** of FIG. **3**.

(Operation of Surveillance Camera System)

FIG. **7** is a schematic diagram showing an example of a UI (user interface) screen generated by the server apparatus **20** according to an embodiment. The user can operate a UI screen **50** displayed on the display unit of the client apparatus **30** to check videos of the cameras (frame images **12**), records of an alarm, and a moving path of the specified person **40** and to execute correction processing of the analysis results, for example.

The UI screen **50** in an embodiment is constituted of a first display area **52** and a second display area **54**. A rolled film image **51** is displayed in the first display area **52**, and object information **53** is displayed in the second display area **54**. As shown in FIG. **7**, the lower half of the UI screen **50** is the first display area **52**, and the upper half of the UI screen **50** is the second display area **54**. The first display area **52** is smaller in size (height) than the second display area **54** in the vertical direction of the UI screen **50**. The position and the size of the first and second display areas **52** and **54** are not limited.

The rolled film image **51** is constituted of a time axis **55**, a pointer **56** indicating a predetermined position on the time axis **55**, identical thumbnail images **57** arranged along the time axis **55**, and a tracking status bar **58** (hereinafter, referred to as status bar **58**) to be described later. The pointer **56** is used as a time indicator. The identical thumbnail image **57** corresponds to the identical object image.

In an embodiment, a reference thumbnail image **43** serving as a reference object image is selected from one or more thumbnail images **41** detected from the frame images **12**. In an embodiment, a thumbnail image **41** generated from the frame image **12** in which a person A is imaged at a predetermined image capture time is selected as a reference thumbnail image **43**. For example, based on the reason why

the person A enters an off-limits area at that time and is thus determined to be a suspicious person, the reference thumbnail image **43** is selected. The conditions and the like on which the reference thumbnail image **43** is selected is not limited.

When the reference thumbnail image **43** is selected, the tracking ID of the reference thumbnail image **43** is referred to, and one or more thumbnail images **41** having the same tracking ID are selected to be identical thumbnail images **57**. The one or more identical thumbnail images **57** are arranged along the time axis **55** based on the image capture time of the reference thumbnail image **43** (hereinafter, referred to as a reference time). As shown in FIG. **7**, the reference thumbnail image **43** is set to be larger in size than the other identical thumbnail images **57**. The reference thumbnail image **43** and the one or more identical thumbnail images **57** constitute the rolled film portion **59**. Note that the reference thumbnail image **43** is included in the identical thumbnail images **57**.

In FIG. **7**, the pointer **56** is arranged at a position corresponding to a reference time T**1** on the time axis **55**. This shows a basic initial status when the UI screen **50** is constituted with reference to the reference thumbnail image **43**. On the right side of the reference time T**1** indicated by the pointer **56**, the identical thumbnail images **57** that have been captured later than the reference time T**1** are arranged. On the left side of the reference time T**1**, the identical thumbnail images **57** that have been captured earlier than the reference time T**1** are arranged.

In an embodiment, the identical thumbnail images **57** are arranged in respective predetermined ranges **61** on the time axis **55** with reference to the reference time T**1**. The range **61** represents a time length and corresponds to a standard, i.e., a scale, of the rolled film portion **59**. The standard of the rolled film portion **59** is not limited and can be appropriately set to be 1 second, 5 seconds, 10 seconds, 30 minutes, 1 hour, and the like. For example, assuming that the standard of the rolled film portion **59** is 10 seconds, the predetermined ranges **61** are set at intervals of 10 seconds on the right side of the reference time T**1** shown in FIG. **7**. From the identical thumbnail images **57** of the person A, which are imaged during the 10 seconds, a display thumbnail image **62** to be displayed as a rolled film image **51** is selected and arranged.

The reference thumbnail image **43** is an image captured at the reference time T**1**. The same reference time T**1** is set at the right end **43***a* and a left end **43***b* of the reference thumbnail image **43**. For a time later than the reference time T**1**, the identical thumbnail images **57** are arranged with reference to the right end **43***a* of the reference thumbnail image **43**. On the other hand, for a time earlier than the reference time T**1**, the identical thumbnail images **57** are arranged with reference to the left end **43***b* of the reference thumbnail image **43**. Consequently, the state where the pointer **56** is positioned at the left end **43***b* of the reference thumbnail image **43** may be displayed as the UI screen **50** showing the basic initial status.

The method of selecting the display thumbnail image **62** from the identical thumbnail images **57**, which have been captured within the time indicated by the predetermined range **61**, is not limited. For example, an image captured at the earliest time, i.e., a past image, among the identical thumbnail images **57** within the predetermined range **61** may be selected as the display thumbnail image **62**. Conversely, an image captured at the latest time, i.e., a future image, may be selected as the display thumbnail image **62**. Alternatively, an image captured at a middle point of time within the predetermined range **61** or an image captured at the closest time to the middle point of time may be selected as the display thumbnail image **62**.

The tracking status bar **58** shown in FIG. **7** is displayed along the time axis **55** between the time axis **55** and the identical thumbnail images **57**. The tracking status bar **58** indicates the time in which the tracking of the person A is executed. Specifically, the tracking status bar **58** indicates the time in which the identical thumbnail images **57** exist. For example, when the person A is located behind a pole or the like or overlaps with another person in the frame image **12**, the person A is not detected as an object. In such a case, the thumbnail image **41** of the person A is not generated. Such a time is a time during which the tracking is not executed and corresponds to a portion **63** in which the tracking status bar **58** interrupts or to a portion **63** in which the tracking status bar **58** is not provided as shown in FIG. **7**.

Further, the tracking status bar **58** is displayed in different color for each of the cameras **10** that capture the image of the person A. Consequently, in order to grasp with which camera **10** the frame image **12** of the source to generate the identical thumbnail image **57** is captured, the display with color is performed as appropriate. The camera **10**, which captures the image of the person A, i.e., the camera **10**, which tracks the person A, is determined based on the person tracking metadata **42** shown in FIG. **4**. Based on the determined results, the tracking status bar **58** is displayed in a color set for each of the cameras **10**.

In map information **65** of the UI screen **50** shown in FIG. **7**, the three cameras **10** and imaging ranges **66** of the respective cameras **10** are shown. For example, predetermined colors are given to the cameras **10** and the imaging ranges **66**. To correspond to those above-mentioned colors, a color is given to the tracking status bar **58**. This allows the person A to be easily and intuitively observed.

As described above, for example, it is assumed that an image captured at the earliest time within the predetermined range **61** is selected as the display thumbnail image **62**. In this case, a display thumbnail image **62***a* located at the leftmost position in FIG. **7** is an identical thumbnail image **57**, which is captured at a time T**2** at a left end **58***a* of the tracking status bar **58** shown above the display thumbnail image **62***a*. In FIG. **7**, no identical thumbnail images **57** are arranged on the left side of this display thumbnail image **62**. This means that no identical thumbnail images **57** are generated before the time T**2** at which the display thumbnail image **62***a* is captured. In other words, the tracking of the person A is not executed in that time. In the range where the identical thumbnail images **57** are not displayed, images, texts, and the like indicating that the tracking is not executed may be displayed. For example, an image having the shape of a person with a gray color may be displayed as an image where no person is displayed.

The second display area **54** shown in FIG. **7** is divided into a left display area **67** and a right display area **68**. In the left display area **67**, the map information **65** that is output as the object information **53** is displayed. In the right display area **68**, the frame image **12** output as the object information **53** and a movement image **69** are displayed. Those images are output to be information associated with the identical thumbnail image **57** that is selected in accordance with the predetermined position indicated by the pointer **56** on the time axis **55**. Consequently, the map information **65**, which indicates the position of the person A included in the identical thumbnail image **57** captured at the time indicated by the pointer **56**, is displayed. Further, the frame image **12**

including the identical thumbnail image **57** captured at the time indicated by the pointer **56**, and the movement image **69** of the person A are displayed. In an embodiment, traffic lines serving as the movement image **69** are displayed, but images to be displayed as the movement image **69** are not limited.

The identical thumbnail image **57** corresponding to the predetermined position on the time axis **55** indicated by the pointer **56** is not limited to the identical thumbnail image **57** captured at that time. For example, information on the identical thumbnail image **57** that is selected as the display thumbnail image **62** may be displayed in the range **61** (standard of the rolled film portion **59**) including the time indicated by the pointer **56**. Alternatively, a different identical thumbnail image **57** may be selected.

The map information **65** is preliminarily stored as the system data shown in FIG. **6**. In the map information **65**, an icon **71***a* indicating the person A that is detected as an object is displayed based on the person tracking metadata **42**. In the UI screen **50** shown in FIG. **7**, a position of the person A at the time T**1** at which the reference thumbnail image **43** is captured is displayed. Further, in the frame image **12** including the reference thumbnail image **43**, a person B is detected as another object. Consequently, an icon **71***b* indicating the person B is also displayed in the map information **65**. Further, the movement images **69** of the person A and the person B are also displayed in the map information **65**.

In the frame image **12** that is output as the object information **53** (hereinafter, referred to as play view image **70**), an emphasis image **72**, which is an image of the detected object shown with emphasis, is displayed. In an embodiment, the frames surrounding the detected person A and person B are displayed to serve as an emphasis image **72***a* and an emphasis image **72***b*, respectively. Each of the frames corresponds to an outer edge of the generated thumbnail image **41**. Note that for example, an arrow may be displayed on the person **40** to serve as the emphasis image **72**. Any other image may be used as the emphasis image **72**.

Further, in an embodiment, an image to distinguish an object shown in the rolled film image **51** from a plurality of objects in the play view image **70** is also displayed. Hereinafter, an object displayed in the rolled film image **51** is referred to as a target object **73**. In the example shown in FIG. **7** and the like, the person A is the target object **73**.

In an embodiment, an image of the target object **73**, which is included in the plurality of objects in the play view image **70**, is displayed. With this, it is possible to grasp where the target object **73** displayed in the one or more identical thumbnail images **57** is in the play view image **70**. As a result, an intuitive observation is allowed. In an embodiment, a predetermined color is given to the emphasis image **72** described above. For example, a striking color such as red is given to the emphasis image **72***a* that surrounds the person A displayed as the rolled film image **51**. On the other hand, another color such as green is given to the emphasis image **72***b* that surrounds the person B serving as another object. In such a manner, the objects are distinguished from each other. The target object **73** may be distinguished by using another methods and images.

The movement images **69** may also be displayed with different colors in accordance with the colors of the emphasis images **72**. Specifically, the movement image **69***a* expressing the movement of the person A may be displayed in red, and the movement image **69***b* expressing the movement of the person B may be displayed in green. This allows the movement of the person A serving as the target object **73** to be sufficiently observed.

FIGS. **8** and **9** are diagrams each showing an example of an operation of a user **1** on the UI screen **50** and processing corresponding to the operation. As shown in FIGS. **8** and **9**, the user **1** inputs an operation on the screen that also functions as a touch panel. The operation is input, as an instruction from the user **1**, into the server apparatus **20** via the client apparatus **30**.

In an embodiment, an instruction to the one or more identical thumbnail images **57** is input, and according to the instruction, a predetermined position on the time axis **55** indicated by the pointer **56** is changed. Specifically, a drag operation is input in a horizontal direction (y-axis direction) to the rolled film portion **59** of the rolled film image **51**. This moves the identical thumbnail image **57** in the horizontal direction and along with the movement, a time indicating image, i.e., graduations, within the time axis **55** is also moved. The position of the pointer **56** is fixed, and thus a position **74** that the pointer **56** points on the time axis **55** (hereinafter, referred to as point position **74**) is relatively changed. Note that the point position **74** may be changed when a drag operation is input to the pointer **56**. In addition, for example, operations for changing the point position **74** are not limited.

In conjunction with the change of the point position **74**, the selection of the identical thumbnail image **57** and the output of the object information **53** that correspond to the point position **74** are changed. For example, as shown in FIGS. **8** and **9**, it is assumed that the identical thumbnail images **57** are moved in the left direction. With this, the pointer **56** is relatively moved in the right direction, and the point position **74** is changed to a time later than the reference time T**1**. In conjunction with this, map information **65** and a play view image **70** that relate to an identical thumbnail image **57** captured later than the reference time T**1** are displayed. In other words, in the map information **65**, the icon **71***a* of the person A is moved in the right direction and the icon **71***b* of the person B is moved in the left direction along the movement images **69**. In the play view image **70**, the person A is moved to the deep side along with the movement image **69***a*, and the person B is moved to the near side along with the movement image **69***b*. Such images are sequentially displayed. This allows the movement of the object along the time axis **55** to be grasped and observed in detail. Further, this allows an operation of selecting an image, with which the object information **53** such as the play view image **70** is displayed, from the one or more identical thumbnail images **57**.

Note that in the examples shown in FIGS. **8** and **9**, the identical thumbnail images **57** that are generated from the frame images **12** captured with one camera **10** are arranged. Consequently, the tracking status bar **58** should be given with only one color corresponding to that camera **10**. In FIGS. **7** to **9**, however, in order to explain that the tracking status bar **58** is displayed in different color for each of the cameras **10**, different types of tracking status bars **58** are illustrated. Additionally, as a result of the movement of the rolled film portion **59** in the left direction, new identical thumbnail images **57** are not displayed on the right side. In the case where the identical thumbnail images **57** captured at that time exist, however, those images are arranged as appropriate.

FIGS. **10** to **12** are diagrams each showing another example of the operation to change the point position **74**. As shown in FIGS. **10** to **12**, the position **74** indicated by the pointer **56** may be changed according to an instruction input to the output object information **53**.

In an embodiment, the person A that is the target object **73** is selected as an object on the play view image **70** of the UI screen **50**. For example, a finger may be placed on the person A or on the emphasis image **72**. Typically, a touch or the like on a position within the emphasis image **72** allows an instruction to select the person A to be input. When the person A is selected, the information displayed in the left display area **67** is changed from the map information **65** to enlarged display information **75**. The enlarged display information **75** may be generated from the frame image **12** displayed as the play view image **70**. The enlarged display information **75** is also included in the object information **53** associated with the identical thumbnail image **57**. The display of the enlarged display information **75** allows the object selected by the user **1** to be observed in detail.

As shown in FIGS. **10** to **12**, in the state where the person A is selected, a drag operation is input along the movement image **69***a*. A frame image **12** corresponding to a position on the movement image **69***a* is displayed as the play view image **70**. The frame image **12** corresponding to a position on the movement image **69***a* refers to a frame image **12** in which the person A is displayed at the above-mentioned position or in which the person A is displayed at a position closest to the above-mentioned position. For example, as shown in FIGS. **10** to **12**, the person A is moved to the deep side along the movement image **69***a*. In conjunction with this movement, the point position **74** is moved to the right direction that is a time later than the reference time T**1**. Specifically, the identical thumbnail images **57** are moved in the left direction. In conjunction with the movement, the enlarged display information **75** is also changed.

When the play view image **70** is changed, in conjunction with the change, the pointer **56** is moved to the position corresponding to the image capture time of the frame image **12** displayed as the play view image **70**. This allows the point position **74** to be changed. This corresponds to the fact that the time at the point position **74** and the image capture time of the play view image **70** are associated with each other and when one of them is changed, the other one is also changed in conjunction with the former change.

FIGS. **13** to **15** are diagrams each showing another example of the operation to change the point position **74**. As shown in FIG. **13**, another object **76** that is different from the target object **73** displayed in the play view image **70** is operated so that the point position **74** can be changed. As shown in FIG. **13**, the person B that is the other object **76** is selected and enlarged display information **75** of the person B is displayed. When a drag operation is input along the movement image **69***b*, the point position **74** of the pointer **56** is changed in accordance with the drag operation. In such a manner, an operation for the other object **76** may be performed. Consequently, the movement of the other object **76** can be observed.

As shown in FIG. **14**, when the finger is separated from the person B that is the other object **76**, a pop-up **77** for specifying the target object **73** is displayed. The pop-up **77** is used to correct or change the target object **73**, for example. As shown in FIG. **15**, in this case, "Cancel" is selected so that the target object **73** is not changed. Subsequently, the pop-up **77** is deleted. The pop-up **77** will be described later together with the correction of the target object **73**.

FIGS. **16** to **19** are diagrams for describing a correction of the one or more identical thumbnail images **57** arranged as the rolled film image **51**. As shown in FIG. **16**, when the reference thumbnail image **43** in which the person A is imaged is selected, a thumbnail image **41***b* in which the person B different from the person A is imaged may be arranged as the identical thumbnail image **57** in some cases. For example, when an object is detected from the frame image **12**, a false detection may occur, and the person B that is the other object **76** may be set to have a tracking ID indicating the person A. For example, such a false detection may occur due to various situations in which those persons resemble in size and shape or in hairstyle, or in which rapidly moving two persons pass away. In such cases, a thumbnail image **41** of an object that is incorrect to serve as a target object **73** is displayed in the rolled film image **51**.

In the surveillance camera system **100** according to an embodiment, as will be described later, the correction of the target object **73** can be executed by a simple operation. Specifically, the one or more identical thumbnail images **57** can be corrected according to a predetermined instruction input by an input unit.

As shown in FIG. **17**, an image in the state where the target object **73** is incorrectly recognized is searched for in the play view image **70**. Specifically, a play view image **70** in which the emphasis image **72***b* of the person B is displayed in red and the emphasis image **72***a* of the person A is displayed in green is searched for. In FIG. **17**, the rolled film portion **59** is operated so that a play view image **70** falsely detected is searched for. Alternatively, the search may be executed by an operation on the person A or the person B of the play view image **70**.

As shown in FIG. **18**, when the pointer **56** is moved to a left end **78***a* of a range **78** in which the thumbnail images **41***b* of the person B are displayed, a play view image **70** in which the target object **73** is falsely detected is displayed. The user **1** selects the person A whose emphasis image **72***a* is displayed in green, the person A being to be originally detected as the target object **73**. Subsequently, the pop-up **77** for specifying the target object **73** is displayed and a target specifying button is pressed.

As shown in FIG. **19**, the thumbnail images **41***b* of the person B, which are arranged on the right side of the pointer **56**, are deleted. In this case, all the thumbnail images **41** captured later than the time indicated by the pointer **56**, that is, the thumbnail images **41** and the images where no person is displayed, are deleted. In an embodiment, an animation **79** by which the thumbnail images **41** captured later than the time indicated by the pointer **56** gradually disappear to the lower side of the UI screen **50** is displayed, and the thumbnail images **41** are deleted. The UI when the thumbnail images **41** are deleted is not limited, and an animation that is intuitively easy to understand or an animation with high designability may be displayed.

After the thumbnail images **41** on the right side of the pointer **56** are deleted, the thumbnail images **41** of the person A who is specified as the corrected target object **73** is arranged as the identical thumbnail images **57**. In the play view image **70**, the emphasis image **72***a* of the person A is displayed in red and the emphasis image **72***b* of the person B is displayed in green.

Note that as shown in FIG. **18** and the like, the play view image **70** falsely detected is found when the pointer **56** is at the left end **78***a* of the range **78** in which the thumbnail images **41***b* of the person B are displayed. However, the play view image **70** falsely detected may also be found in the range in which the thumbnail images **41** of the person A are displayed as the display thumbnail images **62**. In such a case, the thumbnail images **41***b* of the person B that are captured later than the time at which a relevant display thumbnail image **62** is captured may be deleted, or the thumbnail images **41** on the right side of the pointer **56** may be deleted such that the range of the thumbnail images **41** of the person

A is divided. Additionally, the play view image **70** falsely detected may also be found at the halfway of the range in which the thumbnail images **41***b* of the person B are displayed as the display thumbnail images **62**. In this case, the deletion of the thumbnail images including the thumbnail images **41***b* of the person B only needs to be executed.

In such a manner, according to the instruction to select the other object **76** included in the play view image **70** that is output as the object information **53**, the one or more identical thumbnail images **57** are corrected. This allows a correction to be executed by an intuitive operation.

FIGS. **20** to **25** are diagrams for describing another example of the correction of the one or more identical thumbnail images **57**. In those figures, the map information **65** is not illustrated. Similar to the above description, firstly, the play view image **70** at the time when the person B is falsely detected as the target object **73** is searched for. As a result, as shown in FIG. **20**, it is assumed that the person A to be detected as a correct target object **73** does not appear in the play view image **70**. For example, the following cases are conceivable: the person B falsely detected is moved away from the person A; and the person B originally situated in another place is detected as the target object **73**.

Note that in FIG. **20**, the identical thumbnail image **57***a*, which is adjacent to the pointer **56** on its left side, has a smaller size in the horizontal direction than the other thumbnail images **57**. For example, in the case where the target object **73** is changed at the halfway of the range **61** (standard of the rolled film portion **59**) in which the thumbnail image **57***a* is arranged, the standard of the rolled film portion **59** may be partially changed. In other cases, for example, the standard of the rolled film portion **59** may be partially changed when the target object **73** is correctly detected but the camera **10** with which the target object **73** is captured is changed.

As shown in FIG. **21**, when the person A that is intended to be specified as the target object **73** is not displayed in the play view image **70**, a cut button **80** provided to the UI screen **50** is used. In an embodiment, the cut button **80** is provided to the lower portion of the pointer **56**. As shown in FIG. **22**, when the user **1** clicks the cut button **80**, the thumbnail images **41***b* arranged on the right side of the pointer **56** are deleted. Consequently, the thumbnail images **41***b* of the person B, which are arranged as the identical thumbnail images **57** due to the false detection, are deleted. Subsequently, the color of the emphasis image **72***b* of the person B in the play view image **70** is changed from red to green. Note that the position or shape of the cut button **80** is not limited, for example. In an embodiment, the cut button **80** is arranged so as to be connected to the pointer **56**, which allows cutting processing with reference to the pointer **56** to be executed by an intuitive operation.

The search for a time point at which a false detection of the target object **73** occurs corresponds to the selection of at least one identical thumbnail image **57** captured later than that time point, from among the one or more identical thumbnail images **57**. The selected identical thumbnail image **57** is cut so that the one or more identical thumbnail images **57** are corrected.

As shown in FIG. **23**, when the thumbnail images **41***b* arranged on the right side of the pointer **56** are deleted, video images, i.e., the plurality of frame images **12**, which are captured with the respective cameras **10**, are displayed in the left display area **67** displaying the map information **65**. The video images of the cameras **10** are displayed in monitor display areas **81** each having a small size and can be viewed as a video list. In the monitor display areas **81**, the frame images **12** corresponding to the time at the point position **74** of the pointer **56** are displayed. Further, in order to distinguish between the cameras **10**, a color set for each camera **10** is displayed in the upper portion **82** of each monitor display area **81**.

The plurality of monitor display areas **81** are set so as to search for the person A to be detected as the target object **73**. The method of selecting a camera **10**, a captured image of which is displayed in the monitor display area **81**, from the plurality of cameras **10** in the surveillance camera system **100**, is not limited. Typically, the camera **10** is sequentially selected in the descending order of areas with higher possibility that the person A to be the target object **73** is imaged, and the video image of the camera **10** is sequentially displayed as a list from the top of the left display area **67**. An area near the camera **10** that captures the frame image **12** in which a false detection occurs is selected to be an area with high possibility that the person A is imaged. Alternatively, for example, an office in which the person A works is selected based on the information of the person A. Other methods may also be used.

As shown in FIG. **24**, the rolled film portion **59** is operated so that the position **74** indicated by the pointer **56** is changed. In conjunction with this, the play view image **70** and the monitor images of the monitor display areas **81** are changed. Further, when the user **1** selects a monitor display area **81**, a monitor image displayed in the selected monitor display area **81** is displayed as the play view image **70** in the right display area **68**. Consequently, the user **1** can change the point position **74** or select the monitor display area **81** as appropriate, to easily search for the person A to be detected as the target object **73**.

Note that the person A may be detected as the target object **73** at a time too late to be displayed on the UI screen **50**, i.e., at a position on the right side of the point position **74**. Specifically, the false detection of the target object **73** may be solved and the person A may be appropriately detected as the target object **73**. In such a case, for example, a button for inputting an instruction to jump to an identical thumbnail image **57** in which the person A at that time appears may be displayed. This is effective when time is advanced to monitor the person A at a time close to the current time, for example.

As shown in FIG. **25**, a monitor image **12** in which the person A appears is selected from the plurality of monitor display areas **81**, and the selected monitor image **12** is displayed as the play view image **70**. Subsequently, as shown in FIG. **18**, the person A displayed in the play view image **70** is selected, and the pop-up **77** for specifying the target object **73** is displayed. The button for specifying the target object **73** is pressed so that the target object **73** is corrected. In FIG. **25**, a candidate browsing button **83** for displaying candidates is displayed at the upper portion of the pointer **56**. The candidate browsing button **83** will be described later in detail.

FIGS. **26** to **30** are diagrams for describing another example of the correction of the one or more identical thumbnail images **57**. In the one or more identical thumbnail images **57** of the rolled film portion **59**, at a halfway time, a false detection of the target object **73** may occur. For example, the other person B who passes the target object **73** (person A) is falsely detected as the target object **73**. At the moment at which the camera **10** to capture the image of the person B is switched, the person A may be appropriately detected as the target object **73** again.

FIG. **26** is a diagram showing an example of such a case. As shown in FIG. **26**, the arranged identical thumbnail

images **57** include the thumbnail images **41***b* of the person B. When the play view image **70** is viewed, a movement image **69** is displayed. The movement image **69** expresses the movement of the person B who travels toward the deep side, but turns back at the halfway and returns to the near side. In such a case, the thumbnail images **41***b* of the person B displayed in the rolled film portion **59** can be corrected by the following operation.

Firstly, the pointer **56** is adjusted to the time at which the person B is falsely detected as the target object **73**. Typically, the pointer **56** is adjusted to the left end **78***a* of the thumbnail image **41***b* that is located at the leftmost position of the thumbnail images **41***b* of the person B. As shown in FIG. **27**, the user **1** presses the cut button **80**. When a click operation is input in this state, the identical thumbnail images **57** on the right side of the pointer **56** are cut. Consequently, here, the finger is moved to the end of the range **78** with the cut button **80** being pressed. In the range **78**, the thumbnail images **41***b* of the person B are displayed. Specifically, with the cut button **80** being pressed, a drag operation is input so as to cover the area intended to be cut. Subsequently, as shown in FIG. **28**, a UI **84** indicating the range **78** to be cut is displayed. Note that in conjunction with the selection of the range **78** to be cut, the map information **65** and the play view image **70** corresponding to the time of a drag destination are displayed. Alternatively, the map information **65** and the play view image **70** may not be changed.

As shown in FIG. **29**, when the finger is separated from the cut button **80** after the drag operation, the selected range **78** to be cut is deleted. As shown in FIG. **30**, when the thumbnail images **41***b* of the range **78** to be cut are deleted, the plurality of monitor display areas **81** are displayed and the monitor images **12** captured with the respective cameras **10** are displayed. With this, the person A is searched for at the time of the cut range **78**. Further, the candidate browsing button **83** is displayed at the upper portion of the pointer **56**.

The selection of the range **78** to be cut corresponds to the selection of at least one of the one or more identical thumbnail images **57**. The selected identical thumbnail image **57** is cut, so that the one or more identical thumbnail images **57** are corrected. This allows a correction to be executed by an intuitive operation.

FIGS. **31** to **35** are diagrams for describing how candidates are displayed by using the candidate browsing button **83**. The UI screen **50** shown in FIG. **31** is a screen at the stage at which the identical thumbnail images **57** are corrected and the person A to be the target object **73** is searched for. In such a state, the user **1** clicks the candidate browsing button **83**. Subsequently, as shown in FIG. **32**, a candidate selection UI **86** for displaying a plurality of candidate thumbnail images **85** to be selectable is displayed.

The candidate selection UI **86** is displayed subsequently to an animation to enlarge the candidate browsing button **83** and is displayed so as to be connected to the position of the pointer **56**. Among the thumbnail images **41** corresponding to the point position of the pointer **56**, a thumbnail image **41** that stores the tracking ID of the person A is deleted by the correction processing. Consequently, it is assumed that the tracking ID of the person A as a thumbnail image **41** corresponding to the point position does not exist in the storage unit **208**. The server apparatus **20** selects thumbnail images **41** having a high possibility that the person A appears from the plurality of thumbnail images **41** corresponding to the point position **74**, and displays the selected thumbnail images **41** as the candidate thumbnail images **85**. Note that the candidate thumbnail images **85** corresponding to the point position **74** are selected from, for example, the thumbnail images **41** captured at that time of the point position **74** or thumbnail images **41** captured at a time included in a predetermined range around that time of the point position **74**.

The method of selecting the candidate thumbnail images **85** is not limited. Typically, the degree of similarity of objects appearing in the thumbnail images **41** is calculated. For the calculation, any technique including pattern matching processing and edge detection processing may be used. Alternatively, based on information on a target object to be searched for, the candidate thumbnail images **85** may be preferentially selected from an area where the object frequently appears. Other methods may also be used. Note that as shown in FIG. **33**, when the point position **74** is changed, the candidate thumbnail images **85** are also changed in conjunction with the change of the point position **74**.

Additionally, the candidate selection UI **86** includes a close button **87** and a refresh button **88**. The close button **87** is a button for closing the candidate selection UI **86**. The refresh button **88** is a button for instructing the update of the candidate thumbnail images **85**. When the refresh button **88** is clicked, other candidate thumbnail images **85** are retrieved again and displayed.

As shown in FIG. **34**, when a thumbnail image **41***a* of the person A is displayed as the candidate thumbnail image **85** in the candidate selection UI **86**, the thumbnail image **41***a* is selected by the user **1**. Subsequently, as shown in FIG. **35**, the candidate selection UI **86** is closed, and the frame image **12** including the thumbnail image **41***a* is displayed as the play view image **70**. Further, the map information **65** associated with the play view image **70** is displayed. The user **1** can observe the play view image **70** (movement image **69**) and the map information **65** to determine that the object is the person A.

When the object that appears in the play view image **70** is determined to be the person A, as shown in FIG. **18**, the person A is selected and the pop-up **77** for specifying the target object **73** is displayed. The button for specifying the target object **73** is pressed so that the person A is set to be the target object **73**. Consequently, the thumbnail image **41***a* of the person A is displayed as the identical thumbnail image **57**. Note that in FIG. **34**, when the candidate thumbnail image **85** is selected, the setting of the target object **73** may be executed. This allows the time spent on the processing to be shortened.

As described above, from the one or more thumbnail images **41**, in which identification information different from the identification information of the selected reference thumbnail image **43** is stored, the candidate thumbnail image **85** to be a candidate of the identical thumbnail image **57** is selected. This allows the one or more identical thumbnail images **57** to be easily corrected.

FIG. **36** is a flowchart showing in detail an example of processing to correct the one or more identical thumbnail images **57** described above. FIG. **36** shows the processing when a person in the play view image **70** is clicked.

Whether the detected person in the play view image **70** is clicked or not is determined (Step **101**). When it is determined that the person is not clicked (No in Step **101**), the processing returns to the initial status (before the correction). When it is determined that the person is clicked (Yes in Step **101**), whether the clicked person is identical to an alarm person or not is determined (Step **102**).

The alarm person refers to a person to watch out for or a person to be monitored and corresponds to the target object **73** described above. Comparing the tracking ID (track_id) of

the clicked person with the tracking ID of the alarm person, the determination processing in Step **102** is executed.

When the clicked person is determined to be identical to the alarm person (Yes in Step **102**), the processing returns to the initial status (before the correction). In other words, it is determined that the click operation is not an instruction of correction. When the clicked person is determined not to be identical to the alarm person (No in Step **102**), the pop-up **77** for specifying the target object **73** is displayed as a GUI menu (Step **103**). Subsequently, whether "Set Target" in the menu is selected or not, that is, whether the button for specifying the target is clicked or not is determined (Step **104**).

When it is determined that "Set Target" is not selected (No in Step **104**), the GUI menu is deleted. When it is determined that "Set Target" is selected (Yes in Step **104**), a current time t of the play view image **70** is acquired (Step **105**). The current time t corresponds to the image capture time of the frame image **12**, which is displayed as the play view image **70**. It is determined whether the tracking data of the alarm person exists at the time t (Step **106**). Specifically, it is determined whether an object detected as the target object **73** exists or not and its thumbnail image **41** exists or not at the time t.

FIG. **37** is a diagram showing an example of a UI screen when it is determined that an object detected as the target object **73** exists at the time t (Yes in Step **106**). If the identical thumbnail image **57** exists at the time t, the person in the identical thumbnail image **57** (in this case, the person B) appears in the play view image **70**. In this case, an interrupted time of the tracking data is detected (Step **107**). The interrupted time is a time earlier than and closest to the time t and at which the tracking data of the alarm person does not exist. As shown in FIG. **37**, the interrupted time is represented by t_a.

Further, another interrupted time of the tracking data is detected (Step **108**). This interrupted time is a time later than and closest to the time t and at which the tracking data of the alarm person does not exist. As shown also in FIG. **37**, this interrupted time is represented by t_b. The data on the person tracking from the detected time t_a to time t_b is cut. Consequently, the thumbnail image **41***b* of the person B included in the rolled film portion **59** shown in FIG. **37** is deleted. Subsequently, the track_id of data on the tracked person is newly issued between the time t_a and the time t_b (Step **109**).

In the example of the processing described here, when the identical thumbnail image **57** is arranged in the rolled film portion **59**, the track_id of data on the tracked person is issued. The issued track_id of data on the tracked person is set to be the track_id of the alarm person. For example, when the reference thumbnail image **43** is selected, its track_id is issued as the track_id of data on the tracked person. The track_id of data on the tracked person is set to be the track_id of the alarm person. The thumbnail image **41** for which the set track_id is stored is selected to be the identical thumbnail image **57** and arranged. When the identical thumbnail image **57** in the predetermined range (range from the time t_a to the time t_b) is deleted as described above, the track_id of data on the tracked person is newly issued in the range.

The specified person is set to be a target object (Step **110**). Specifically, the track_id of data on the specified person is newly issued in the range from the time t_a to the time t_b, and the track_id is set to be the track_id of the alarm person. As a result, in the example shown in FIG. **37**, the thumbnail image of the person A specified via the pop-up **77** is arranged in the range from which the thumbnail image of the person B is deleted. In such a manner, the identical thumbnail image **57** is corrected and the GUI after the correction is updated (Step **111**).

FIG. **38** is a diagram showing an example of the UI screen when it is determined that an object detected as the target object **73** does not exist at the time t (No in Step **106**). In the example shown in FIG. **38**, tracking is not executed in a certain time range in the case where the person A is set as the target object **73**.

If no identical thumbnail image **57** exists at the time t, the person (person B) does not appear in the play view image **70** (or may appear but be not detected). In this case, the tracking data of the alarm person at a time earlier than and closest to the time t is detected (Step **112**). Subsequently, the time of the tracking data (represented by time t_a) is calculated. In the example shown in FIG. **38**, the data of the person A detected as the target object **73** is detected and the time t_a is calculated. Note that if tracking data does not exist before the time t, a smallest time is set as the time t_a. The smallest time means the smallest time and the leftmost time point on the set time axis.

Additionally, the tracking data of the alarm person at a time later than and closest to the time t is detected (Step **113**). Subsequently, the time of the tracking data (represented by time t_b) is calculated. In the example shown in FIG. **38**, the data of the person A detected as the target object **73** is detected and the time t_b is calculated. Note that if tracking data does not exist after the time t, a largest time is set as the time t_b. The largest time means the largest time and the rightmost time point on the set time axis.

The specified person is set to be the target object **73** (Step **110**). Specifically, the track_id of data on the specified person is newly issued in the range from the time t_a to the time t_b, and the track_id is set to be the track_id of the alarm person. As a result, in the example shown in FIG. **38**, the thumbnail image of the person A specified via the pop-up **77** is arranged in the range in which the certain time range does not exist. In such a manner, the identical thumbnail image **57** is corrected and the GUI after the correction is updated (Step **111**). As a result, the thumbnail image of the person A is arranged as the identical thumbnail image **57** in the rolled film portion **59**.

FIG. **39** is a flowchart showing another example of the processing to correct the one or more identical thumbnail images **57** described above. FIGS. **40** and **41** are diagrams for describing the processing. FIGS. **39** to **41** show processing when the cut button **80** is clicked.

It is determined whether the cut button **80** as a GUI on the UI screen **50** is clicked or not (Step **201**). When it is determined that the cut button **80** is clicked (Yes in Step **201**), it is determined that an instruction of cutting at one point is issued (Step **202**). A cut time t, at which cutting on the time axis **55** is executed, is calculated based on the position where the cut button **80** is clicked in the rolled film portion **59** (Step **203**). For example, when the cut button **80** is provided to be connected to the pointer **56** as shown in FIGS. **40**A and **40**B and the like, a time corresponding to the point position **74** when the cut button **80** is clicked is calculated as the cut time t.

It is determined whether the cut time t is equal to or larger than a time T at which an alarm is generated (Step **204**). The time T at which an alarm is generated corresponds to the reference time T**1** in FIG. **7** and the like. Although will be described later, when a person to be monitored is determined, the determination time is set to be the time at an alarm generation, and the thumbnail image **41** of the person at the time point is selected as the reference thumbnail image

43. Subsequently, with the time T at an alarm generation being set to be the reference time T1, a basic UI screen **50** in the initial status as shown in FIG. **8** is generated. The determination in Step **204** is a determination on whether the cut time t is earlier or later than the reference time T1. In the example of FIGS. **40**A and **40**B, the determination in Step **204** corresponds to a determination on whether the pointer **56** is located on the left or right side of the reference thumbnail image **43** with a large size.

For example, as shown in FIG. **40**A, it is assumed that the rolled film portion **59** is dragged in the left direction and the point position **74** of the pointer **56** is relatively moved in the right direction. When the cut button **80** is clicked in this state, it is determined that the cut time t is equal to or larger than the time T at an alarm generation (Yes in Step **204**). In this case, the start time of cutting is set to be the cut time t, and the end time of cutting is set to be the largest time. In other words, the time range after the cut time t (range R on the right side) is set to be a cut target (Step **205**). Subsequently, the track_id of data on the tracked person is newly issued between the start time and the end time (Step **206**). Note that only the range in which the target object **73** is detected, that is, the range in which the identical thumbnail image **57** is arranged, may be set to the range to be cut.

As shown in FIG. **40**B, it is assumed that the rolled film portion **59** is dragged in the right direction and the point position **74** of the pointer **56** is relatively moved in the left direction. When the cut button **80** is clicked in this state, it is determined that the cut time t is smaller than the time T at an alarm generation (No in Step **204**). In this case, the start time of cutting is set to be the s, and the end time of cutting is set to be the cut time t. In other words, the time range before the cut time t (range L on the left side) is set to be a cut target (Step **207**). Subsequently, the track_id of data on the tracked person is newly issued between the start time and the end time (Step **206**).

In Step **201**, when it is determined that the cut button **80** is not clicked (No in Step **201**), it is determined whether the cut button **80** is dragged or not (Step **208**). When it is determined that the cut button **80** is not dragged (No in Step **208**), the processing returns to the initial status (before the correction). When it is determined that the cut button **80** is dragged (Yes in Step **208**), the dragged range is set to be a range selected by the user, and a GUI to depict this range is displayed (Step **209**).

It is determined whether the drag operation on the cut button **80** is finished or not (Step **210**). When it is determined that the drag operation is not finished (No in Step **210**), that is, when it is determined that the drag operation is going on, the selected range is continued to be depicted. When it is determined that the drag operation on the cut button **80** is finished (Yes in Step **210**), the cut time t_a is calculated based on the position where the drag is started. Further, the cut time t_b is calculated based on the position where the drag is finished (Step **211**).

The calculated cut time t_a and cut time t_b are compared with each other (Step **212**). As a result, when both of the cut time t_a and the cut time t_b are equal to each other (when t_a=t_b), the processing after the instruction of cutting at one point is determined is executed. Specifically, the time t_a is set to be the cut time t in Step **203**, and the processing proceeds to Step **204**.

When the cut time t_a is smaller than the cut time t_b (when t_a<t_b), the start time of cutting is set to be the cut time t_a, and the end time of cutting is set to be the cut time t_b (Step **213**). For example, when the drag operation is input toward the future time (in the right direction) with the cut button **80** being pressed, t_a<t_b is obtained. In this case, the cut time t_a is the start time, and the cut time t_b is the end time.

When the cut time t_a is larger than the cut time t_b (when t_a>t_b), the start time of cutting is set to be the cut time t_b, and the end time of cutting is set to be the cut time t_a (Step **214**). For example, when the drag operation is input toward the past time (in the left direction) with the cut button **80** being pressed, t_a>t_b is obtained. In this case, the cut time t_b is the start time, and the cut time t_a is the end time. Specifically, of the cut time t_a and the cut time t_b, the smaller one is set to be the start time, and the other larger one is set to be the end time.

When the start time and the end time are set, the track_id of data on the tracked person is newly issued between the start time and the end time (Step **206**). In such a manner, the identical thumbnail image **57** is corrected and the GUI after the correction is updated (Step **215**). The one or more identical thumbnail images **57** may be corrected by the processing as shown in the examples of FIGS. **36** and **39**. Note that as shown in FIGS. **41**A and **41**B, a range with a width smaller than the width of the identical thumbnail image **57** may be selected as a range to be cut. In this case, a part **41**P of the thumbnail image **41**, which corresponds to the range to be cut, only needs to be cut.

Here, other examples of a configuration and an operation of the rolled film image **51** will be described. FIGS. **42** to **45** are diagrams for describing the examples. For example, as shown in FIG. **42**A, the drag of the identical thumbnail image **57** in the left direction allows the point position **74** to be relatively moved. As shown in FIG. **42**B, it is assumed that the reference thumbnail image **43** with a large size is dragged to reach a left end **89** of the rolled film image **51**. At that time, the reference thumbnail image **43** may be fixed at the position of the left end **89**. When the drag operation is further input from this state in the left direction, as shown in FIG. **43**A, the other identical thumbnail images **57** are moved in the left direction so as to overlap with the reference thumbnail image **43** and travel on the back side of the reference thumbnail image **43**. Specifically, also when the drag operation is input until the reference time reaches the outside of the rolled film image **51**, the reference thumbnail image **43** is continued to be displayed in the rolled film image **51**. This allows the firstly detected target object to be referred to, when the target object is falsely detected or the sight of the target object is lost, for example. As a result, the target object that is detected to be a suspicious person can be sufficiently monitored. Note that as shown in FIG. **43**B, also when the drag operation is input in the right direction, the similar processing may be executed.

Additionally, when the drag operation is input and a finger of the user **1** is released, an end of the identical thumbnail image **57** arranged at the closest position to the pointer **56** may be automatically moved to the point position **74** of the pointer **56**. For example, as shown in FIG. **44**A, it is assumed that the drag operation is input until the pointer **56** overlaps the reference thumbnail image **43** and the finger of the user **1** is released at that position. In this case, as shown in FIG. **44**B, the left end **43***b* of the reference thumbnail image **43** located closest to the pointer **56** may be automatically aligned with the point position **74**. At that time, an animation in which the rolled film portion **59** is moved in the right direction is displayed. Note that the same processing may be performed on the other identical thumbnail images **57** other than the reference thumbnail image **43**. This allows the operability on rolled film image **51** to be improved.

As shown in FIG. **45**, the point position **74** may also be moved by a flick operation. When a flick operation in the horizontal direction is input, a moving speed at a moment at which the finger of the user **1** is released is calculated. Based on the moving speed, the one or more identical thumbnail images **57** are moved in the flick direction with a constant deceleration. The pointer **56** is relatively moved in the direction opposite to the flick direction. The method of calculating the moving speed and the method of setting a deceleration are not limited, and well-known techniques may be used instead.

Next, the change of the standard, i.e., the scale, of the rolled film portion **59** will be described. FIGS. **46** to **56** are diagrams for describing the change. For example, it is assumed that a fixed size S**1** is set for the size in the horizontal direction of each identical thumbnail image **57** arranged in the rolled film portion **59**. A time assigned to the fixed size S**1** is set as a standard of the rolled film portion **59**. Under such settings, the operation and processing to change the standard of the rolled film portion **59** will be described. Note that the fixed size S**1** may be set as appropriate based on the size of the UI screen, for example.

In FIG. **46**, the standard of the rolled film portion **59** is set to 10 seconds. Consequently, the graduations of 10 seconds on the time axis **55** are assigned to the fixed size S**1** of the identical thumbnail image **57**. The display thumbnail image **62** displayed in the rolled film portion **59** is a thumbnail image **41** that is captured at a predetermined time in the assigned 10 seconds.

As shown in FIG. **46**, a touch operation is input to two points L and M in the rolled film portion **59**. Subsequently, right and left hands **1***a* and **1***b* are separated from each other so as to increase a distance between the touched points L and M in the horizontal direction. As shown in FIG. **46**, the operation may be input with the right and left hands **1***a* and **1***b* or input by a pinch operation with two fingers of one hand. The pinch operation is a motion of the two fingers that simultaneously come into contact with the two points and open and close, for example.

As shown in FIG. **47**, in accordance with the increase of the distance between the two points L and M, the size S**2** of each display thumbnail image **62** in the horizontal direction increases. For example, an animation in which each display thumbnail image **62** is increased in size in the horizontal direction is displayed in accordance with the operation with both of the hands. Along with the increase in size, a distance between the graduations, i.e., the size of graduations, on the time axis **55** also increases in the horizontal direction. As a result, the number of graduations assigned to the fixed size S**1** decreases. FIG. **47** shows a state where the graduations of 9 seconds are assigned to the fixed size S**1**.

As shown in FIG. **48**, the distance between the two points L and M is further increased, and both of the hands **1***a* and **1***b* are released in the state where the graduations of 6 seconds are assigned to the fixed size S**1**. As shown in FIG. **49**, an animation in which the size S**2** of each display thumbnail image **62** is changed to the fixed size S**1** again is displayed. Subsequently, the standard of the rolled film portion **59** is set to 6 seconds. At that time, the thumbnail image **41** displayed as the display thumbnail image **62** may be selected anew from the identical thumbnail images **57**.

The shortest time that can be assigned to the fixed size S**1** may be preliminarily set. At a time point when the distance between the two points L and M is increased to be longer than the size to which the shortest time is assigned, the standard of the rolled film portion **59** may be automatically set to the shortest time. For example, assuming that the shortest time is set to 5 seconds in FIG. **50**, a distance in which the graduations of 5 seconds are assigned to the fixed size S**1** is a distance in which the size S**2** of the display thumbnail image **62** has the size twice as large as the fixed size S**1**. When the distance between the two points L and M is increased to be larger than the above-mentioned distance of the display thumbnail image **62**, as shown in FIG. **51**, the standard is automatically set to the shortest time, 5 seconds, if the right and left hands **1***a* and **1***b* are not released. Such processing allows the operability of the rolled film image **51** to be improved. Note that the time set to be the shortest time is not limited. For example, the standard set to the initial status may be used as a reference, and one-half or one-third of the time may be set to be the shortest time.

In the above description, the method of changing the standard of the rolled film portion **59** to be smaller, that is, the method of displaying the rolled film image **51** in detail has been described. Conversely, a change of the standard of the rolled film portion **59** to be larger to overview the rolled film image **51** is also allowed.

For example, as shown in FIG. **52**, a touch operation is input with the right and left hands **1***a* and **1***b* in the state where the standard of the rolled film portion **59** is set to 5 seconds. Subsequently, the right and left hands **1***a* and **1***b* are brought close to each other so as to reduce the distance between the two points L and M. A pinch operation may be input with two fingers of one hand.

As shown in FIG. **53**, in accordance with the decrease of the distance between the two points L and M, the size S**2** of each display thumbnail image **62** and the size of each graduation of the time axis **55** decrease. As a result, the number of graduations assigned to the fixed size S**1** increases. In FIG. **53**, the graduations of 9 seconds are assigned to the fixed size S**1**. When the right and left hands **1***a* and **1***b* are released in the state where the distance between the two points L and M is reduced, the size S**2** of each display thumbnail image **62** is changed to the fixed size S**1** again. Subsequently, the time corresponding to the number of graduations assigned to the fixed size S**1** when the hands are released is set as the standard of the rolled film portion **59**. At that time, the thumbnail image **41** displayed as the display thumbnail image **62** may be selected anew from the identical thumbnail images **57**.

The longest time that can be assigned to the fixed size S**1** may be preliminarily set. At a time point when the distance between the two points L and M is reduced to be shorter than the size to which the longest time is assigned, the standard of the rolled film portion **59** may be automatically set to the longest time. For example, assuming that the longest time is set to 10 seconds in FIG. **54**, a distance in which the graduations of 10 seconds are assigned to the fixed size S**1** is a distance in which the size S**2** of the display thumbnail image **62** has half the size of the size S**1**. When the distance between the two points L and M is reduced to be smaller than the above-mentioned distance of the display thumbnail image **62**, as shown in FIG. **55**, the standard is automatically set to the longest time, 10 seconds, if the right and left hands **1***a* and **1***b* are not released. Such processing allows the operability of the rolled film image **51** to be improved. Note that the time set to be the longest time is not limited. For example, the standard set to the initial status may be a reference, and two or three times as long as the time may be set to be the longest time.

The standard of the rolled film portion **59** may be changed by an operation with a mouse. For example, as shown in the upper part of FIG. **56**, a wheel button **91** of a mouse **90** is rotated toward the near side, i.e., in the direction of the arrow

A. In accordance with the amount of the rotation, the size S2 of the display thumbnail image **62** and the size of the graduations are increased. When such a state is held for a predetermined period of time or more, the standard of the rolled film portion **59** is changed to have a smaller value. On the other hand, when the wheel button **91** of the mouse **90** is rotated to the deep side, i.e., in the direction of the arrow B, the size S2 of the display thumbnail image **62** and the size of the graduations are reduced in accordance with the amount of the rotation. When such a state is held for a predetermined period of time or more, the standard of the rolled film portion **59** is changed to have a larger value. Such processing can also be easily achieved. Note that the setting for the shortest time and the longest time described above can also be achieved. In other words, at the time point at which a predetermined amount or more of the rotation is added, the shortest time or the longest time only needs to be set as a standard of the rolled film portion **59** in accordance with the rotation direction.

Since such a simple operation allows the standard of the rolled film portion **59** to be changed, a suspicious person or the like can be sufficiently monitored along with the operation of the rolled film image **51**. As a result, a useful surveillance camera system can be achieved.

The standard of graduations displayed on the time axis **55**, that is, the time standard can also be changed. For example, in the example shown in FIG. **57**, the standard of the rolled film portion **59** is set to 15 seconds. Meanwhile, long graduations **92** with a large length, short graduations **93** with a short length, and middle graduations **94** with a middle length between the large and short lengths are provided on the time axis **55**. One middle graduation **94** is arranged at the middle of the long graduations **92**, and four short graduations **93** are arranged between the middle graduation **94** and the long graduation **92**. In the example shown in FIG. **57**, the fixed size S1 is set to be equal to the distance between the long graduations **92**. Consequently, the time standard is set such that the distance between the long graduations **92** is set to 15 seconds.

Here, it is assumed that the time set for the distance between the long graduations **92** is preliminarily determined as follows: 1 sec, 2 sec, 5 sec, 10 sec, 15 sec, and 30 sec (mode in seconds); 1 min, 2 min, 5 min, 10 min, 15 min, and 30 min (mode in minutes); and 1 hour, 2 hours, 4 hours, 8 hours, and 12 hours (mode in hours). Specifically, it is assumed that the mode in seconds, the mode in minutes, and the mode in hours are set to be selectable and the times described above are each prepared as a time that can be set in each mode. Note that the time that can be set in each mode is not limited to the above-mentioned times.

As shown in FIG. **58**, a multi-touch operation is input to the two points L and M in the rolled film portion **59**, and the distance between the two points L and M is increased. Along with the increase, the size S2 of the display thumbnail image **62** and the size of each graduation increase. In the example shown in FIG. **58**, the time assigned to the fixed size S1 is set to 13 seconds. Because the value of "13 seconds" is not a preliminarily set value, the time standard is not changed. As shown in FIG. **59**, the distance between the right and left hands **1***a* and **1** *b* is further increased, the time assigned to the fixed size S1 is set to 10 seconds. The value of "10 seconds" is a preliminarily set time. Consequently, at the time at which the assigned time is changed to be 10 seconds, as shown in FIG. **60**, the time standard is changed such that the distance between the long graduations **92** is set to 10 seconds. Subsequently, two fingers of the right and left hands **1***a* and **1***b* are released, and the size of the display thumbnail image **62** is changed to the fixed size S1 again. At that time, the size of the graduations is reduced and displayed on the time axis **55**. Alternatively, the distance between the long graduations **92** may be fixed and the size of the display thumbnail image **62** may be increased.

When the time standard is increased, the distance between the two points L and M only needs to be reduced. At the time point at which the time assigned to the fixed size S1 is set to 30 seconds preliminarily determined, the standard is changed such that the distance between the long graduations **92** is set to 30 seconds. Note that the operation described here is identical to the above-mentioned operation to change the standard of the rolled film portion **59**. It may be determined as appropriate whether the operation to change the distance between the two points L and M may be used to change the standard of the rolled film portion **59** or to change the time standard. Alternatively, a mode to change the standard of the rolled film portion **59** and a mode to change the time standard may be set to be selectable. Appropriately selecting the mode may allow the standard of the rolled film portion **59** and the time standard to be appropriately changed.

As described above, in the surveillance camera system **100** according to an embodiment, the plurality of cameras **10** are used. Here, an example of the algorithm of the person tracking under an environment using a plurality of cameras will be described. FIGS. **61** and **62** are diagrams for describing the outline of the algorithm. For example, as shown in FIG. **61**, an image of the person **40** is captured with a first camera **10***a*, and another image of the person **40** is captured later with a second camera **10***b* that is different from the first camera **10***a*. In such a case, whether the persons captured with the respective surveillance cameras **10***a* and **10***b* are identical or not is determined by the following person tracking algorithm. This allows the tracking of the person **40** across the coverage of the cameras **10***a* and **10***b*.

As shown in FIG. **62**, in the algorithm described herein, the following two prominent types of processing are executed so as to track a person with a plurality of cameras.

1. One-to-one matching processing for detected persons **40**

2. Calculation of optimum combinations for the whole of one or more persons **40** in close time range, i.e., in Time-Scope shown in FIG. **62**

Specifically, one-to-one matching processing is performed on a pair of the persons in a predetermined range. By the matching processing, a score on the degree of similarity is calculated for each pair. Together with such processing, an optimization is performed on a combination of persons determined to be identical to each other.

FIG. **63** shows pictures and diagrams showing an example of the one-to-one matching processing. Note that a face portion of each person is taken out in each picture. This is processing for privacy protection of the persons who appear in the pictures used herein and has no relation with the processing executed in an embodiment of the present disclosure. Additionally, the one-to-one matching processing is not limited to the following one and any technique may be used instead.

As shown in a frame A, edge detection processing is performed on an image **95** of the person **40** (hereinafter, referred to as person image **95**), and an edge image **96** is generated. Subsequently, matching is performed on color information of respective pixels in inner areas **96***b* of edges **96***a* of the persons. Specifically, the matching processing is performed by not using the entire image **95** of the person **40** but using the color information of the inner area **96***b* of the

edge **96***a* of the person **40**. Additionally, the person image **95** and the edge image **96** are each divided into three areas in the vertical direction. Subsequently, the matching processing is performed between upper areas **97***a*, between middle areas **97***b*, and between lower areas **97***c*. In such a manner, the matching processing is performed for each of the partial areas. This allows highly accurate matching processing to be executed. Note that the algorithm used for the edge detection processing and for the matching processing in which the color information is used is not limited.

As shown in a frame B, an area to be matched **98** may be selected as appropriate. For example, based on the results of the edge detection, areas including identical parts of bodies may be detected and the matching processing may be performed on those areas.

As shown in a frame C, out of images detected as the person images **95**, an image **99** that is improper as a matching processing target may be excluded by filtering and the like. For example, based on the results of the edge detection, an image **99** that is improper as a matching processing target is determined. Additionally, the image **99** that is improper as a matching processing target may be determined based on the color information and the like. Executing such filtering and the like allows highly accurate matching processing to be executed.

As shown in a frame D, based on person information and map information stored in the storage unit, information on a travel distance and a travel time of the person **40** may be calculated. For example, not a distance represented by a straight line X and a travel time of the distance but a distance and a travel distance associated with the structure, paths, and the like of an office are calculated (represented by curve Y). Based on the information, a score on the degree of similarity is calculated or a predetermined range (TimeScope) may be set. For example, based on the arrangement positions of the cameras **10** and the information on the distance and the travel time, a time at which one person is sequentially imaged with each of two cameras **10**. With the calculation results, a possibility that the person imaged with the two cameras **10** is identical may be determined.

As shown in a frame E, a person image **105** that is most suitable for the matching processing may be selected when the processing is performed. In the present disclosure, a person image **95** at a time point **110** at which the detections is started, that is, at which the person **40** appears, and a person image **95** at a time point **111** at which the detection is ended, that is, at which the person **40** disappears, are used for the matching processing. At that time, the person images **105** suitable for the matching processing are selected as the person images **95** at the appearance point **110** and the disappearance point **111**, from a plurality of person images **95** generated from the plurality of frame images **12** captured at times close to the respective time points. For example, a person image **95***a* is selected from the person images **95***a* and **95***b* to be an image of the person A at the appearance point **110** shown in the frame E. A person image **95***d* is selected from the person images **95***c* and **95***d* to be an image of the person B at the appearance point **110**. A person image **95***e* is selected from the person images **95***e* and **95***f* to be an image of the person B at the disappearance point **111**. Note that two person images **95***g* and **95***h* are adopted as the images of the person A at the disappearance point **111**. In such a manner, a plurality of images determined to be suitable for the matching processing, that is, images having high scores, may be selected, and the matching processing may be executed in each image. This allows highly accurate matching processing to be executed.

FIGS. **64** and **70** are schematic diagrams each showing an application example of the algorithm of the person tracking according to an embodiment of the present disclosure. Here, which tracking ID is set for the person image **95** at the appearance point **110** (hereinafter, referred to as appearance point **110**, omitting "person image **95**") is determined. Specifically, if the person at the appearance point **110** is identical to the person appearing in the person image **95** at the past disappearance point **111** (hereinafter, referred to as disappearance point **111**, omitting "person image **95**"), the same ID is set continuously. If the person is new, a new ID is set for the person. So, a disappearance point **111** and an appearance point **110** later than the disappearance point **111** are used to perform the one-to-one matching processing and the optimization processing. Hereinafter, the matching processing and the optimization processing are referred to as optimization matching processing.

Firstly, an appearance point **110***a* for which the tracking ID is set is assumed to be a reference, and TimeScope is set in a past/future direction. The optimization matching processing is performed on appearance points **110** and disappearance points **111** in the TimeScope. As a result, when it is determined that there is no tracking ID to be assigned to the reference appearance point **110***a*, a new tracking ID is assigned to the appearance point **110***a*. On the other hand, when it is determined that there is a tracking ID to be assigned to the reference appearance point **110***a*, the tracking ID is continuously assigned. Specifically, when the tracking ID is determined to be identical to the ID of the past disappearance point **111**, the ID assigned to the disappearance point **111** is continuously assigned to the appearance point **110**.

In the example shown in FIG. **64**, the appearance point **110***a* of the person A is set to be a reference and the TimeScope is set. The optimization matching processing is performed on a disappearance point **111** of the person A and an appearance point **110** of a person F in the TimeScope. As a result, it is determined that there is no ID to be assigned to the appearance point **110***a* of the person A, and a new ID:**1** is assigned to the appearance point **110***a*. Next, as shown in FIG. **65**, an appearance point **110***a* of a person C is set to be a reference and the TimeScope is selected. Subsequently, the optimization matching processing is performed on the disappearance point **111** of the person A and each of later appearance points **10**. As a result, it is determined that there is no ID to be assigned to the appearance point **110***a* of the person C, and a new ID:**2** is assigned to the appearance point **110***a* of the person C.

As shown in FIG. **66**, an appearance point **110***a* of the person F is set to be a reference and the TimeScope is selected. The optimization matching processing is performed on the disappearance point **111** of the person A and each of later appearance points **110**. Further, the optimization matching processing is performed on a disappearance point **111** of the person C and each of later appearance points **110**. As a result, for example, as shown in FIG. **67**, it is determined that the ID:1, which is the tracking ID of the disappearance point **111** of the person A, is assigned to the appearance point **110***a* of the person F. Specifically, in this case, the person A and the person F are determined to be identical.

As shown in FIG. **68**, an appearance point **110***a* of a person E is set to be a reference and the TimeScope is selected. The optimization matching processing is performed on the disappearance point **111** of the person A and each of later appearance points **110**. Further, the optimization matching processing is performed on the disappearance

point **111** of the person C and each of later appearance points **110**. As a result, it is determined that there is no ID to be assigned to the appearance point **110***a* of the person E, and a new ID:3 is assigned to the appearance point **110***a* of the person E.

As shown in FIG. **69**, an appearance point **110***a* of the person B is set to be a reference and the TimeScope is selected. The optimization matching processing is performed on the disappearance point **111** of the person A and each of later appearance points **110**. Further, the optimization matching processing is performed on the disappearance point **111** of the person C and each of later appearance points **110**. Furthermore, the optimization matching processing is performed on a disappearance point **111** of the person F and each of later appearance points **110**. Furthermore, the optimization matching processing is performed on a disappearance point **111** of the person E and each of later appearance points **110**. As a result, for example, as shown in FIG. **70**, it is determined that the ID:2, which is the tracking ID of the disappearance point **111** of the person C, is assigned to the appearance point **110***a* of the person B. Specifically, in this case, the person C and the person B are determined to be identical. For example, in such a manner, the person tracking under the environment using the plurality of cameras is executed.

Hereinabove, in the information processing apparatus (server apparatus **20**) according to an embodiment, the predetermined person **40** is detected from each of the plurality of frame images **12**, and a thumbnail image **41** of the person **40** is generated. Further, the image capture time information and the tracking ID that are associated with the thumbnail image **41** are stored. Subsequently, one or more identical thumbnail images **57** having the identical tracking ID are arranged based on the image capture time information of each image. This allows the person **40** of interest to be sufficiently observed. With this technique, the useful surveillance camera system **100** can be achieved.

For example, surveillance images of a person tracked with the plurality of cameras **10** are easily arranged in the rolled film portion **59** on a timeline. This allows a highly accurate surveillance. Further, the target object **73** can be easily corrected and can be observed with a high operability accordingly.

In surveillance camera systems in related art, images from surveillance cameras are displayed in divided areas of a screen. Consequently, it has been difficult to achieve a large-scale surveillance camera system using a lot of cameras. Further, it has also been difficult to track a person whose images are captured with a plurality of cameras. Using the surveillance camera system according to an embodiment of the present disclosure described above can provide a solution of such a problem.

Specifically, camera images that track the person **40** are connected to one another, so that the person can be easily observed irrespective of the total number of cameras. Further, editing the rolled film portion **59** can allow the tracking history of the person **40** to be easily corrected. The operation for the correction can be intuitively executed.

FIG. **71** is a diagram for describing the outline of a surveillance system **500** using the surveillance camera system **100** according to an embodiment of the present disclosure. Firstly, a security guard **501** observes surveillance images captured with a plurality of cameras on a plurality of monitors **502** (Step **301**). A UI screen **503** indicating an alarm generation is displayed to notify the security guard **501** of a generation of an alarm (Step **302**). As described above, an alarm is generated when a suspicious person appears, a sensor or the like detects an entry of a person into an off-limits area, and a fraudulent access to a secured door is detected, for example. Further, an alarm may be generated when a person lying for a long period of time is detected by an algorithm by which a posture of a person can be detected, for example. Furthermore, an alarm may be generated when a person who fraudulently acquires an ID card such as an employee ID card is found.

An alarm screen **504** displaying a state at an alarm generation is displayed. The security guard **501** can observe the alarm screen **504** to determine whether the generated alarm is correct or not (Step **303**). This step is seen as a first step in this surveillance system **500**.

When the security guard **501** determines that the alarm is falsely generated through the check of the alarm screen **504** (Step **304**), the processing returns to the surveillance state of Step **301**. When the security guard **501** determines that the alarm is appropriately generated, a tracking screen **505** for tracking a person set as a suspicious person is displayed. While watching the tracking screen **505**, the security guard **501** collects information to be sent to another security guard **506** located near the monitored location. Further, while tracking a suspicious person **507**, the security guard **501** issues an instruction to the security guard **506** at the monitored location (Step **305**). This step is seen as a second step in this surveillance system **500**. The first and second steps are mainly executed as operations at an alarm generation.

According to the instruction, the security guard **506** at the monitored location can search for the suspicious person **507**, so that the suspicious person **507** can be found promptly (Step **306**). After the suspicious person **507** is found and the incident comes to an end, for example, an operation to collect information for solving the incident is next executed. Specifically, the security guard **501** observes a UI screen called a history screen **508** in which a time at an alarm generation is set to be a reference. Consequently, the movement and the like of the suspicious person **507** before and after the occurrence of the incident are observed and the incident is analyzed in detail (Step **307**). This step is seen as a third step in this surveillance system **500**. For example, in Step **307**, the surveillance camera system **100** using the UI screen **50** described above can be effectively used. In other words, the UI screen **50** can be used as the history screen **508**. Hereinafter, the UI screen **50** according to an embodiment is referred to as the history screen **508**.

To serve as the information processing apparatus according to an embodiment, an information processing apparatus that generates the alarm screen **504**, the tracking screen **505**, and the history screen **508** to be provided to a user may be used. This information processing apparatus allows an establishment of a useful surveillance camera system. Hereinafter, the alarm screen **504** and the tracking screen **505** will be described.

FIG. **72** is a diagram showing an example of the alarm screen **504**. The alarm screen **504** includes a list display area **510**, a first display area **511**, a second display area **512**, and a map display area **513**. In the list display area **510**, times at which alarms have been generated up to the present time are displayed as a history in the form of a list. In the first display area **511**, a frame image **12** at a time at which an alarm is generated is displayed as a playback image **515**. In the second display area **512**, an enlarged image **517** of an alarm person **516** is displayed. The alarm person **516** is a target for which an alarm is generated and which is displayed in the playback image **515**. In the example shown in FIG. **72**, the person C is set as the alarm person **516**, and an emphasis image **518** of the person C is displayed in red. In the map

display area **513**, map information **519** indicating a position of the alarm person **516** at the alarm generation is displayed.

As shown in FIG. **72**, when one of the listed times at which alarms have been generated is selected, information on the alarm generated at the selected time is displayed in the first and second display areas **511** and **512** and the map display area **513**. When the time is changed to another one, the information to be displayed in each display area is also changed.

Further, the alarm screen **504** includes a tracking button **520** for switching to the tracking screen **505** and a history button **521** for switching to the history screen **508**.

As shown in FIG. **73**, moving the alarm person **516** along a movement image **522** may allow information before and after the alarm generation to be displayed in each display area. At that time, each of various types of information may be displayed in conjunction with the drag operation.

Further, the alarm person **516** may be changed or corrected. For example, as shown in FIG. **74**, another person B in the playback image **515** is selected. Subsequently, an enlarged image **517** and map information **519** on the person B are displayed in each display area. Additionally, a movement image **522***b* indicating the movement of the person B is displayed in the playback image **515**. As shown in FIG. **75**, when the finger of the user **1** is released, a pop-up **523** for specifying the alarm person **516** is displayed, and when a button for specifying a target is selected, the alarm person **516** is changed. At that time, the information on the listed times at which alarms have been generated is changed from the information of the person C to the information of the person B. Alternatively, alarm information with which the information of the person B is associated may be newly generated as identical alarm generation information. In this case, two identical times of alarm generation are listed in the list display area **510**.

Next, the tracking screen **505** will be described. A tracking button **520** of the alarm screen **504** shown in FIG. **76** is pressed so that the tracking screen **505** is displayed.

FIG. **77** is a diagram showing an example of the tracking screen **505**. In the tracking screen **505**, information on the current time is displayed in a first display area **525**, a second display area **526**, and a map display area **527**. As shown in FIG. **77**, in the first display area **525**, a frame image **12** of the alarm person **516** that is being captured at the current time is displayed as a live image **528**. In the second display area **526**, an enlarged image **529** of the alarm person **516** appearing in the live image **528** is displayed. In the map display area **527**, map information **530** indicating the position of the alarm person **516** at the current time is displayed. Each piece of the information described above is displayed in real time with a lapse of time.

Note that in the alarm screen **504** shown in FIG. **76**, the person B is set as the alarm person **516**. In the tracking screen **505** shown in FIG. **77**, however, the person A is tracked as the alarm person **516**. In such a manner, a person to be tracked as a target may be falsely detected. In such a case, a target to be set as the alarm person **516** (hereinafter, also referred to as target **516** in some cases) has to be corrected. For example, when the person B that is the target **516** appears in the live image **528**, a pop-up for specifying the target **516** is used to correct the target **516**. On the other hand, as shown in FIG. **77**, there are many cases where the target **516** does not appear in the live image **528**. Hereinafter, the correction of the target **516** in such a case will be described.

FIGS. **78** to **82** are diagrams each showing an example of a method of correcting the target **516**. As shown in FIG. **78**, a lost tracking button **531** is clicked. The lost tracking button **531** is provided for the case where the sight of the target **516** to be tracked is lost. Subsequently, as shown in FIG. **79**, a thumbnail image **532** of the person B and a candidate selection UI **534** are displayed in the second display area **526**. The person B of the thumbnail image **532** is to be the target **516**. The candidate selection UI **534** is used to display a plurality of candidate thumbnail images **533** to be selectable. The candidate thumbnail images **533** are selected from the thumbnail images of the person whose images are captured with each camera at the current time. The candidate thumbnail images **533** are selected as appropriate based on the degree of similarity of a person, a positional relationship between cameras, and the like (the selection method described on the candidate thumbnail images **85** shown in FIG. **32** may be used).

Further, the candidate selection UI **534** is provided with a refresh button **535**, a cancel button **536**, and an OK button **537**. The refresh button **535** is a button for instructing the update of the candidate thumbnail images **533**. When the refresh button **535** is clicked, other candidate thumbnail images **533** are retrieved again and displayed. Note that when the refresh button **535** is held down, the mode may be switched to an auto-refresh mode. The auto-refresh mode refers to a mode in which the candidate thumbnail images **533** are automatically updated with every lapse of a predetermined time. The cancel button **536** is a button for cancelling the display of the candidate thumbnail images **533**. The OK button **537** is a button for setting a selected candidate thumbnail image **533** as a target.

As shown in FIG. **80**, when a thumbnail image **533***b* of the person B is displayed as the candidate thumbnail image **533**, the thumbnail image **533***b* is selected by the user **1**. Subsequently, the frame image **12** including the thumbnail image **533***b* is displayed in real time as the live image **528**. Further, map information **530** related to the live image **528** is displayed. The user **1** can determine that the object is the person B by observing the live image **528** and the map information **530**. As shown in FIG. **81**, when the object appearing in the live image **528** is determined to be the person B, the OK button **537** is clicked. This allows the person B to be selected as a target and set as an alarm person.

FIG. **82** is a diagram showing a case where a target **539** is corrected using a pop-up **538**. Clicking another person **540** appearing in the live image **528** provides a display of the pop-up **538** for specifying a target. In the tracking screen **505**, the live image **528** is displayed in real time. Consequently, the real time display is continued also after the pop-up **538** is displayed, and the clicked person **540** also continues to move. The pop-up **538**, which does not follow the moving persons, displays a text asking whether the target **539** is corrected to the specified other person **540**, and a cancel button **541** and a yes button **542** to respond to the text. For example, when the screen is switched, the pop-up **538** is not deleted until any of the buttons is pressed. This allows an observation of a real-time movement of a person to be monitored and also allows a determination on whether the person is set to be an alarm person.

FIGS. **83** to **86** are diagrams for describing other processing to be executed using the tracking screen **505**. For example, in a surveillance camera system using a plurality of cameras, there may be areas that are not imaged with any of the cameras. Specifically, there may be dead areas that are not covered with any of the cameras. Processing when the target **539** falls within such areas will be described.

As shown in FIG. **83**, the person B set as the target **539** moves toward the near side. It is assumed that there is a dead

area that is not covered with the cameras in the traveling direction of the target **539**. In such a case, as shown in FIG. **83**, a gate **543** is set at a predetermined position of the live image **528**. The position and the size of the gate **543** may be set as appropriate based on an arrangement relationship between the cameras, that is, situations of dead areas not covered with the cameras, and the like. The gate **543** is displayed in the live image **528** when the person B approaches the gate **543** by a predetermined distance or more. Alternatively, the gate **543** may always be displayed.

As shown in FIG. **84**, when the person B overlaps the gate **543**, a moving image **544** that reflects a positional relationship between the cameras is displayed. First, images other than the gate **543** disappear, and an image with the emphasized gate **543** is displayed. Subsequently, as shown in FIG. **85**, an animation **544** is displayed. In the animation **544**, the gate **543** moves with the movement that reflects the positional relationship between the cameras. The left side of a gate **543***a*, which is the smallest gate shown in FIG. **85**, corresponds to the deep side of the live image **528** of FIG. **83**. The right side of the smallest gate **543***a* corresponds to the near side of the live image **528**. Consequently, the person B approaches the smallest gate **543***a* from the left side and travels to the right side.

As shown in FIG. **86**, gates **545** and live images **546** are displayed. The gates **545** correspond to the imaging ranges of candidate cameras (first and second candidate cameras) that are assumed to capture the person B next. The live images **546** are captured with the respective candidate cameras. The candidate cameras are each selected as a camera with a highly possibility of capturing next an image of the person B situated at a position of dead areas where the cameras are not covered. The selection may be executed as appropriate based on the positional relationship between the cameras, the person information of the person B, and the like. Numerical values are assigned to the gates **545** of the respective candidate cameras. Each of the numerical values represents a predicted time at which the person B is assumed to appear in the gate **545**. Specifically, a time at which an image of the person B is assumed to be captured with each candidate camera as the live image **546** is predicted. The information on the predicted time is calculated based on the map information, information on the structure of a building, and the like. Note that an image captured last is displayed in the enlarged image **529** shown in FIG. **86**. Specifically, the latest enlarged image of the person B is displayed. This allows an easy checking of the appearance of the target on the live image **546** captured with the candidate camera.

In embodiments described above, various computers such as a PC (Personal Computer) are used as the client apparatus **30** and the server apparatus **20**. FIG. **87** is a schematic block diagram showing a configuration example of such a computer.

A computer **200** includes a CPU (Central Processing Unit) **201**, a ROM (Read Only Memory) **202**, a RAM (Random Access Memory) **203**, an input/output interface **205**, and a bus **204** that connects those components to one another.

The input/output interface **205** is connected to a display unit **206**, an input unit **207**, a storage unit **208**, a communication unit **209**, a drive unit **210**, and the like.

The display unit **206** is a display device using, for example, liquid crystal, EL (Electro-Luminescence), or a CRT (Cathode Ray Tube).

The input unit **207** is, for example, a controller, a pointing device, a keyboard, a touch panel, and other operational devices. When the input unit **207** includes a touch panel, the touch panel may be integrated with the display unit **206**.

The storage unit **208** is a non-volatile storage device and is, for example, a HDD (Hard Disk Drive), a flash memory, or other solid-state memory.

The drive unit **210** is a device that can drive a removable recording medium **211** such as an optical recording medium, a floppy (registered trademark) disk, a magnetic recording tape, and a flash memory. On the other hand, the storage unit **208** is often used to be a device that is preliminarily mounted on the computer **200** and mainly drives a non-removable recording medium.

The communication unit **209** is a modem, a router, or another communication device that is used to communicate with other devices and is connected to a LAN (Local Area Network), a WAN (Wide Area Network), and the like. The communication unit **209** may use any of wired and wireless communications. The communication unit **209** is used separately from the computer **200** in many cases.

The information processing by the computer **200** having the hardware configuration as described above is achieved in cooperation with software stored in the storage unit **208**, the ROM **202**, and the like and hardware resources of the computer **200**. Specifically, the CPU **201** loads programs constituting the software into the RAM **203**, the programs being stored in the storage unit **208**, the ROM **202**, and the like, and executes the programs so that the information processing by the computer **200** is achieved. For example, the CPU **201** executes a predetermined program so that each block shown in FIG. **1** is achieved.

The programs are installed into the computer **200** via a recording medium, for example. Alternatively, the programs may be installed into the computer **200** via a global network and the like.

Further, the program to be executed by the computer **200** may be a program by which processing is performed chronologically along the described order or may be a program by which processing is performed at a necessary timing such as when processing is performed in parallel or an invocation is performed.

## Other Embodiments

The present disclosure is not limited to embodiments described above and can achieve other various embodiments.

For example, FIG. **88** is a diagram showing a rolled film image **656** according to another embodiment. In an embodiment described above, as shown in FIG. **7** and the like, the reference thumbnail image **43** is displayed at substantially the center of the rolled film portion **59** so as to be connected to the pointer **56** arranged at the reference time T**1**. Additionally, the reference thumbnail image **43** is also moved in the horizontal direction in accordance with the drag operation on the rolled film portion **59**. Instead of this operation, as shown in FIG. **88**, a reference thumbnail image **643** may be fixed to a right end **651** or a left end **652** of the rolled film portion **659** from the beginning. In addition, the position to display the reference thumbnail image **643** may be changed as appropriate.

In an embodiment described above, a person is set as an object to be detected, but the object is not limited to the person. Other moving objects such as animals and automobiles may be detected as an object to be observed.

Although the client apparatus and the server apparatus are connected via the network and the server apparatus and the plurality of cameras are connected via the network in an embodiment described above, the network may not be used to connect the apparatuses. Specifically, a method of con-

necting the apparatuses is not limited. Further, although the client apparatus and the server apparatus are arranged separately in an embodiment described above, the client apparatus and the server apparatus may be integrated to be used as an information processing apparatus according to an embodiment of the present disclosure. An information processing apparatus according to an embodiment of the present disclosure may be configured including a plurality of imaging apparatuses.

For example, the image switching processing according to an embodiment of the present disclosure described above may be used for another information processing system other than the surveillance camera system.

At least two of the features of embodiments described above can be combined.

Note that the present disclosure can take the following configurations.

(1) An image processing apparatus including: an obtaining unit configured to obtain a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments contains at least one image frame within which a specific target object is found to be captured; and a providing unit configured to provide image frames of the obtained plurality of segments for display along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

(2) The image processing apparatus of (1), wherein an object is specified as the specific target object prior to the compiling of the plurality of segments.

(3) The image processing apparatus of (1) or (2), wherein the timeline is representative of capture times of the plurality of segments and the tracking status indicator is displayed along the timeline in conjunction with the displayed plurality of segments, the displayed plurality of segments being arranged along the timeline at corresponding capture times.

(4) The image processing apparatus of any of (1) through (3), wherein each one of the displayed plurality of segments is selectable, and upon selection of a desired segment of the plurality of segments, the desired segment is reproduced.

(5) The image processing apparatus of any of (1) through (4), wherein the desired segment is reproduced within a viewing display area while the image frames of the plurality of segments are displayed along the timeline.

(6) The image processing apparatus of any of (1) through (5), wherein a focus is displayed in conjunction with at least one image of the reproduced desired segment to indicate a position of the specific target object within the at least one image.

(7) The image processing apparatus of any of (1) through (6), wherein a map with an icon which indicates a location of the specific target object is displayed together with the reproduced desired segment and the image frames along the timeline in the viewing display area.

(8) The image processing apparatus of any of (1) through (7), wherein the focus includes at least one of an identity mark, a highlighting, an outlining, and an enclosing box.

(9) The image processing apparatus of any of (1) through (8), wherein a path of movement over a period of time of the specific target object captured within the image frames of the plurality of segments is displayed at corresponding positions within images reproduced for display.

(10) The image processing apparatus of any of (1) through (9), wherein when a user specifies, from within the viewing display area, a desired position of the specific target object along the path of movement, a focus is placed upon a corresponding segment displayed along the timeline within which corresponding segment the specific target object is found to be captured at a location of the desired position.

(11) The image processing apparatus of any of (1) through (10), wherein the at least one image frame of each segment is represented by at least one respective representative image for display along the timeline, and the respective representative image for each segment of the plurality of segments is extracted from contents of each corresponding segment.

(12) The image processing apparatus of any of (1) through (11), wherein an object which is displayed in the viewing display area can be selectable by a user as the specific target object, and based on the selection by the user, at least a part of the plurality of segments displayed along the timeline is replaced by a segment which contains the specific target object selected by the user in the viewing display area.

(13) The image processing apparatus of any of (1) through (12), wherein the plurality of segments are generated based on images captured by different imaging devices.

(14) The image processing apparatus of any of (1) through (13), wherein the different imaging devices include at least one of a mobile imaging device and a video surveillance device.

(15) The image processing apparatus of any of (1) through (14), wherein the at least one media source includes a database of video contents containing recognized objects, and the specific target object is selected from among the recognized objects.

(16) The image processing apparatus of any of (1) through (15), wherein a monitor display area in which different images which represents different media sources are displayed is provided together with the viewing display area, and at least one displayed image in the viewing display area is changed based on a selection of an image displayed in the monitor display area.

(17) The image processing apparatus of any of (1) through (16), wherein a plurality of candidate thumbnail images to be selectable as the specific target object by a user are displayed in connection with a position of the plurality of segments along the timeline.

(18) The image processing apparatus of any of (1) through (17), wherein the plurality of candidate thumbnail images correspond to respective selected positions of the plurality of segments along the timeline and have high probability for inclusion of the specific target object.

(19) The image processing apparatus of any of (1) through (18), wherein the specific target object is found to be captured based on a degree of similarity of objects appearing within the plurality of segments.

(20) The image processing apparatus of any of (1) through (19), wherein the specific target object is recognized as being present within the plurality of segments according to a result of facial recognition processing.

(21) An image processing method including: obtaining a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments contains at least one image frame within which a specific target object is found to be captured; and providing image frames of the obtained plurality of segments for display along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

(22) A non-transitory computer-readable medium having embodied thereon a program, which when executed by a computer causes the computer to perform a method, the method including: obtaining a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments contains at least one image

frame within which a specific target object is found to be captured; and providing image frames of the obtained plurality of segments for display along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

(23) An information processing apparatus, including: a detection unit configured to detect a predetermined object from each of a plurality of captured images that are captured with an imaging apparatus and are temporally successive; a first generation unit configured to generate a partial image including the object, for each of the plurality of captured images from which the object is detected, to generate at least one object image; a storage unit configured to store, in association with the generated at least one object image, information on an image capture time of each of the captured images each including the at least one object image, and identification information used to identify the object included in the at least one object image; and an arrangement unit configured to arrange at least one identical object image having the same stored identification information from among the at least one object image, based on the stored information on the image capture time of each image.

(24) The information processing apparatus of (23), further including a selection unit configured to select a reference object image from the at least one object image, the reference object image being a reference, in which the arrangement unit is configured to arrange the at least one identical object image storing identification information that is the same as the identification information of the selected reference object image, based on the information on the image capture time of the reference object image.

(25) The information processing apparatus of (23) or (24), in which the detection unit is configured to detect the predetermined object from each of the plurality of captured images that are captured with each of a plurality of imaging apparatuses.

(26) The information processing apparatus of any one of (23) through (25), further including a first output unit configured to output a time axis, in which the arrangement unit is configured to arrange the at least one identical object image along the time axis.

(27) The information processing apparatus of any of (23) through (26), in which the arrangement unit is configured to arrange the at least one identical object image for each predetermined range on the time axis, the at least one identical object image having the image capture time within the predetermined range.

(28) The information processing apparatus of any of (23) through (27), in which the first output unit is configured to output a pointer indicating a predetermined position on the time axis, the information processing apparatus further including a second output unit configured to select the at least one identical object image corresponding to the predetermined position on the time axis indicated by the pointer and to output object information that is information related to the at least one identical object image.

(29) The information processing apparatus of any of (23) through (28), in which the second output unit is configured to change the selection of the at least one identical object image corresponding to the predetermined position and the output of the object information, in conjunction with a change of the predetermined position indicated by the pointer.

(30) The information processing apparatus of any of (23) through (29), in which the second output unit is configured to output one of the captured images that includes the at least one identical object image corresponding to the predetermined position.

(31) The information processing apparatus of any of (23) through (30), further including a second generation unit configured to detect a movement of the object and generate a movement image expressing the movement, in which the second output unit is configured to output the movement image of the object included in the at least one identical object image corresponding to the predetermined position.

(32) The information processing apparatus of any of (23) through (31), in which the second output unit is configured to output map information indicating a position of the object included in the at least one identical object image corresponding to the predetermined position.

(33) The information processing apparatus of any of (23) through (32), further including an input unit configured to input an instruction from a user, in which the first output unit is configured to change the predetermined position indicated by the pointer according to an instruction given to the at least one identical object image, the instruction being input with the input unit.

(34) The information processing apparatus of any of (23) through (33), in which the first output unit is configured to change the predetermined position indicated by the pointer according to an instruction given to the output object information.

(35) The information processing apparatus of any of (23) through (34), further including a correction unit configured to correct the at least one identical object image according to a predetermined instruction input with the input unit.

(36) The information processing apparatus of any of (23) through (35), in which the correction unit is configured to correct the at least one identical object image according to an instruction to select another object included in the captured image that is output as the object information.

(37) The information processing apparatus of any of (23) through (36), in which the correction unit is configured to correct the at least one identical object image according to an instruction to select at least one image from the at least one identical object image.

(38) The information processing apparatus of any of (23) through (37), in which the correction unit is configured to select a candidate object image that is to be a candidate of the at least one identical object image, from the at least one object image storing identification information that is different from the identification information of the selected reference object image.

(39) The information processing apparatus of any of (23) through (38), further including a determination unit configured to determine whether the detected object is a person to be monitored, in which the selection unit is configured to select, as the reference object image, the at least one object image including the object that is determined to be the person to be monitored.

(40) An information processing method executed by a computer, the method comprising: detecting a predetermined object from each of a plurality of captured images that are captured with an imaging apparatus and are temporally successive; generating a partial image including the object, for each of the plurality of captured images from which the object is detected, to generate at least one object image; storing, in association with the generated at least one object image, information on an image capture time of each of the captured images each including the at least one object image, and identification information used to identify the object included in the at least one object image; and arrang-

ing at least one identical object image having the same stored identification information from among the at least one object image, based on the stored information on the image capture time of each image.

(41) A program causing a computer to execute: detecting a predetermined object from each of a plurality of captured images that are captured with an imaging apparatus and are temporally successive; generating a partial image including the object, for each of the plurality of captured images from which the object is detected, to generate at least one object image; storing, in association with the generated at least one object image, information on an image capture time of each of the captured images each including the at least one object image, and identification information used to identify the object included in the at least one object image; and arranging at least one identical object image having the same stored identification information from among the at least one object image, based on the stored information on the image capture time of each image.

(42) An information processing system, comprising: at least one imaging apparatus configured to capture a plurality of images that are temporally successive; and an information processing apparatus including a detection unit configured to detect a predetermined object from each of the plurality of images that are captured with the at least one imaging apparatus, a generation unit configured to generate a partial image including the object, for each of the plurality of images from which the object is detected, to generate at least one object image, a storage unit configured to store, in association with the generated at least one object image, information on an image capture time of each of the images each including the at least one object image, and identification information used to identify the object included in the at least one object image, and an arrangement unit configured to arrange at least one identical object image having the same stored identification information from among the at least one object image, based on the stored information on the image capture time of each image.

It should be understood by those skilled in the art that various modifications, combinations, sub-combinations and alterations may occur depending on design requirements and other factors insofar as they are within the scope of the appended claims or the equivalents thereof.

It should be understood by those skilled in the art that various modifications, combinations, sub-combinations and alterations may occur depending on design requirements and other factors insofar as they are within the scope of the appended claims or the equivalents thereof.

REFERENCE SIGNS LIST

T1 reference time
1 user
5 network
10 camera
12 frame image
20 server apparatus
23 image analysis unit
24 data management unit
25 alarm management unit
27 communication unit
30 client apparatus
40 person
41 thumbnail image
42 person tracking metadata
43 reference thumbnail image
53 object information
55 time axis
56 pointer
57 identical thumbnail image
61 predetermined range
65 map information
69 movement image
80 cut button
85 candidate thumbnail image
100 surveillance camera system
500 surveillance system
504 alarm screen
505 tracking screen
508 history screen

The invention claimed is:

1. An image processing apparatus comprising:
circuitry configured to
obtain a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments consists of at least one image frame within which a specific target object is found to be captured,
generate an object image which is a partial image comprising the specific target of each of the at least one image frame within which the specific target object is found to be captured, and
display the object image along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

2. The image processing apparatus of claim 1, wherein an object is specified as the specific target object prior to the compiling of the plurality of segments.

3. The image processing apparatus of claim 1, wherein the timeline is representative of capture times of the plurality of segments and the tracking status indicator is displayed along the timeline in conjunction with the displayed plurality of segments, the displayed plurality of segments being arranged along the timeline at corresponding capture times.

4. The image processing apparatus of claim 1, wherein each one of the displayed plurality of segments is selectable, and upon selection of a desired segment of the plurality of segments, the desired segment is reproduced.

5. The image processing apparatus of claim 4, wherein the desired segment is reproduced within a viewing display area while the image frames of the plurality of segments are displayed along the timeline.

6. The image processing apparatus of claim 5, wherein a focus is displayed in conjunction with at least one image of the reproduced desired segment to indicate a position of the specific target object within the at least one image.

7. The image processing apparatus of claim 6, wherein a map with an icon which indicates a location of the specific target object is displayed together with the reproduced desired segment and the image frames along the timeline in the viewing display area.

8. The image processing apparatus of claim 6, wherein the focus comprises at least one of an identity mark, a highlighting, an outlining, and an enclosing box.

9. The image processing apparatus of claim 5, wherein a path of movement over a period of time of the specific target object captured within the image frames of the plurality of segments is displayed at corresponding positions within images reproduced for display.

10. The image processing apparatus of claim 9, wherein when a user specifies, from within the viewing display area, a desired position of the specific target object along the path of movement, a focus is placed upon a corresponding

segment displayed along the timeline within which corresponding segment the specific target object is found to be captured at a location of the desired position.

**11**. The image processing apparatus of claim **1**, wherein the at least one image frame of each segment is represented by at least one respective representative image for display along the timeline, and the respective representative image for each segment of the plurality of segments is extracted from contents of each corresponding segment.

**12**. The image processing apparatus of claim **5**, wherein

an object which is displayed in the viewing display area can be selectable by a user as the specific target object, and

based on the selection by the user, at least a part of the plurality of segments displayed along the timeline is replaced by a segment which contains the specific target object selected by the user in the viewing display area.

**13**. The image processing apparatus of claim **1**, wherein the plurality of segments are generated based on images captured by different imaging devices.

**14**. The image processing apparatus of claim **13**, wherein the different imaging devices comprise at least one of a mobile imaging device and a video surveillance device.

**15**. The image processing apparatus of claim **1**, wherein the at least one media source comprises a database of video contents containing recognized objects, and the specific target object is selected from among the recognized objects.

**16**. The image processing apparatus of claim **5**, wherein a monitor display area in which different images which represents different media sources are displayed is provided together with the viewing display area, and at least one displayed image in the viewing display area is changed based on a selection of an image displayed in the monitor display area.

**17**. The image processing apparatus of claim **1**, wherein a plurality of candidate thumbnail images to be selectable as the specific target object by a user are displayed in connection with a position of the plurality of segments along the timeline.

**18**. The image processing apparatus of claim **17**, wherein the plurality of candidate thumbnail images correspond to respective selected positions of the plurality of segments along the timeline and have high probability for inclusion of the specific target object.

**19**. The image processing apparatus of claim **1**, wherein the specific target object is found to be captured based on a degree of similarity of objects appearing within the plurality of segments.

**20**. The image processing apparatus of claim **1**, wherein the specific target object is recognized as being present within the plurality of segments according to a result of facial recognition processing.

**21**. An image processing method, the method being executed via at least one processor having circuitry, and comprising:

obtaining a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments consists of at least one image frame within which a specific target object is found to be captured;

generating an object image which is a partial image including the specific target of each of the at least one image frame within which the specific target object is found to be captured; and

displaying the object image along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

**22**. A non-transitory computer-readable medium having embodied thereon a program, which when executed by a computer having circuitry, causes the computer to perform a method, the method comprising:

obtaining a plurality of segments compiled from at least one media source, wherein each segment of the plurality of segments consists of at least one image frame within which a specific target object is found to be captured;

generating an object image which is a partial image including the specific target of each of the at least one image frame within which the specific target object is found to be captured; and

displaying the object image along a timeline and in conjunction with a tracking status indicator that indicates a presence of the specific target object within the plurality of segments in relation to time.

**23**. The image processing apparatus according to claim **1**, wherein the tracking status indicator further comprises information for identifying the specific target object.

**24**. The image processing apparatus according to claim **23**, wherein the circuitry is further configured to arrange the object image having a same specific target along a same timeline.

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