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(54) **NOTIFICATION SYSTEM**

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(57) **ABSTRACT**

A notification system that appropriately notifies a healthcare provider of a change in the state of a patient in a sickroom is provided. The notification system includes: a detection unit that generates movement information of a subject according to a change over time; a storage unit that is connected to the detection unit and stores the movement information; and a control unit that receives the movement information from the detection unit, analyzes the movement information, makes a determination on the occurrence of a predetermined event from the result of the analysis, specifies the movement information in a predetermined period including the time when the determination was made, applies a storage priority value to the movement information according to a type of the predetermined event occurred, and transmits the movement information to the storage unit.

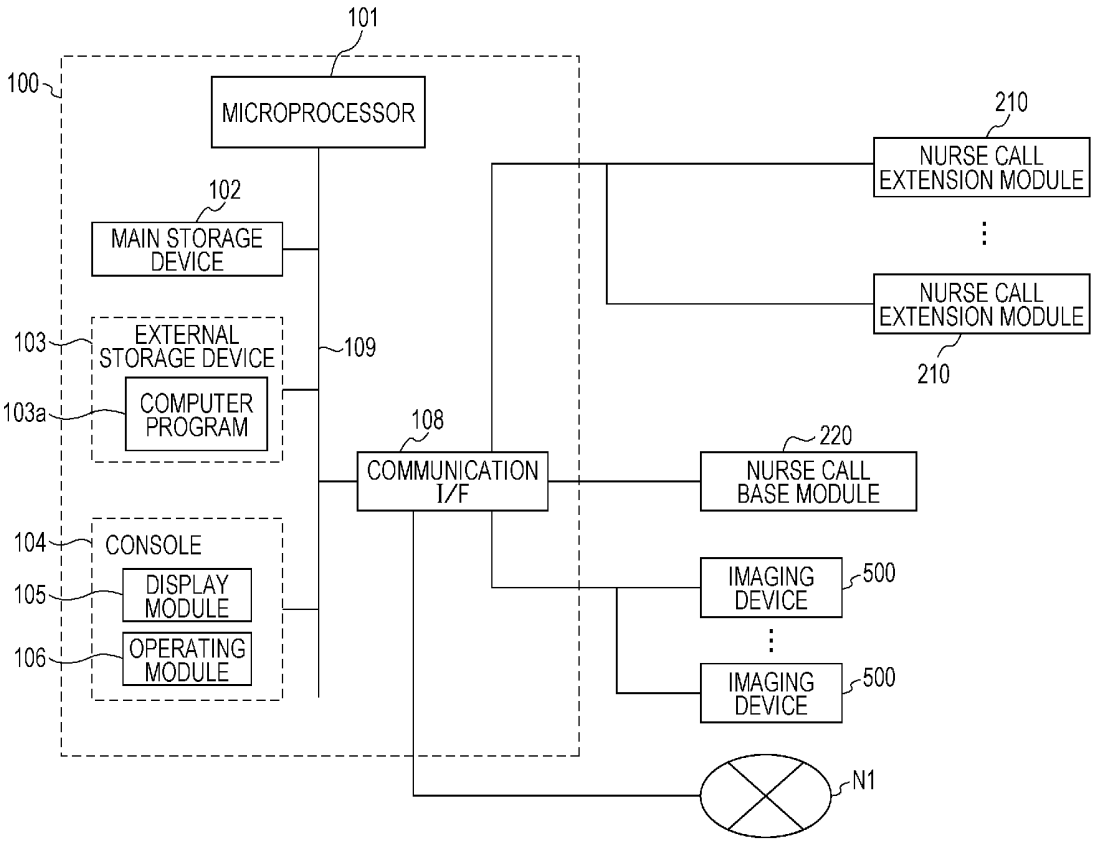


FIG. 1

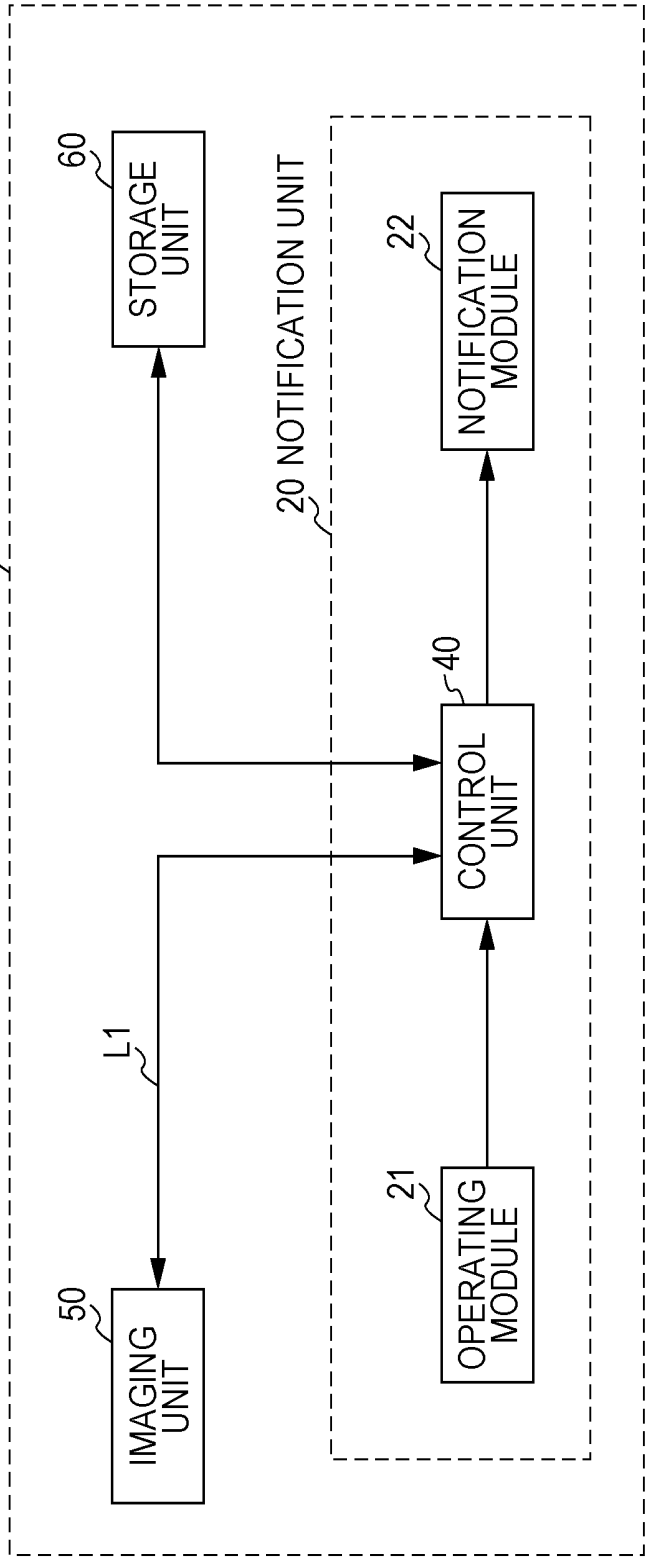

10
60
STORAGE UNIT
20 NOTIFICATION UNIT
22
NOTIFICATION MODULE
40
CONTROL UNIT
L1
21
OPERATING MODULE
50
IMAGING UNIT

FIG. 2

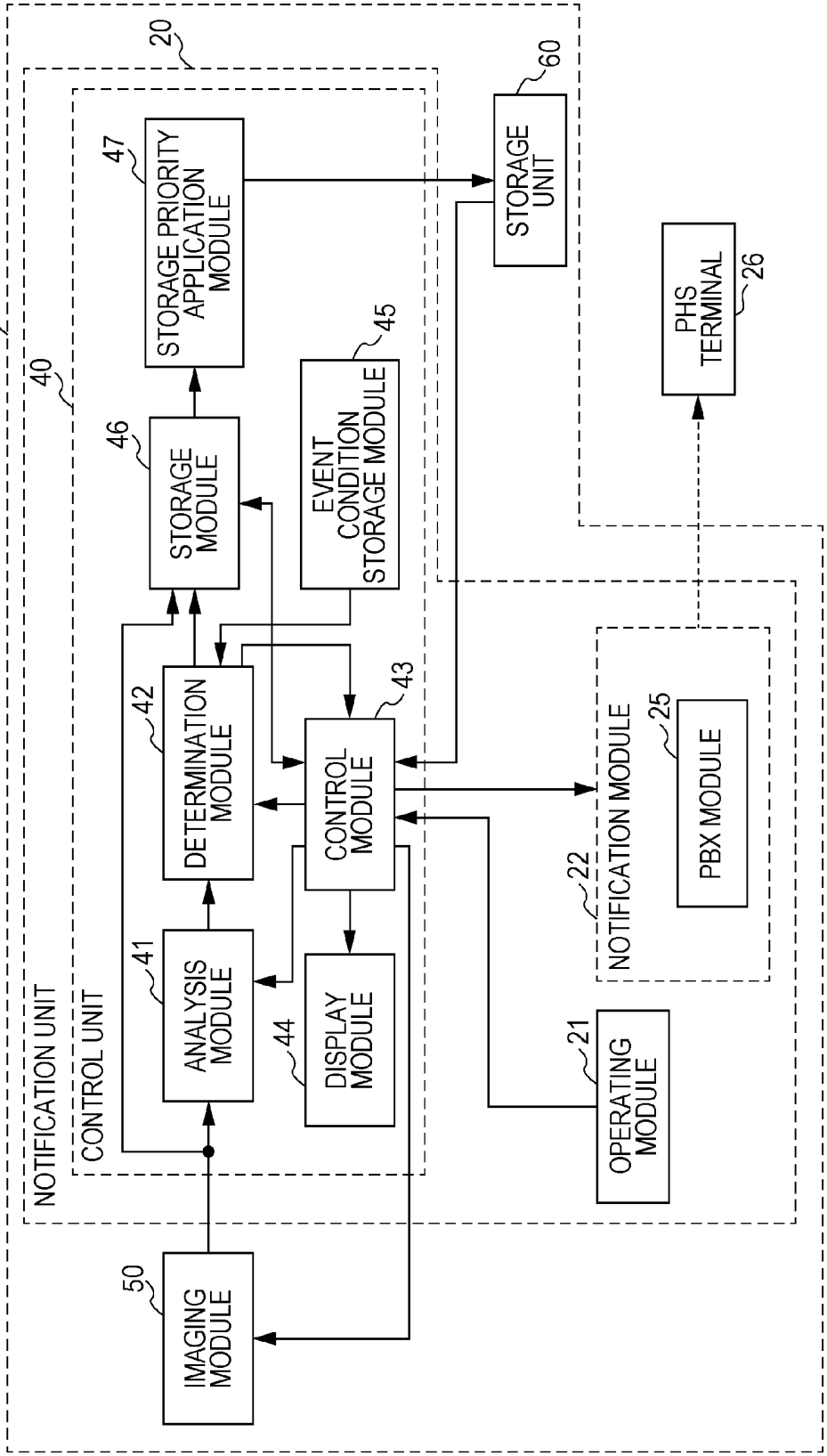

10
NOTIFICATION UNIT
20
CONTROL UNIT
40
STORAGE PRIORITY APPLICATION MODULE
47
STORAGE UNIT
60
PHS TERMINAL
26
EVENT CONDITION STORAGE MODULE
45
STORAGE MODULE
46
DETERMINATION MODULE
42
CONTROL MODULE
43
ANALYSIS MODULE
41
DISPLAY MODULE
44
NOTIFICATION MODULE
22
PBX MODULE
25
OPERATING MODULE
21
IMAGING MODULE
50

FIG. 3

EVENT NAME	EVENT THRESHOLD
FALLING	1
TUMBLING	1
LEAVING BED	3
GETTING UP	2
WANDERING	1
⋮	⋮

FIG. 4

PRESENCE OF OCCURRENCE OF EVENT	EVENT NAME	STORAGE PRIORITY VALUE
ABSENT	—	Z
PRESENT	FALLING	A
PRESENT	TUMBLING	B
PRESENT	LEAVING BED	D
PRESENT	GETTING UP	E
PRESENT	WANDERING	C
⋮	⋮	⋮

FIG. 5

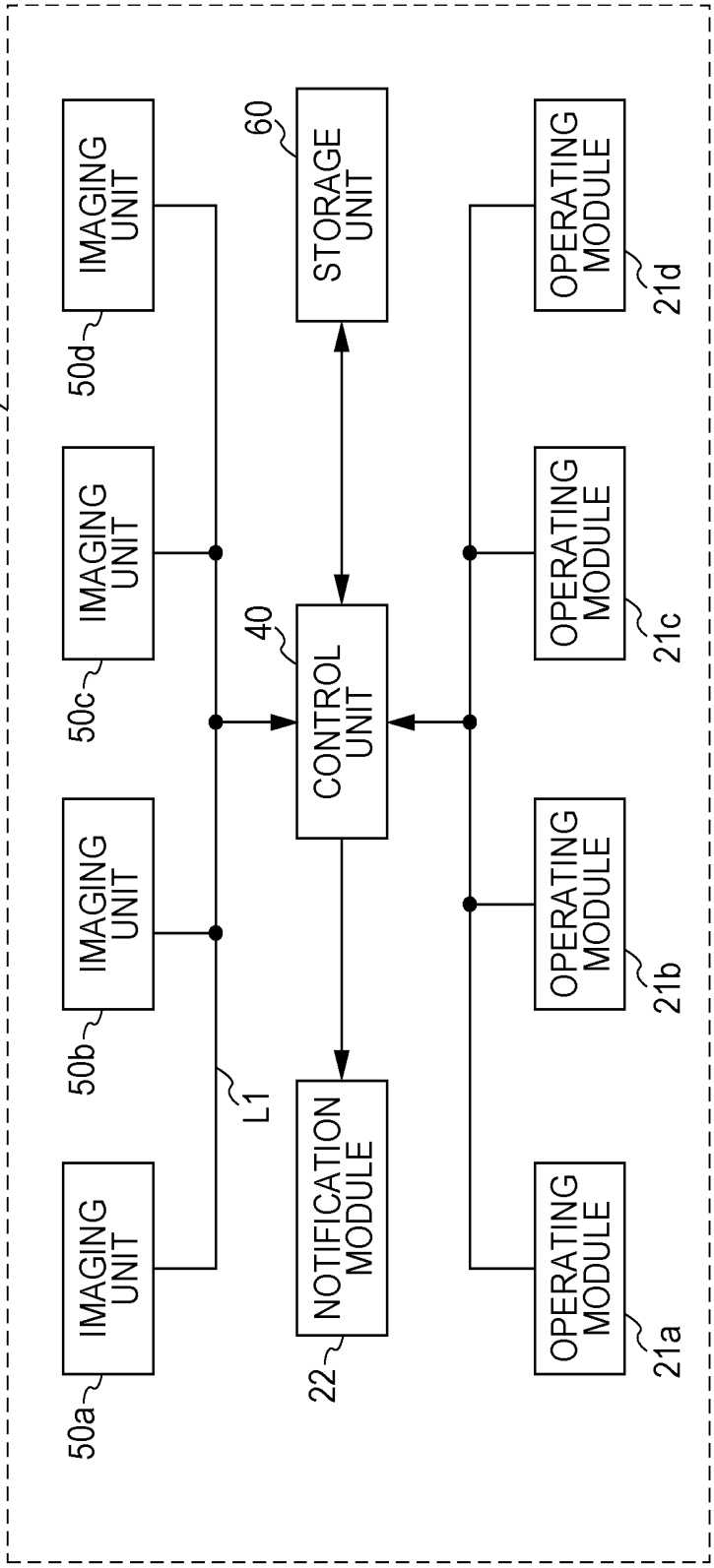

10
IMAGING UNIT
50a
IMAGING UNIT
50b
IMAGING UNIT
50c
IMAGING UNIT
50d
L1
NOTIFICATION MODULE
22
CONTROL UNIT
40
STORAGE UNIT
60
OPERATING MODULE
21a
OPERATING MODULE
21b
OPERATING MODULE
21c
OPERATING MODULE
21d

FIG. 6

SICKBED NUMBER	IMAGING UNIT UID	OPERATING MODULE UID	...
1	50	70	
2	51	71	
3	52	72	
4	53	73	
⋮			

FIG. 7

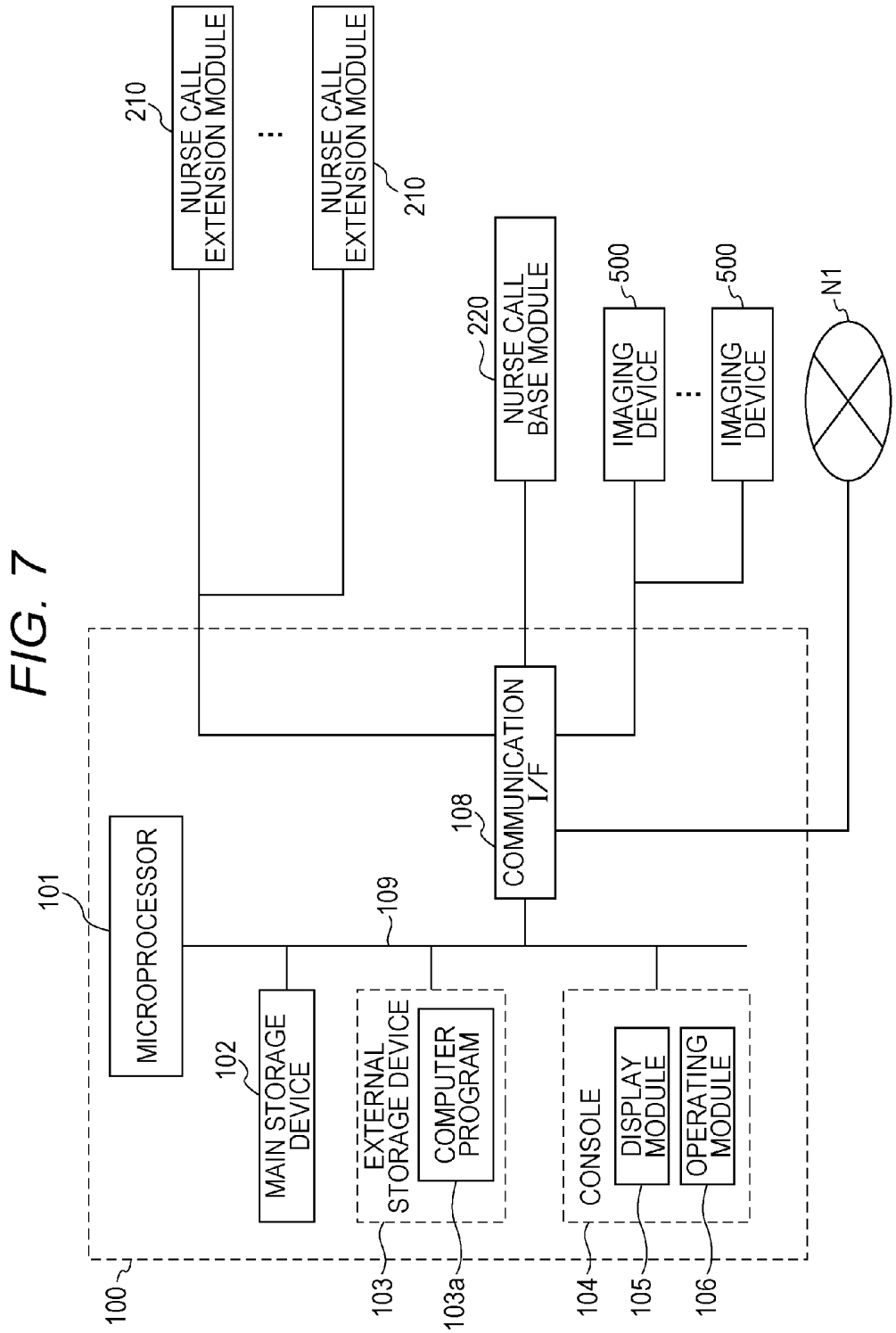

NURSE CALL EXTENSION MODULE
210
NURSE CALL EXTENSION MODULE
210
NURSE CALL BASE MODULE
220
IMAGING DEVICE
500
IMAGING DEVICE
500
N1
COMMUNICATION I/F
108
MICROPROCESSOR
101
109
MAIN STORAGE DEVICE
102
EXTERNAL STORAGE DEVICE
COMPUTER PROGRAM
CONSOLE
DISPLAY MODULE
OPERATING MODULE
100
103
103a
104
105
106

FIG. 8

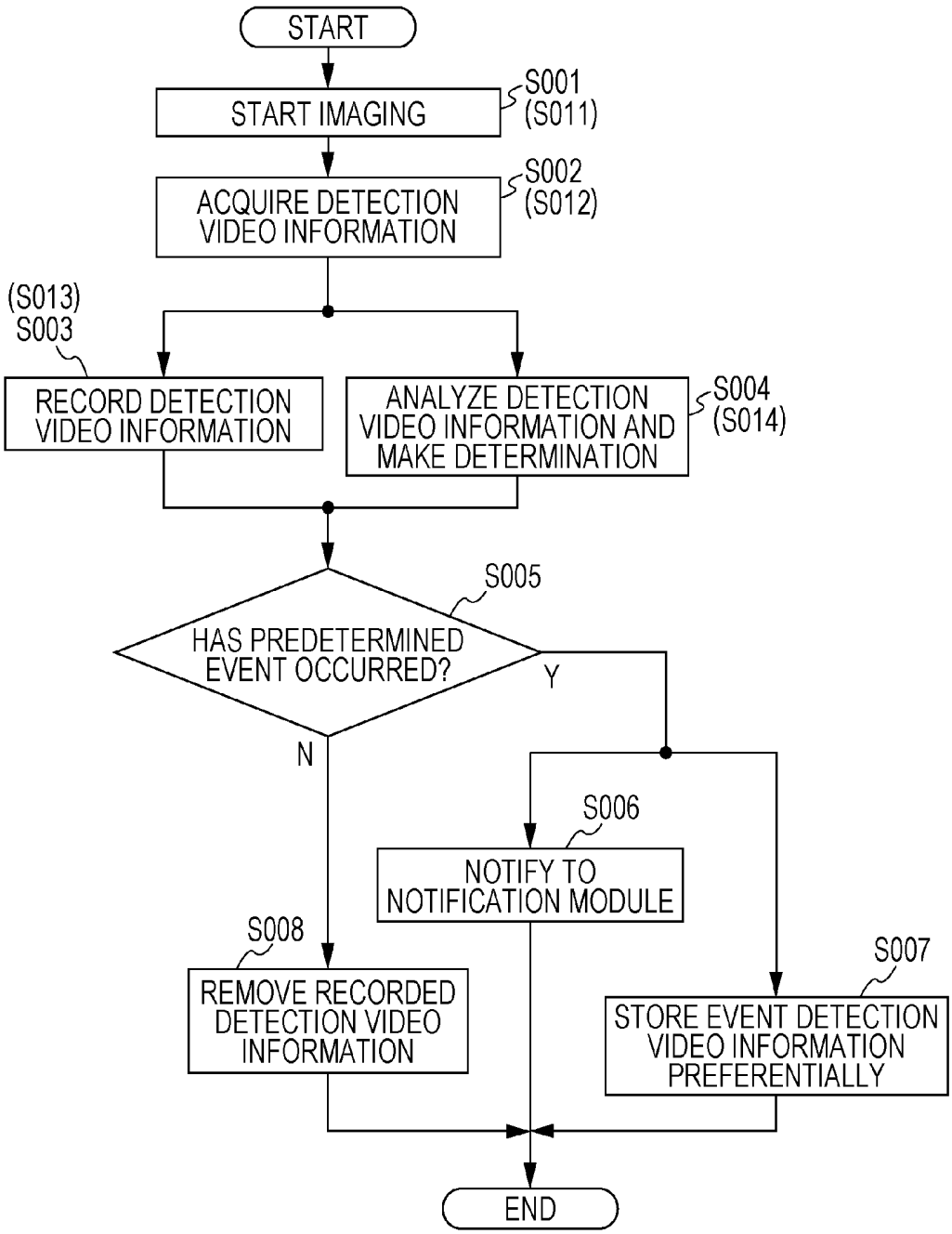

START
START IMAGING
S001
(S011)
ACQUIRE DETECTION VIDEO INFORMATION
S002
(S012)
(S013)
S003
RECORD DETECTION VIDEO INFORMATION
ANALYZE DETECTION VIDEO INFORMATION AND MAKE DETERMINATION
S004
(S014)
S005
HAS PREDETERMINED EVENT OCCURRED?
Y
N
S006
NOTIFY TO NOTIFICATION MODULE
S008
REMOVE RECORDED DETECTION VIDEO INFORMATION
S007
STORE EVENT DETECTION VIDEO INFORMATION PREFERENTIALLY
END

FIG. 9

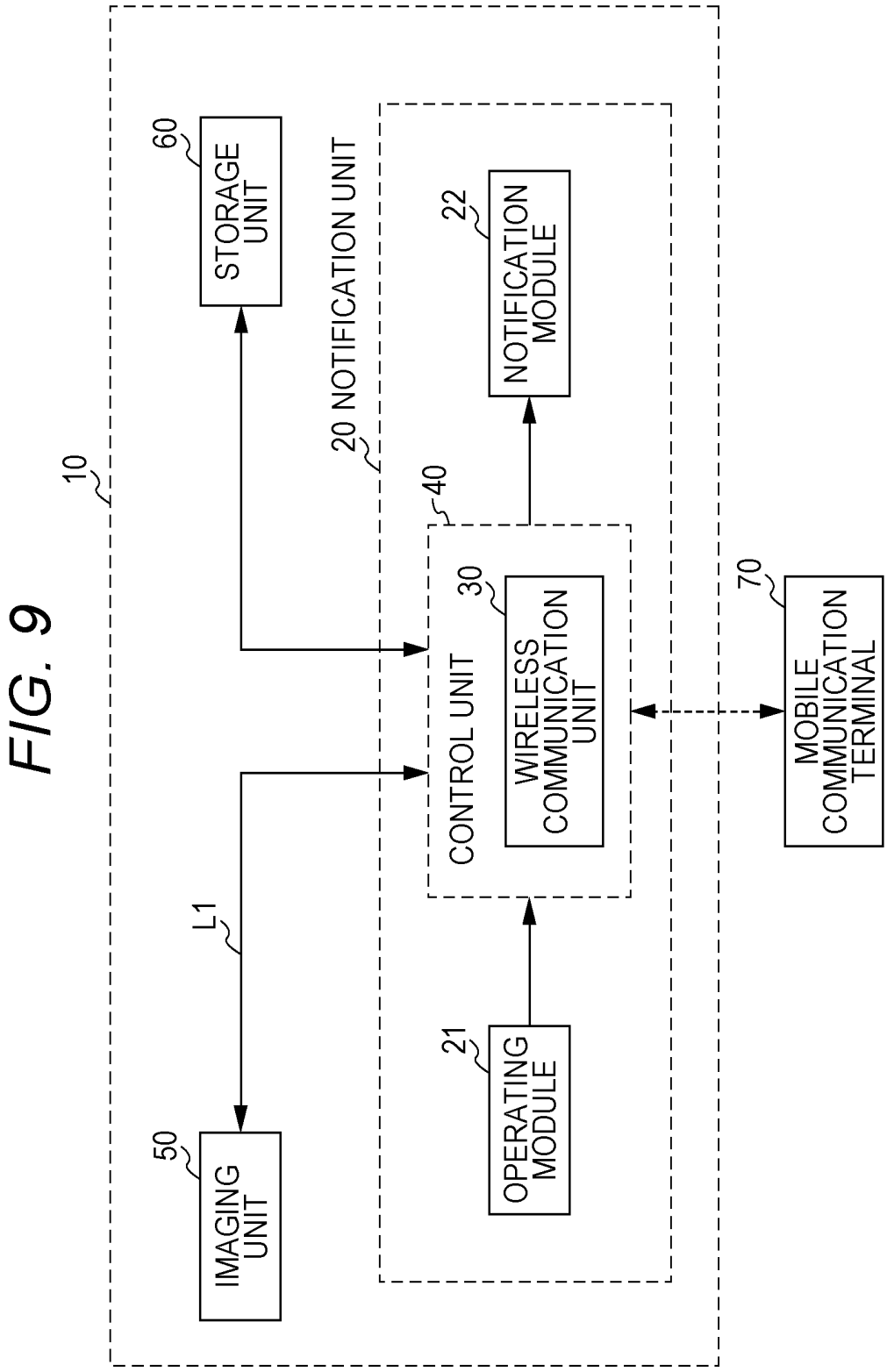

10
60
STORAGE UNIT
20 NOTIFICATION UNIT
22
NOTIFICATION MODULE
40
CONTROL UNIT
30
WIRELESS COMMUNICATION UNIT
70
MOBILE COMMUNICATION TERMINAL
L1
50
IMAGING UNIT
21
OPERATING MODULE

FIG. 10

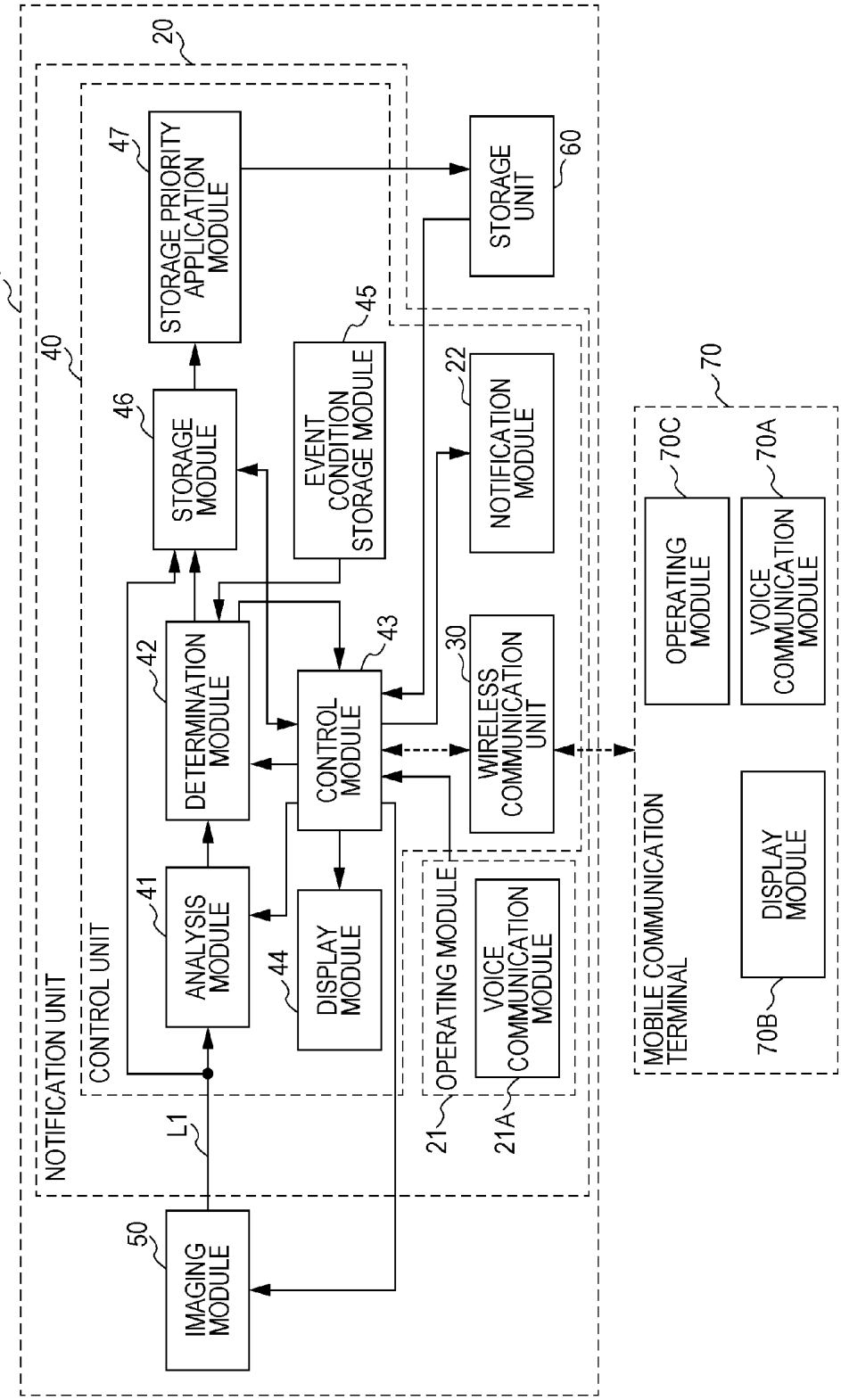

10
20
40
NOTIFICATION UNIT
CONTROL UNIT
47
STORAGE PRIORITY APPLICATION MODULE
60
STORAGE UNIT
45
EVENT CONDITION STORAGE MODULE
46
STORAGE MODULE
22
NOTIFICATION MODULE
42
DETERMINATION MODULE
43
CONTROL MODULE
30
WIRELESS COMMUNICATION UNIT
41
ANALYSIS MODULE
44
DISPLAY MODULE
OPERATING MODULE
VOICE COMMUNICATION MODULE
21
21A
L1
50
IMAGING MODULE
70
MOBILE COMMUNICATION TERMINAL
70C
OPERATING MODULE
70A
VOICE COMMUNICATION MODULE
DISPLAY MODULE
70B

FIG. 11

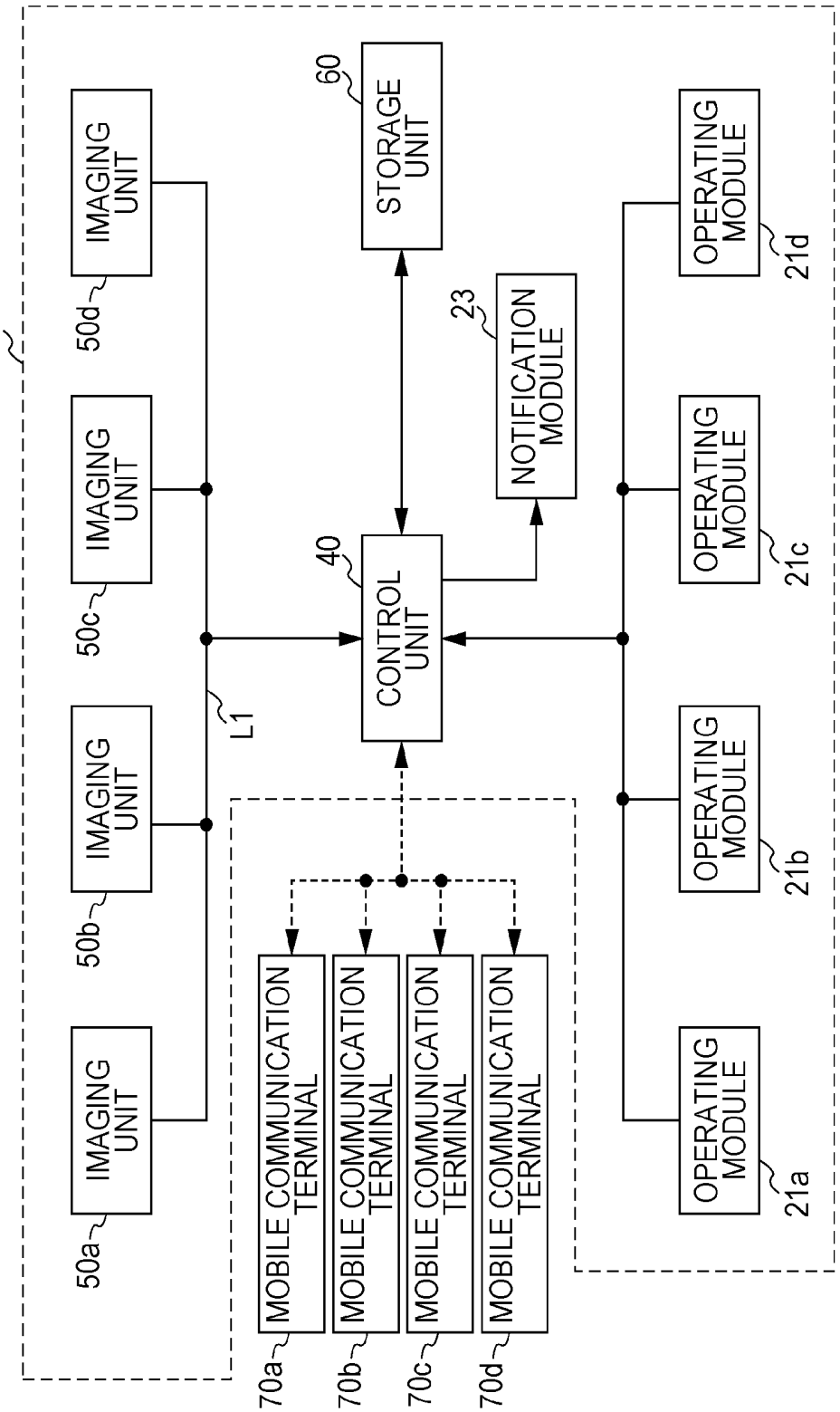

10
IMAGING UNIT
50a
IMAGING UNIT
50b
IMAGING UNIT
50c
IMAGING UNIT
50d
L1
CONTROL UNIT
40
STORAGE UNIT
60
NOTIFICATION MODULE
23
OPERATING MODULE
21a
OPERATING MODULE
21b
OPERATING MODULE
21c
OPERATING MODULE
21d
MOBILE COMMUNICATION TERMINAL
70a
MOBILE COMMUNICATION TERMINAL
70b
MOBILE COMMUNICATION TERMINAL
70c
MOBILE COMMUNICATION TERMINAL
70d

FIG. 12

SICKBED NUMBER	IMAGING UNIT UID	OPERATING MODULE UID	MOBILE INFORMATION TERMINAL UID	...
1	50	70	110	
2	51	71	111	
3	52	72	112	
4	53	73	113	
⋮				

FIG. 13

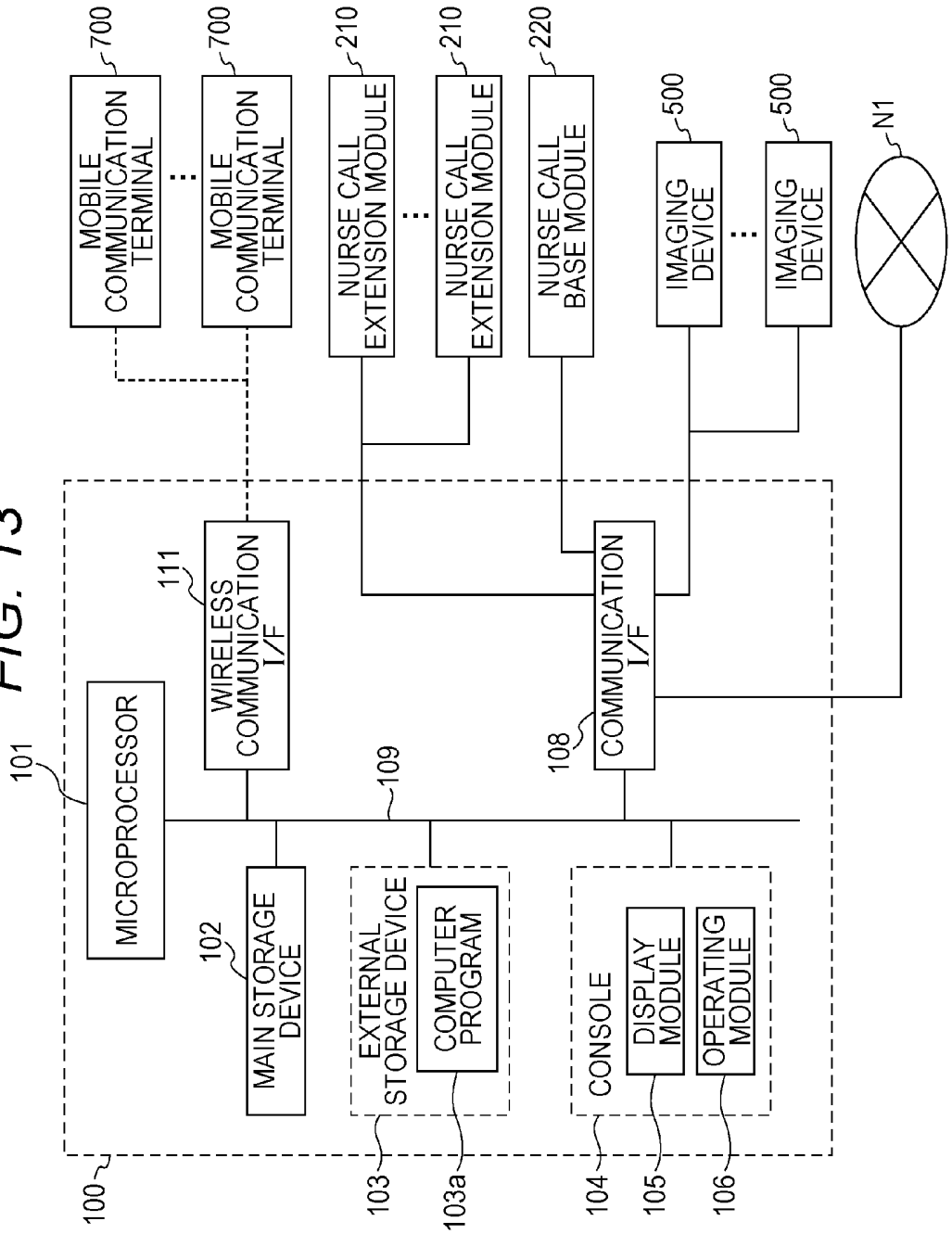

MOBILE COMMUNICATION TERMINAL
700
MOBILE COMMUNICATION TERMINAL
700
NURSE CALL EXTENSION MODULE
210
NURSE CALL EXTENSION MODULE
210
NURSE CALL BASE MODULE
220
IMAGING DEVICE
500
IMAGING DEVICE
500
N1
WIRELESS COMMUNICATION I/F
111
COMMUNICATION I/F
108
MICROPROCESSOR
101
109
MAIN STORAGE DEVICE
102
EXTERNAL STORAGE DEVICE
COMPUTER PROGRAM
CONSOLE
DISPLAY MODULE
OPERATING MODULE
100
103
103a
104
105
106

FIG. 14

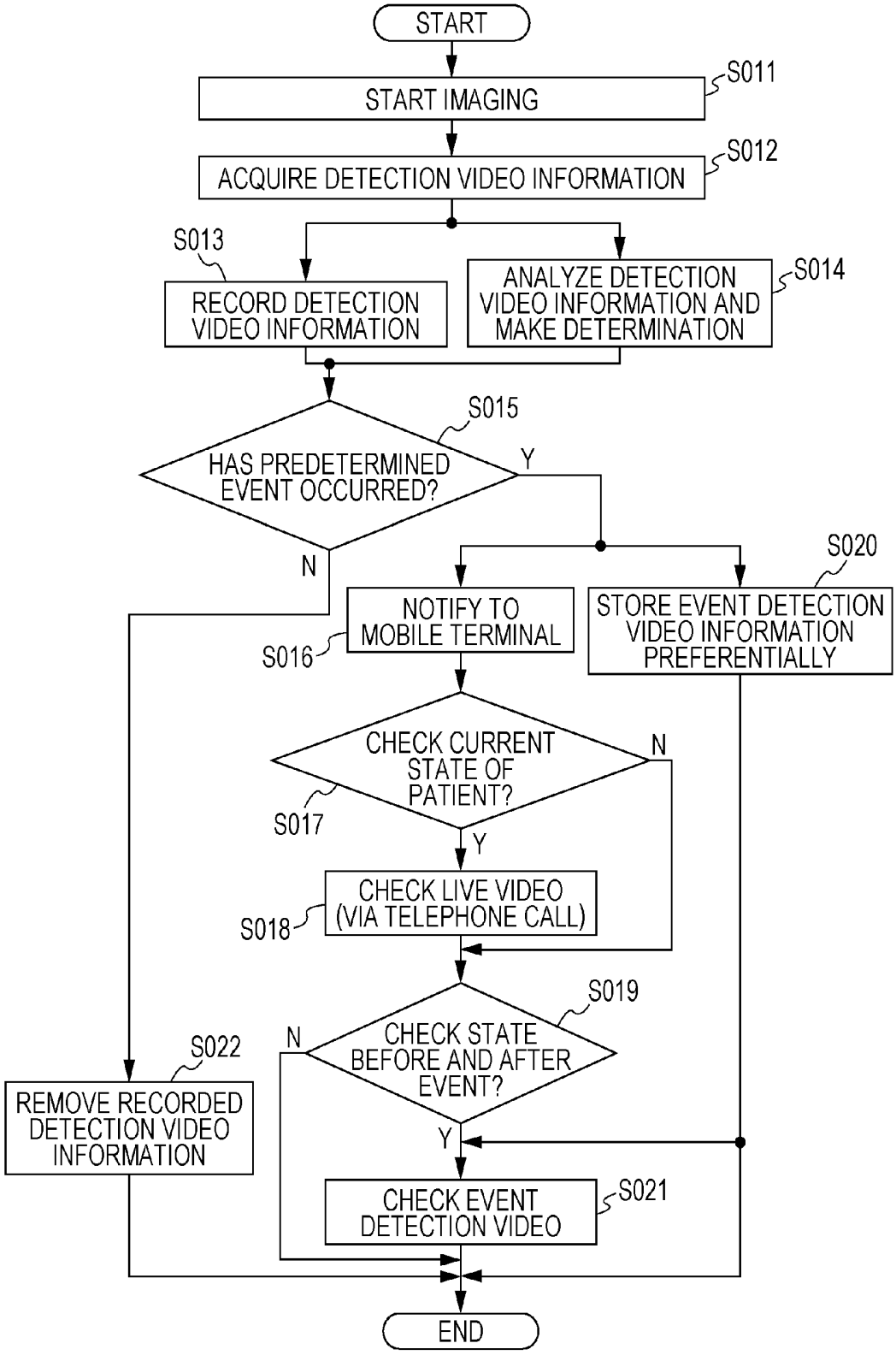

START
START IMAGING
S011
ACQUIRE DETECTION VIDEO INFORMATION
S012
S013
RECORD DETECTION VIDEO INFORMATION
ANALYZE DETECTION VIDEO INFORMATION AND MAKE DETERMINATION
S014
S015
HAS PREDETERMINED EVENT OCCURRED?
Y
N
S020
NOTIFY TO MOBILE TERMINAL
S016
STORE EVENT DETECTION VIDEO INFORMATION PREFERENTIALLY
CHECK CURRENT STATE OF PATIENT?
N
S017
Y
CHECK LIVE VIDEO (VIA TELEPHONE CALL)
S018
S019
N
CHECK STATE BEFORE AND AFTER EVENT?
S022
REMOVE RECORDED DETECTION VIDEO INFORMATION
Y
CHECK EVENT DETECTION VIDEO
S021
END

FIG. 15

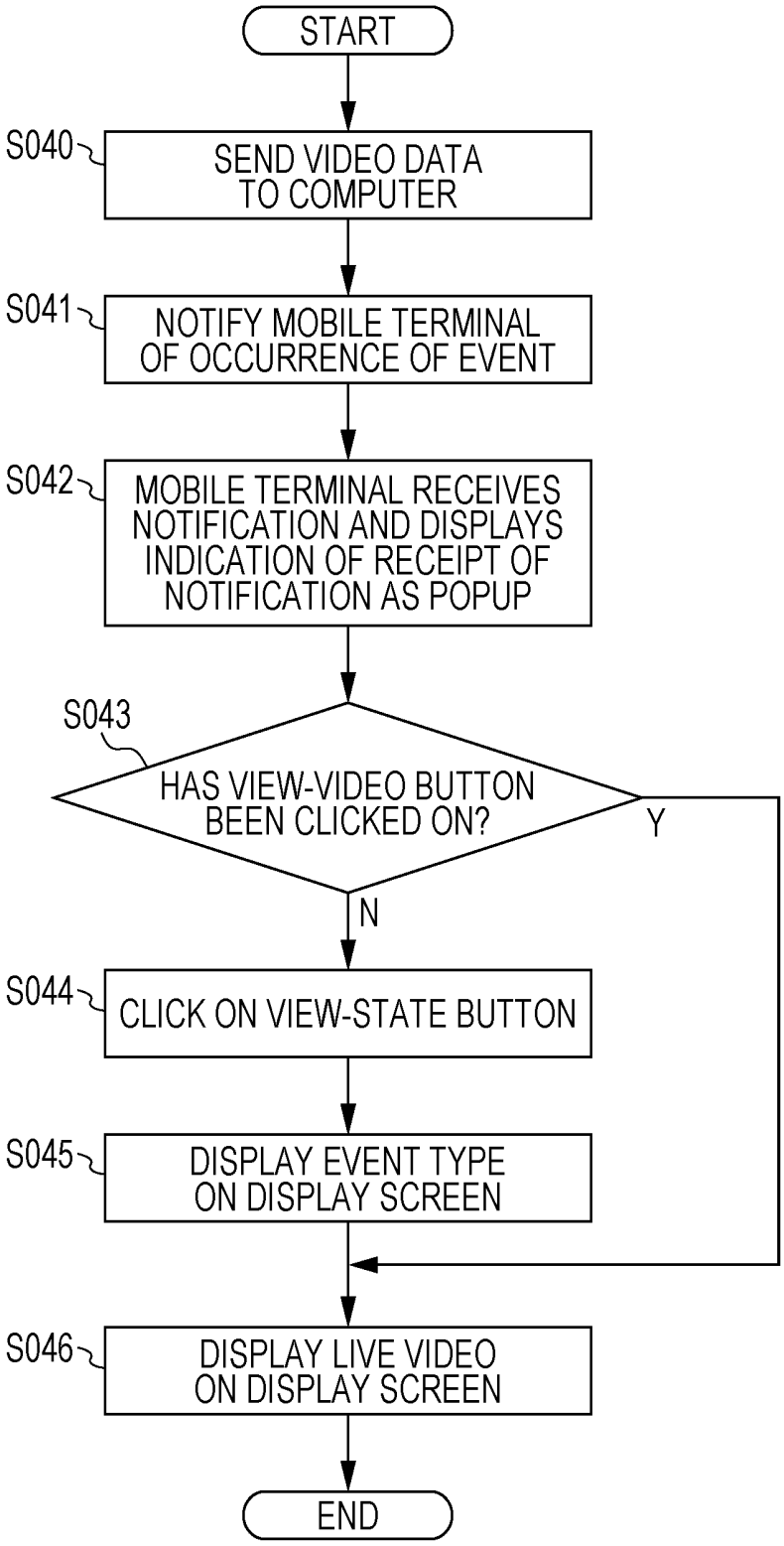

START
S040
SEND VIDEO DATA TO COMPUTER
S041
NOTIFY MOBILE TERMINAL OF OCCURRENCE OF EVENT
S042
MOBILE TERMINAL RECEIVES NOTIFICATION AND DISPLAYS INDICATION OF RECEIPT OF NOTIFICATION AS POPUP
S043
HAS VIEW-VIDEO BUTTON BEEN CLICKED ON?
Y
N
S044
CLICK ON VIEW-STATE BUTTON
S045
DISPLAY EVENT TYPE ON DISPLAY SCREEN
S046
DISPLAY LIVE VIDEO ON DISPLAY SCREEN
END

FIG. 16

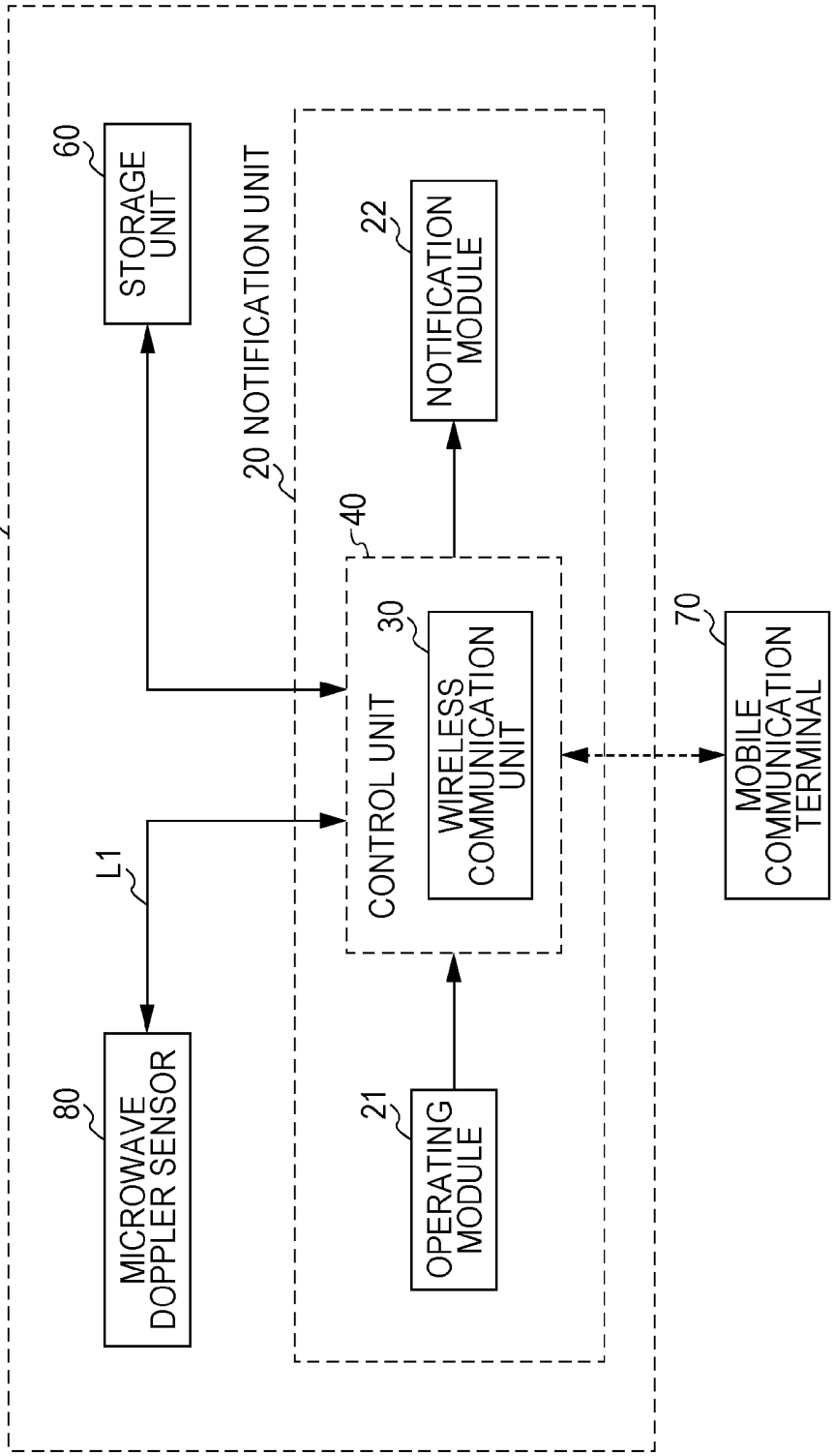

10
60
STORAGE UNIT
20 NOTIFICATION UNIT
22
NOTIFICATION MODULE
40
CONTROL UNIT
30
WIRELESS COMMUNICATION UNIT
70
MOBILE COMMUNICATION TERMINAL
L1
80
MICROWAVE DOPPLER SENSOR
21
OPERATING MODULE

FIG. 17

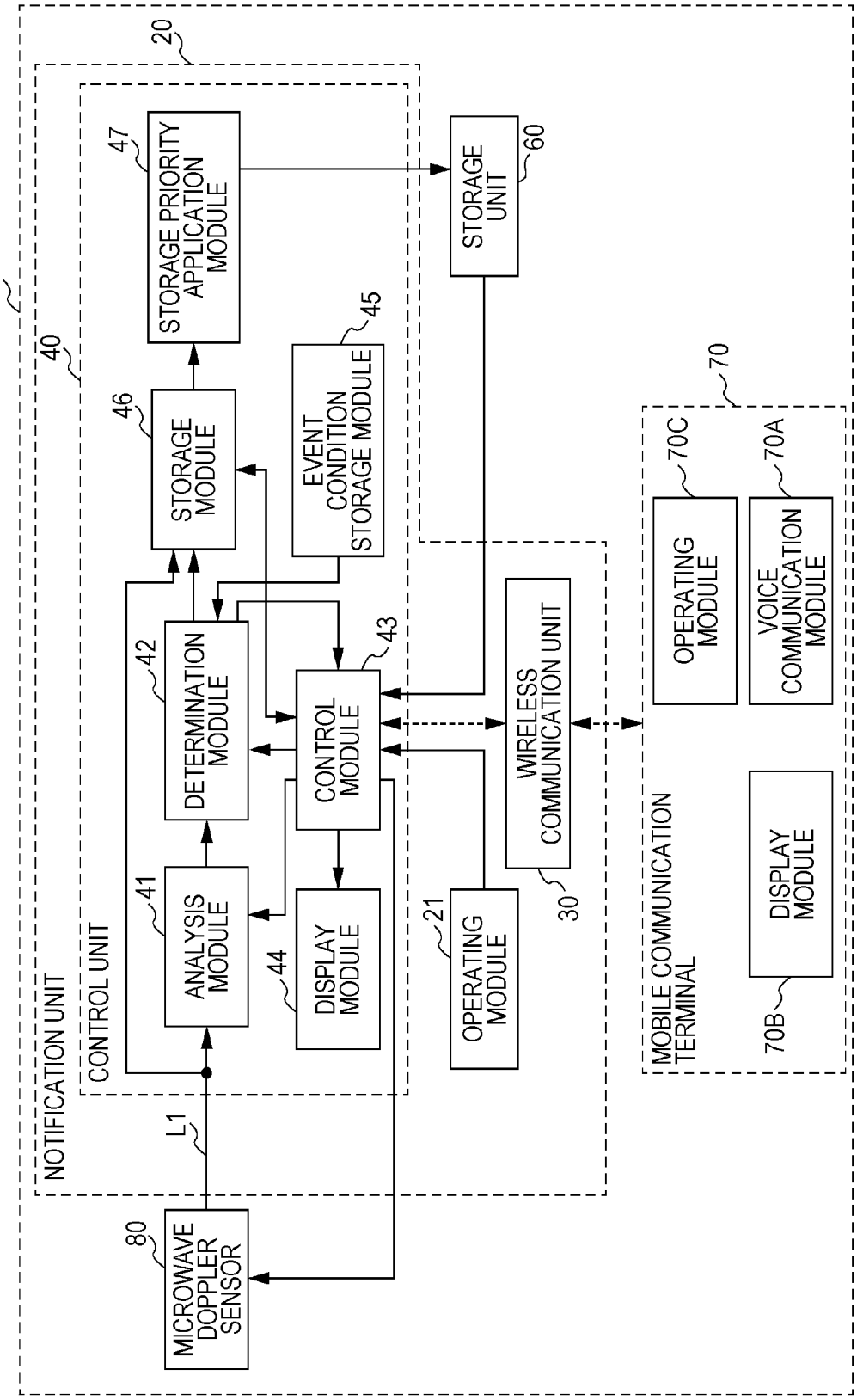

10
20
NOTIFICATION UNIT
CONTROL UNIT
40
47
STORAGE PRIORITY APPLICATION MODULE
STORAGE UNIT
60
45
EVENT CONDITION STORAGE MODULE
46
STORAGE MODULE
70
70C
OPERATING MODULE
70A
VOICE COMMUNICATION MODULE
42
DETERMINATION MODULE
43
CONTROL MODULE
WIRELESS COMMUNICATION UNIT
41
ANALYSIS MODULE
44
DISPLAY MODULE
21
OPERATING MODULE
30
MOBILE COMMUNICATION TERMINAL
DISPLAY MODULE
70B
L1
80
MICROWAVE DOPPLER SENSOR

FIG. 18

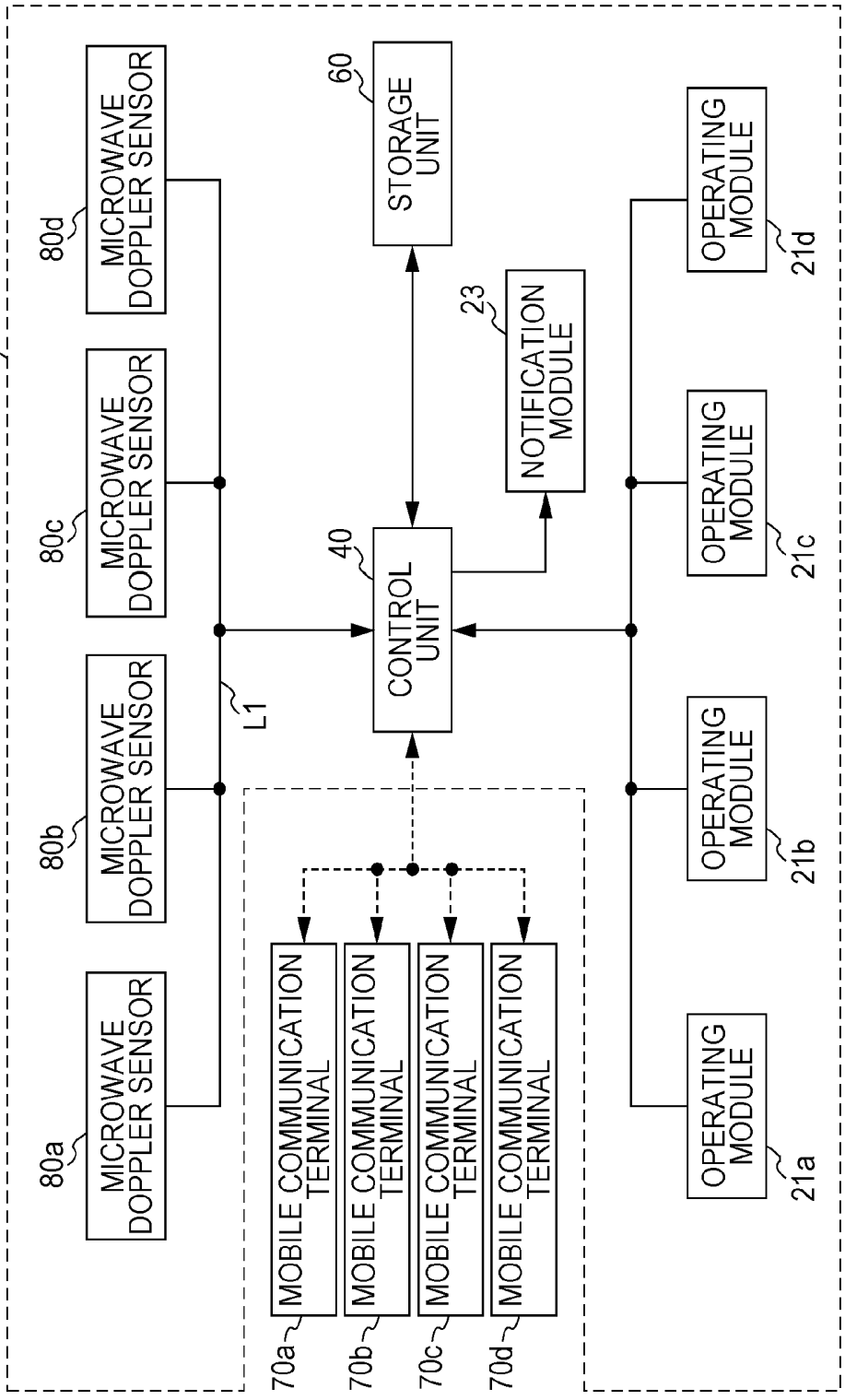

10
80a
MICROWAVE DOPPLER SENSOR
80b
MICROWAVE DOPPLER SENSOR
80c
MICROWAVE DOPPLER SENSOR
80d
MICROWAVE DOPPLER SENSOR
L1
40
CONTROL UNIT
60
STORAGE UNIT
23
NOTIFICATION MODULE
70a
MOBILE COMMUNICATION TERMINAL
70b
MOBILE COMMUNICATION TERMINAL
70c
MOBILE COMMUNICATION TERMINAL
70d
MOBILE COMMUNICATION TERMINAL
21a
OPERATING MODULE
21b
OPERATING MODULE
21c
OPERATING MODULE
21d
OPERATING MODULE

FIG. 19

SICKBED NUMBER	MICROWAVE DOPPLER SENSOR UID	OPERATING MODULE UID	MOBILE INFORMATION TERMINAL UID	...
1	80	70	110	
2	81	71	111	
3	82	72	112	
4	83	73	113	
⋮				

FIG. 20

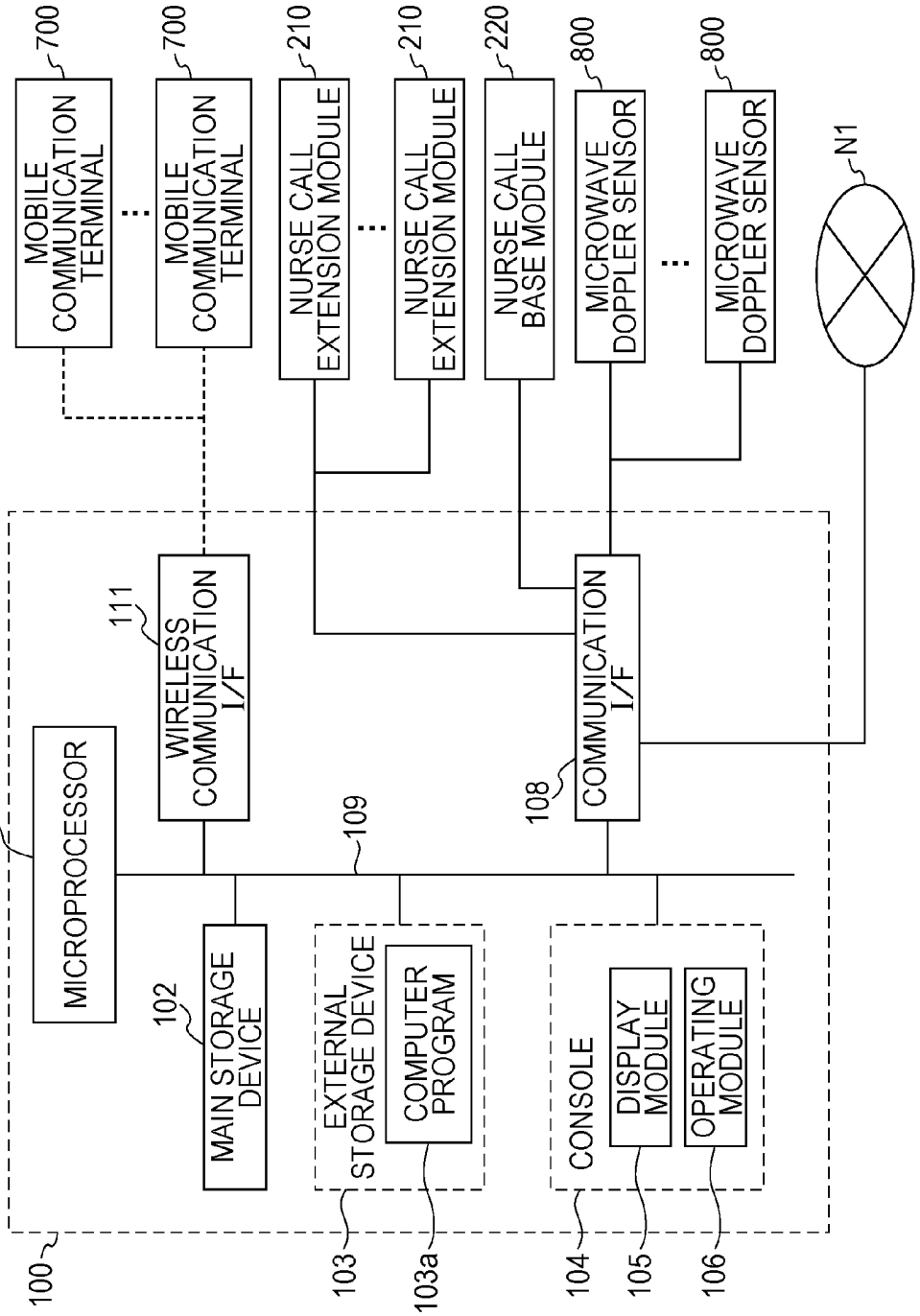

MOBILE COMMUNICATION TERMINAL
700
MOBILE COMMUNICATION TERMINAL
700
NURSE CALL EXTENSION MODULE
210
NURSE CALL EXTENSION MODULE
210
NURSE CALL BASE MODULE
220
MICROWAVE DOPPLER SENSOR
800
MICROWAVE DOPPLER SENSOR
800
N1
WIRELESS COMMUNICATION I/F
111
COMMUNICATION I/F
108
MICROPROCESSOR
101
109
MAIN STORAGE DEVICE
102
EXTERNAL STORAGE DEVICE
COMPUTER PROGRAM
CONSOLE
DISPLAY MODULE
OPERATING MODULE
100
103
103a
104
105
106

FIG. 21

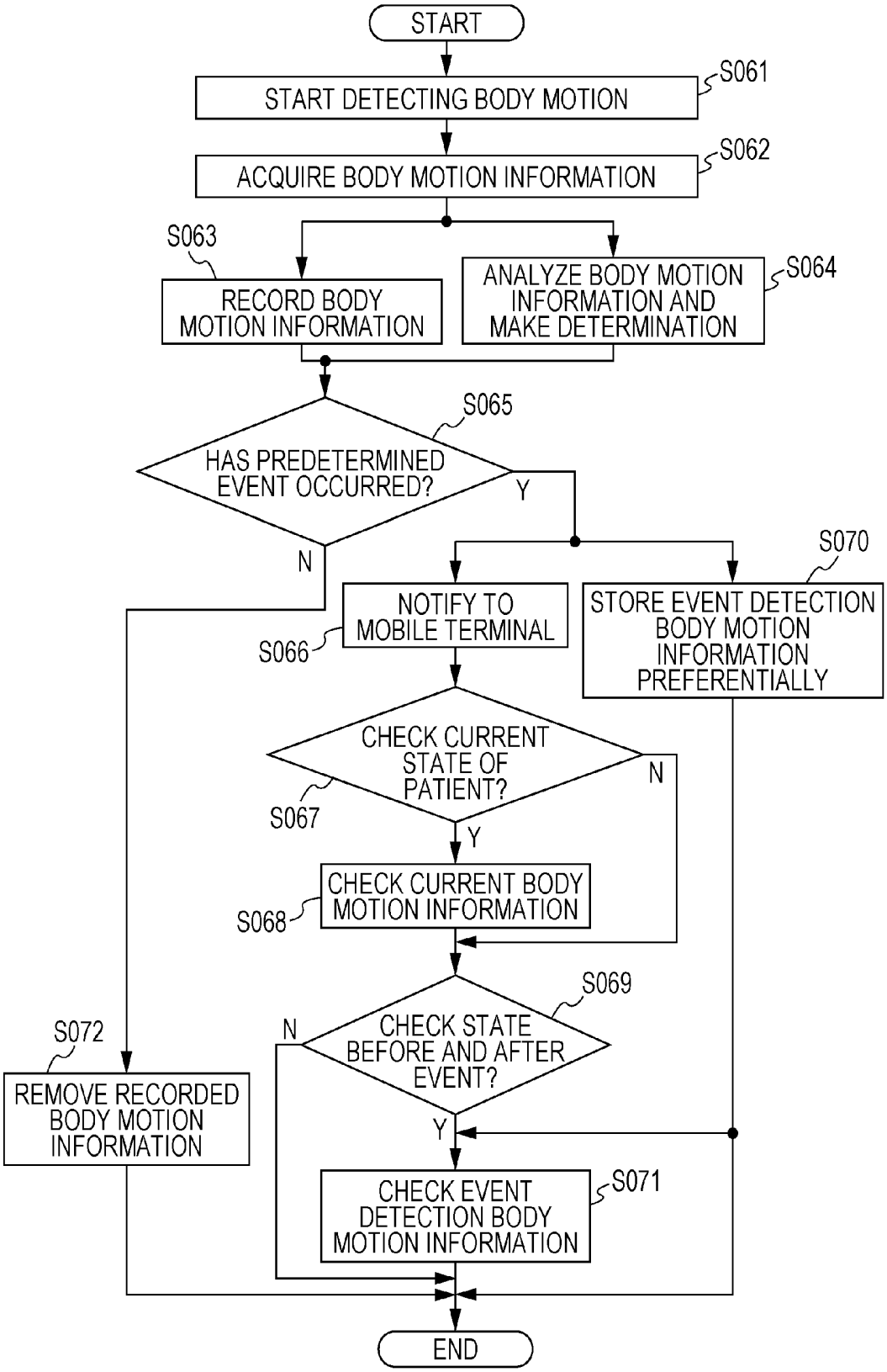

START
START DETECTING BODY MOTION
S061
ACQUIRE BODY MOTION INFORMATION
S062
S063
RECORD BODY MOTION INFORMATION
ANALYZE BODY MOTION INFORMATION AND MAKE DETERMINATION
S064
S065
HAS PREDETERMINED EVENT OCCURRED?
Y
N
S070
NOTIFY TO MOBILE TERMINAL
S066
STORE EVENT DETECTION BODY MOTION INFORMATION PREFERENTIALLY
CHECK CURRENT STATE OF PATIENT?
S067
N
Y
CHECK CURRENT BODY MOTION INFORMATION
S068
S069
N
CHECK STATE BEFORE AND AFTER EVENT?
Y
S072
REMOVE RECORDED BODY MOTION INFORMATION
CHECK EVENT DETECTION BODY MOTION INFORMATION
S071
END

FIG. 22

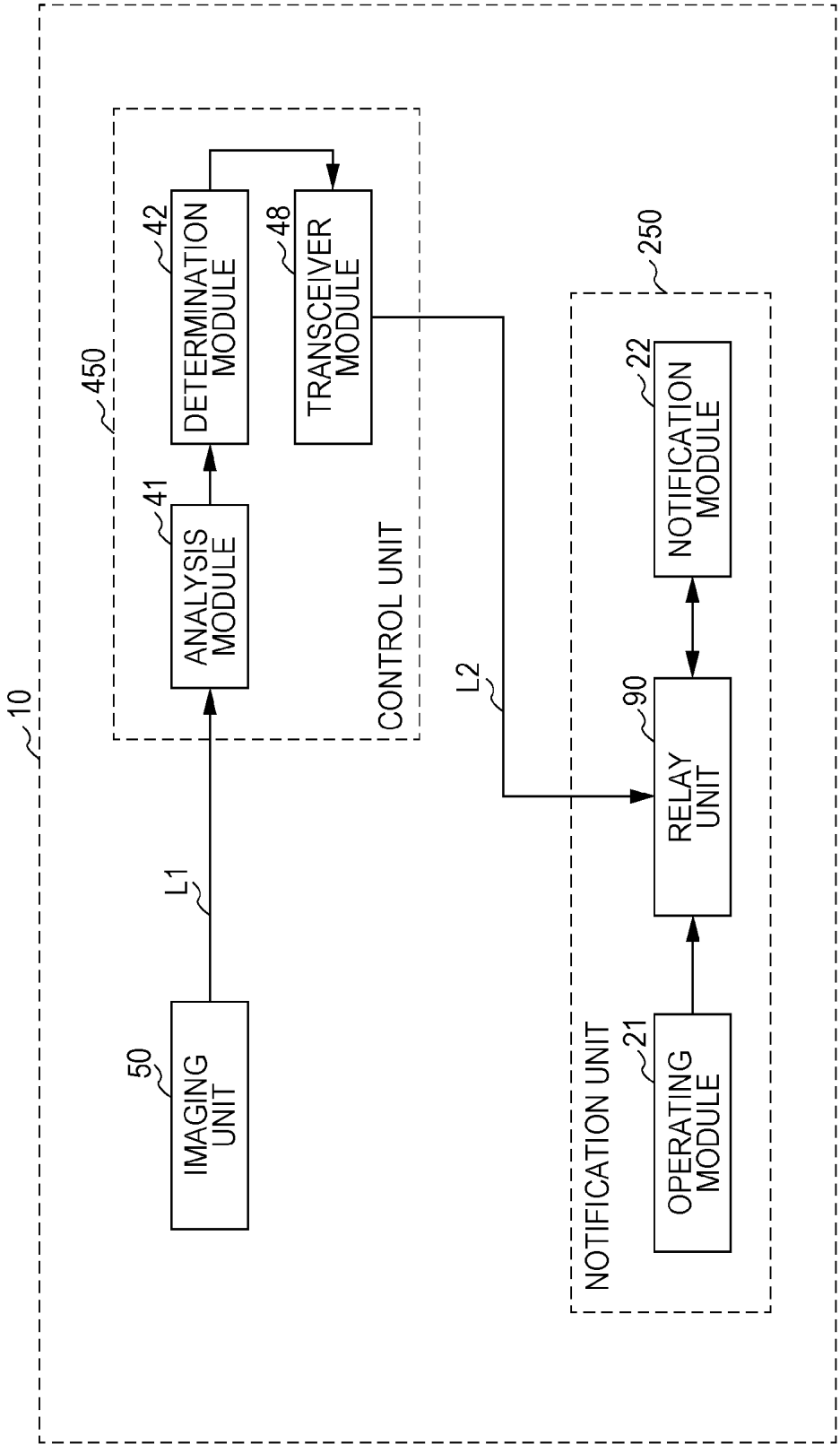

10
450
CONTROL UNIT
42
DETERMINATION MODULE
48
TRANSCEIVER MODULE
41
ANALYSIS MODULE
50
IMAGING UNIT
L1
L2
250
NOTIFICATION UNIT
22
NOTIFICATION MODULE
90
RELAY UNIT
21
OPERATING MODULE

FIG. 23

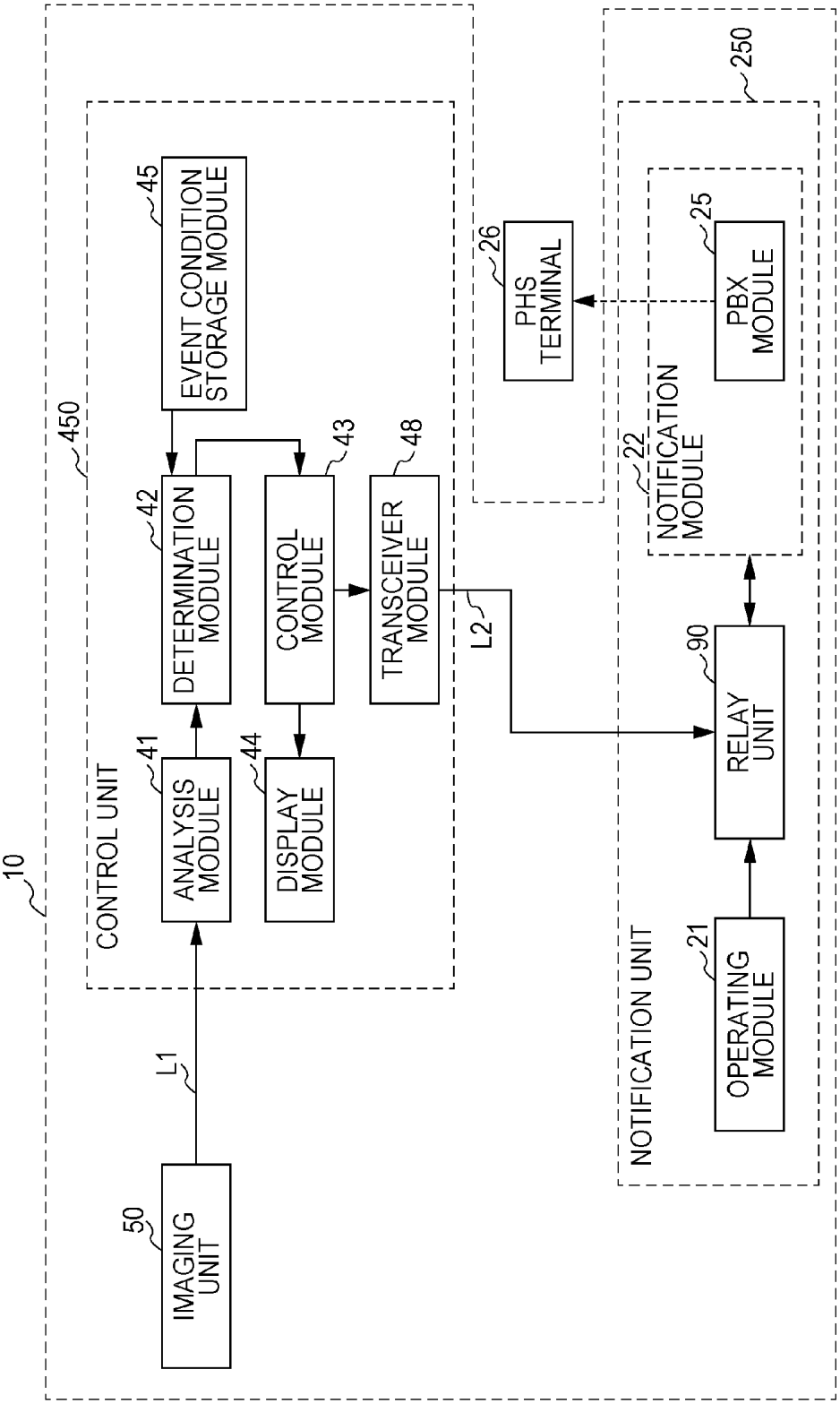

10
CONTROL UNIT
450
ANALYSIS MODULE
41
DETERMINATION MODULE
42
DISPLAY MODULE
44
CONTROL MODULE
43
TRANSCEIVER MODULE
48
EVENT CONDITION STORAGE MODULE
45
IMAGING UNIT
50
L1
L2
PHS TERMINAL
26
NOTIFICATION UNIT
250
NOTIFICATION MODULE
22
PBX MODULE
25
RELAY UNIT
90
OPERATING MODULE
21

FIG. 24

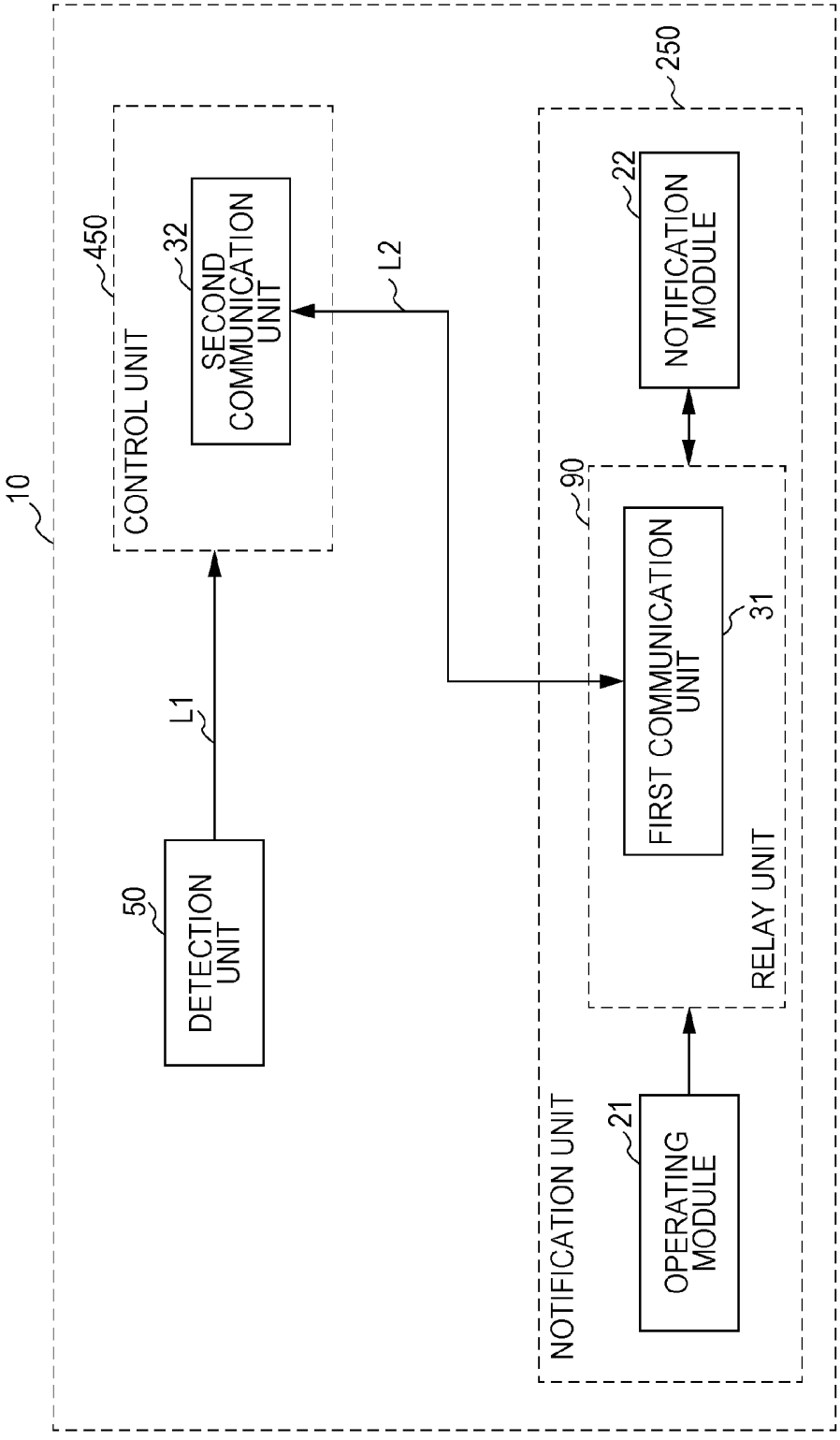

10
CONTROL UNIT
450
SECOND COMMUNICATION UNIT
32
L2
250
NOTIFICATION MODULE
22
90
FIRST COMMUNICATION UNIT
31
RELAY UNIT
L1
DETECTION UNIT
50
NOTIFICATION UNIT
OPERATING MODULE
21

FIG. 25

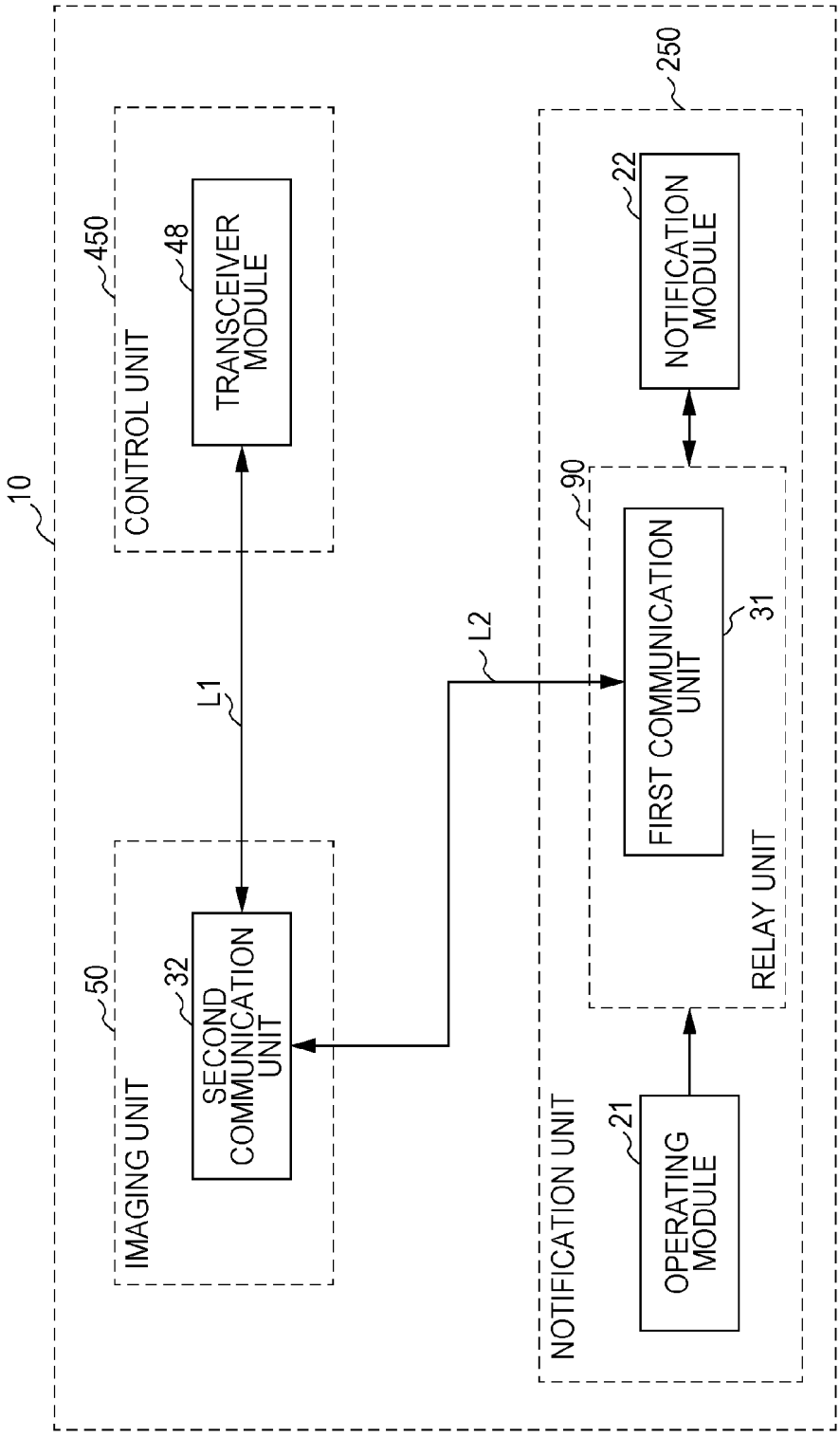

10
CONTROL UNIT
450
TRANSCEIVER MODULE
48
L1
IMAGING UNIT
50
SECOND COMMUNICATION UNIT
32
L2
NOTIFICATION UNIT
250
NOTIFICATION MODULE
22
RELAY UNIT
90
FIRST COMMUNICATION UNIT
31
OPERATING MODULE
21

FIG. 26

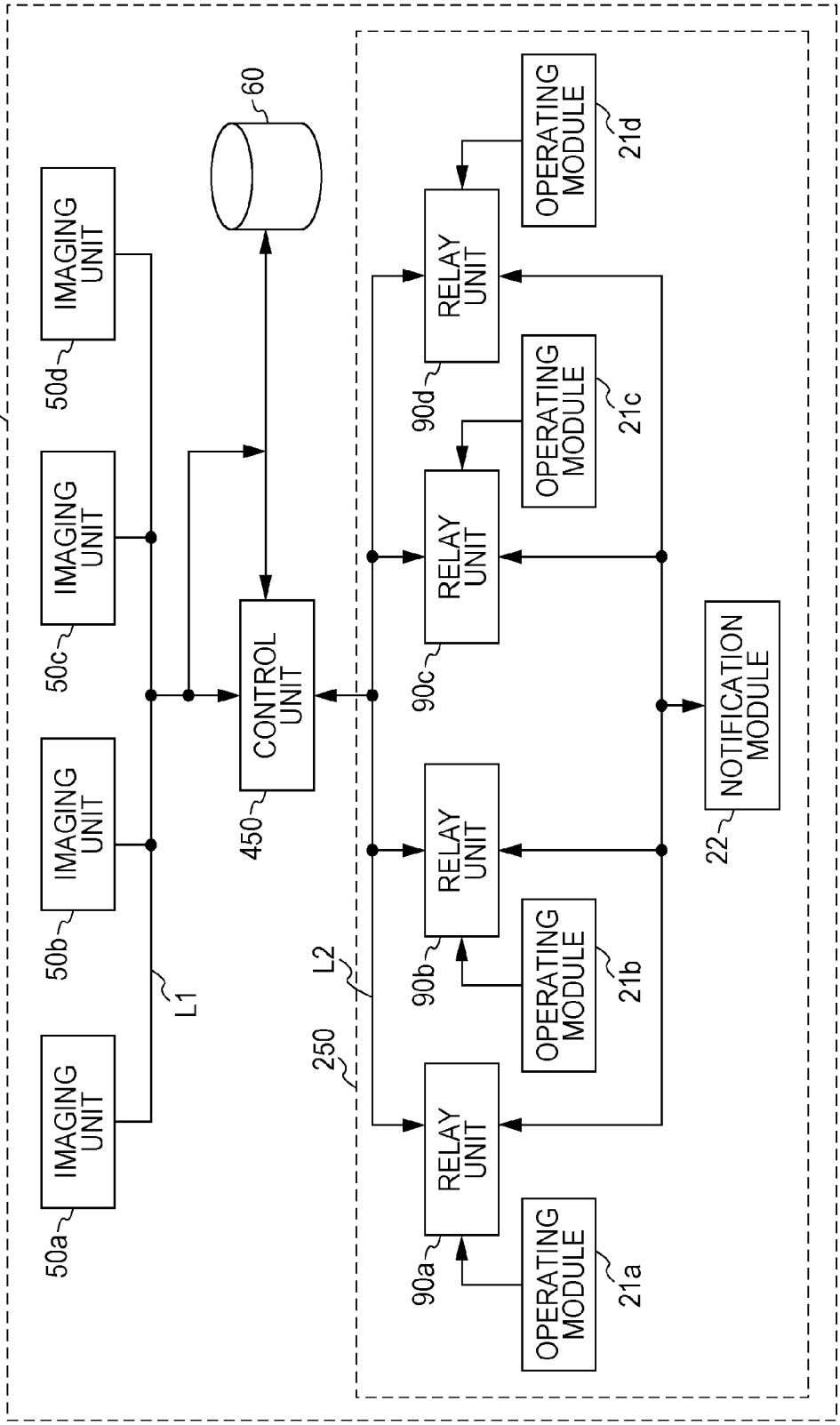

10
60
IMAGING UNIT
50d
IMAGING UNIT
50c
IMAGING UNIT
50b
IMAGING UNIT
50a
L1
CONTROL UNIT
450
L2
250
RELAY UNIT
90d
RELAY UNIT
90c
RELAY UNIT
90b
RELAY UNIT
90a
OPERATING MODULE
21d
OPERATING MODULE
21c
OPERATING MODULE
21b
OPERATING MODULE
21a
NOTIFICATION MODULE
22

FIG. 27

SICKBED NUMBER	IMAGING UNIT UID	RELAY UNIT UID	OPERATING MODULE UID	...
1	50	60	70	
2	51	61	71	
3	52	62	72	
4	53	63	73	
⋮				

FIG. 28

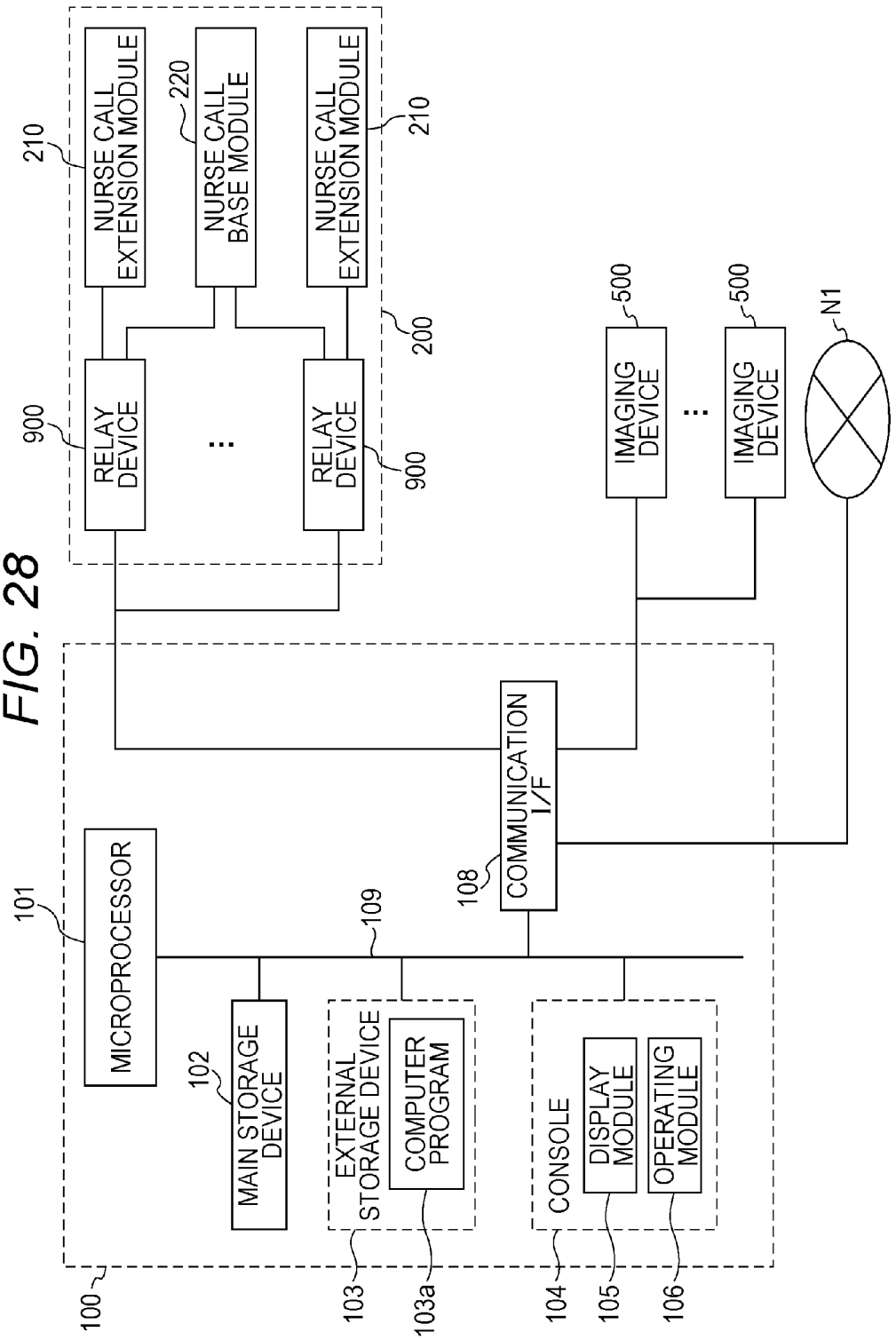

NURSE CALL EXTENSION MODULE
NURSE CALL BASE MODULE
NURSE CALL EXTENSION MODULE
210
220
210
200
RELAY DEVICE
RELAY DEVICE
900
900
IMAGING DEVICE
IMAGING DEVICE
500
500
N1
COMMUNICATION I/F
108
MICROPROCESSOR
101
109
MAIN STORAGE DEVICE
102
EXTERNAL STORAGE DEVICE
COMPUTER PROGRAM
CONSOLE
DISPLAY MODULE
OPERATING MODULE
100
103
103a
104
105
106

FIG. 29

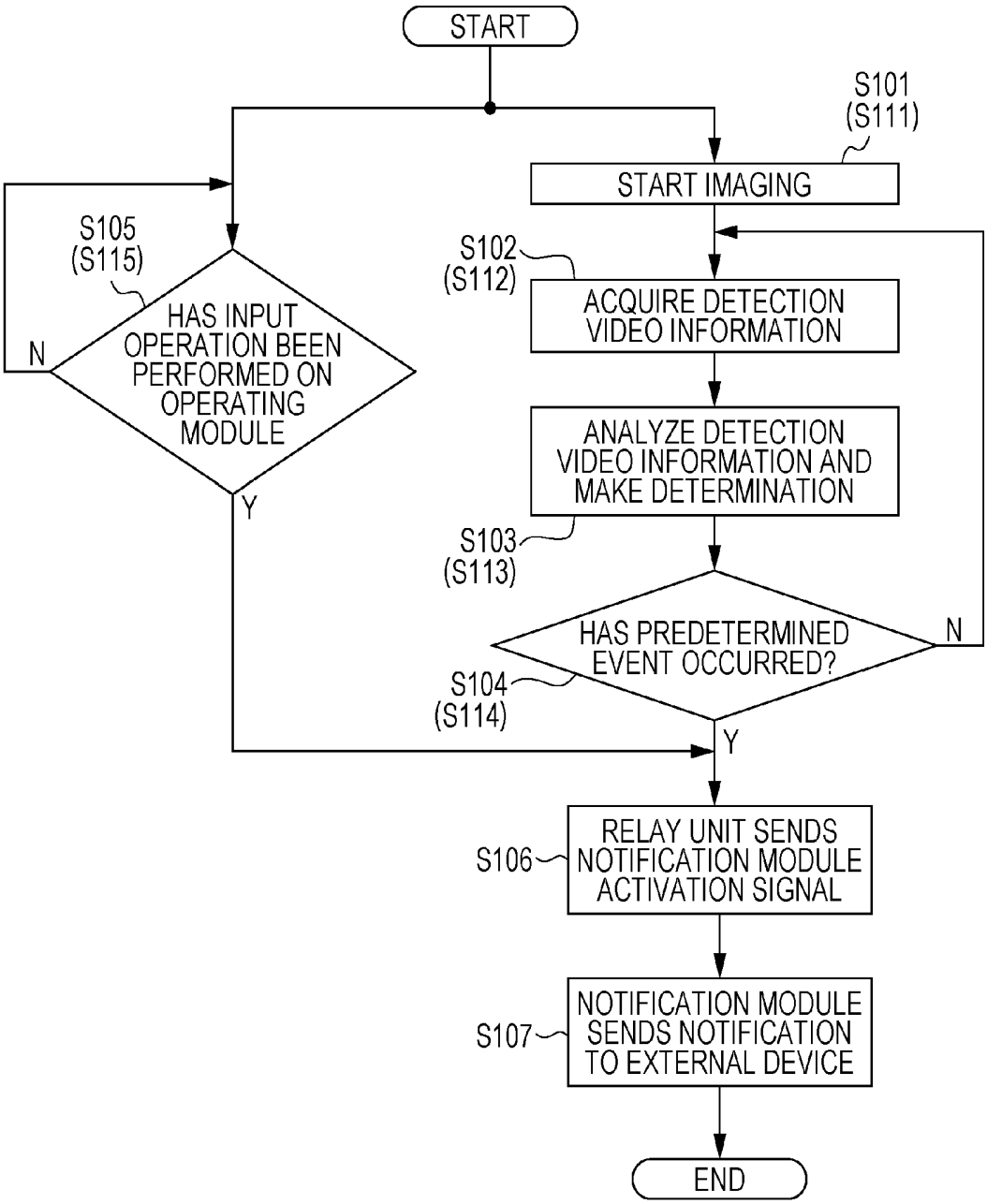

START
S101
(S111)
START IMAGING
S102
(S112)
ACQUIRE DETECTION VIDEO INFORMATION
ANALYZE DETECTION VIDEO INFORMATION AND MAKE DETERMINATION
S103
(S113)
HAS PREDETERMINED EVENT OCCURRED?
N
S104
(S114)
Y
S105
(S115)
HAS INPUT OPERATION BEEN PERFORMED ON OPERATING MODULE
N
Y
S106
RELAY UNIT SENDS NOTIFICATION MODULE ACTIVATION SIGNAL
S107
NOTIFICATION MODULE SENDS NOTIFICATION TO EXTERNAL DEVICE
END

FIG. 30

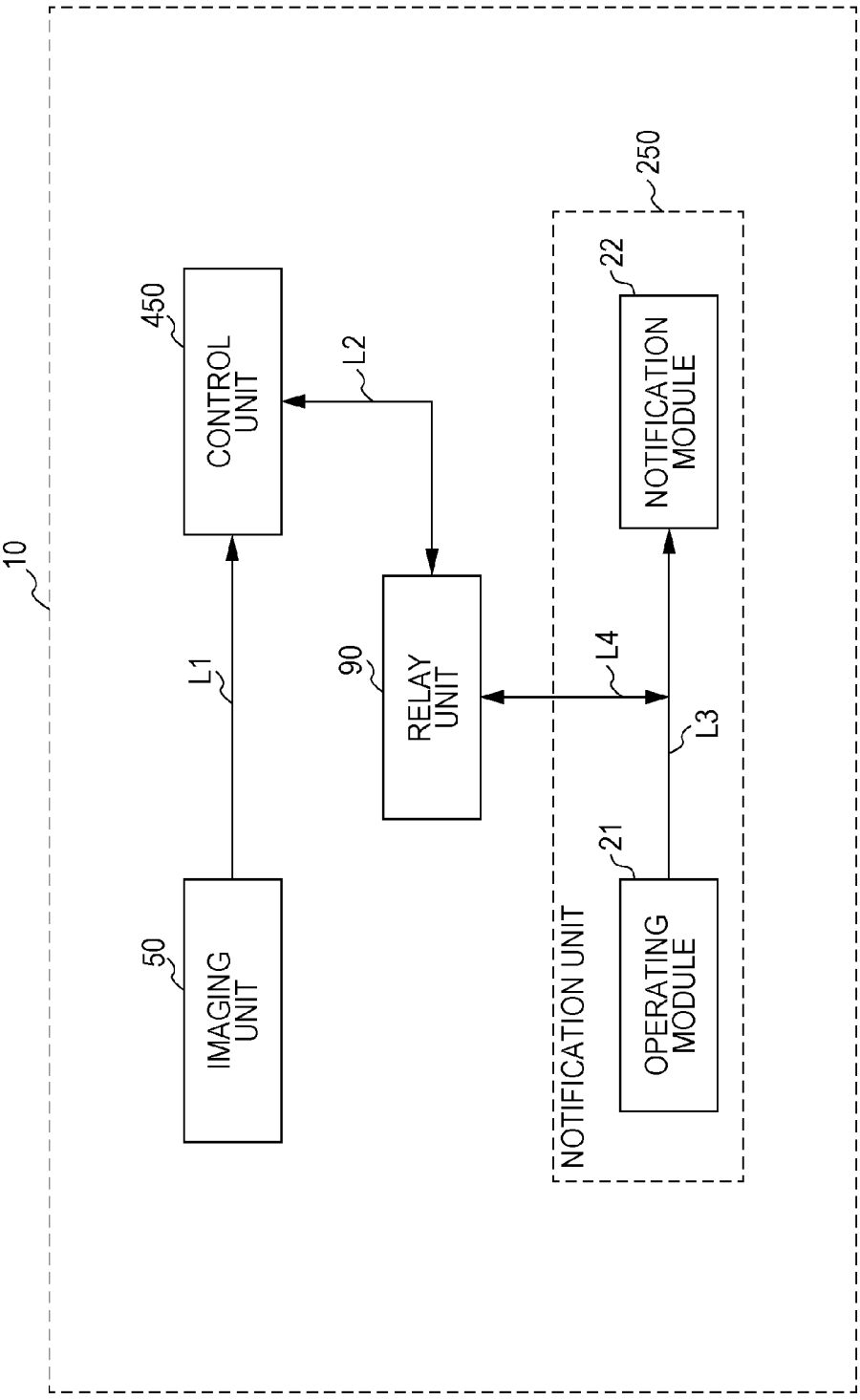

10
450
CONTROL UNIT
L2
22
NOTIFICATION MODULE
250
L1
90
RELAY UNIT
L4
L3
50
IMAGING UNIT
21
OPERATING MODULE
NOTIFICATION UNIT

FIG. 31

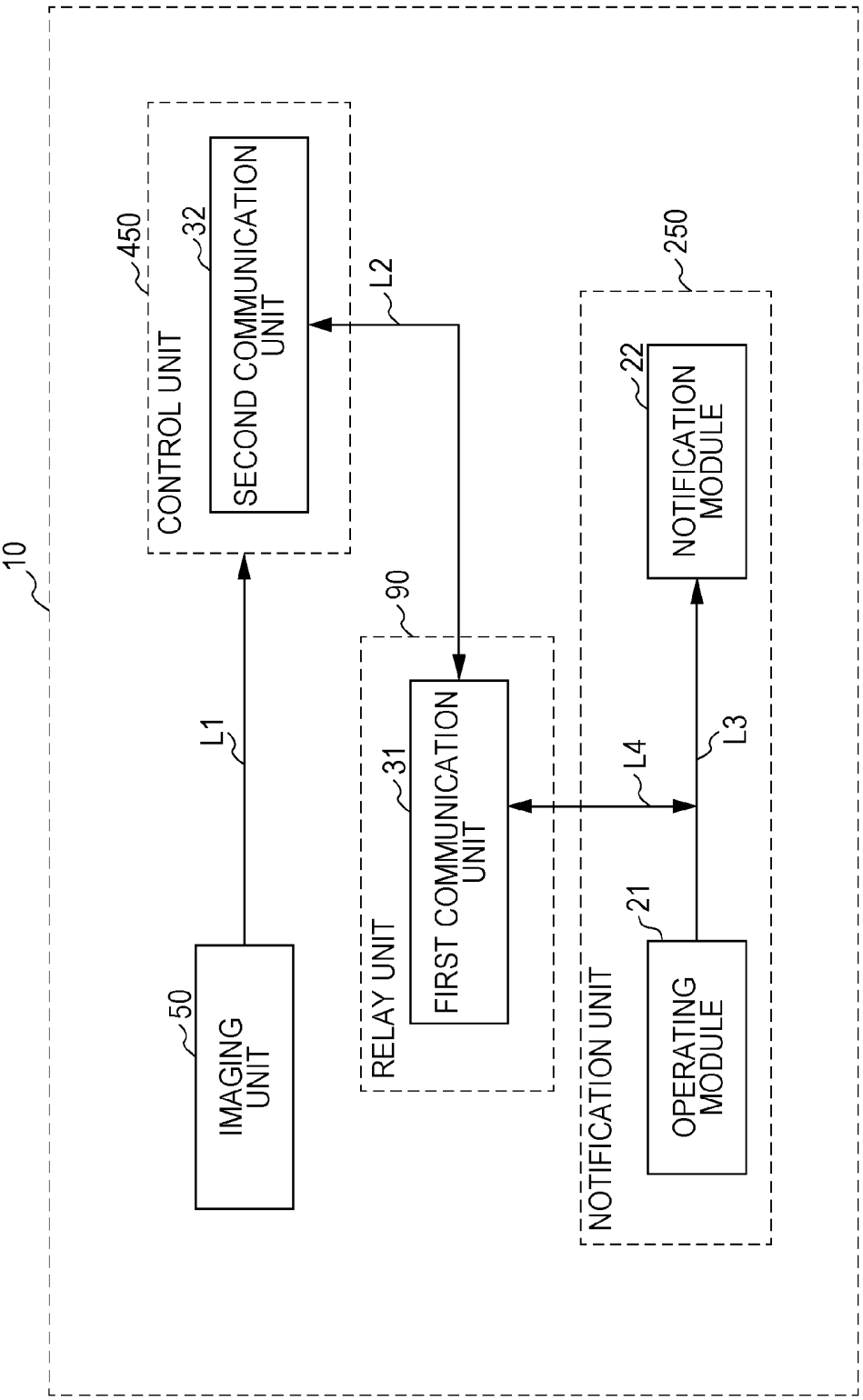

10
CONTROL UNIT
450
SECOND COMMUNICATION UNIT
32
L2
250
NOTIFICATION MODULE
22
90
RELAY UNIT
FIRST COMMUNICATION UNIT
31
L1
L4
L3
IMAGING UNIT
50
NOTIFICATION UNIT
OPERATING MODULE
21

FIG. 32

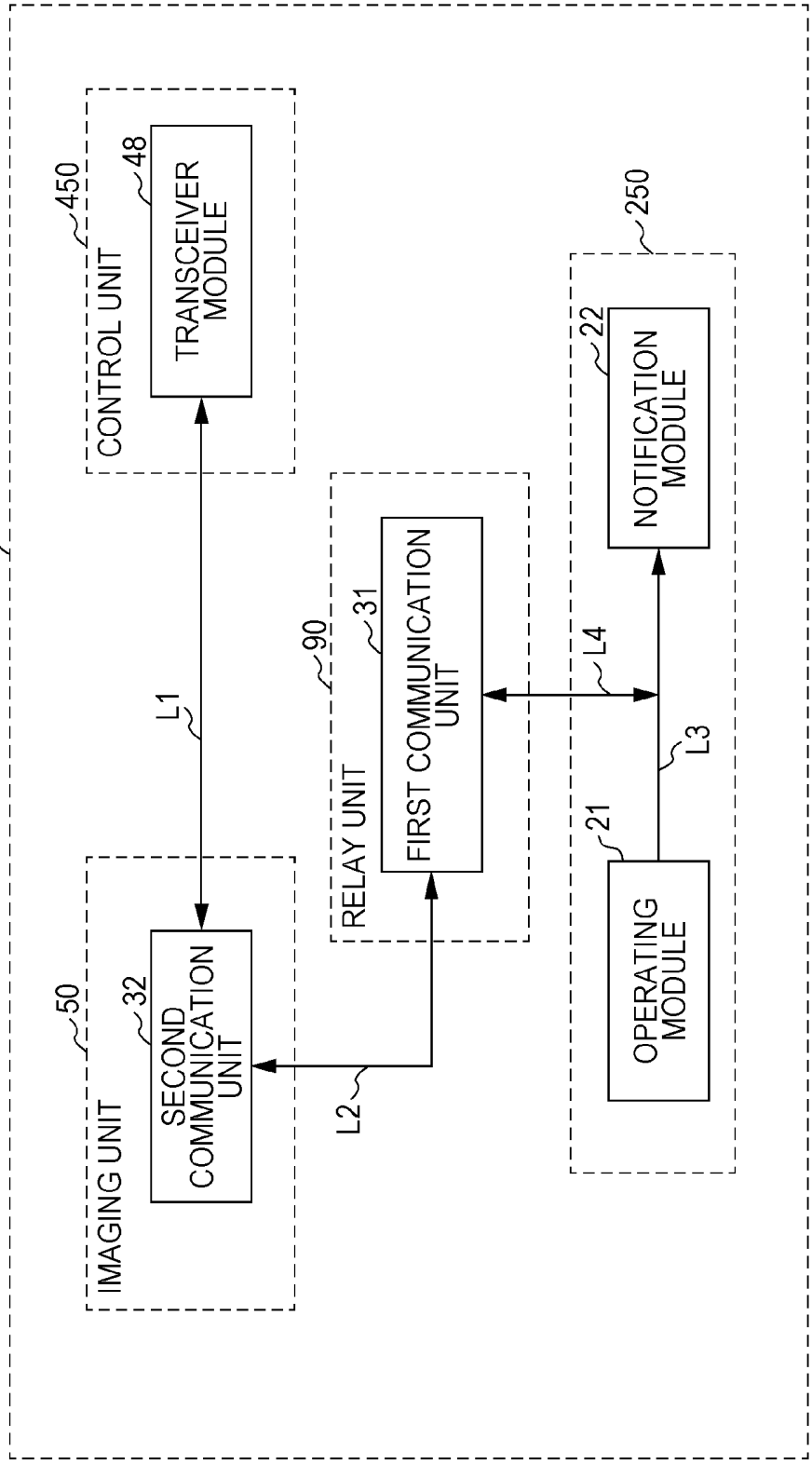

10
450
CONTROL UNIT
48
TRANSCEIVER MODULE
L1
50
IMAGING UNIT
32
SECOND COMMUNICATION UNIT
L2
90
RELAY UNIT
31
FIRST COMMUNICATION UNIT
L4
L3
250
22
NOTIFICATION MODULE
21
OPERATING MODULE

FIG. 33

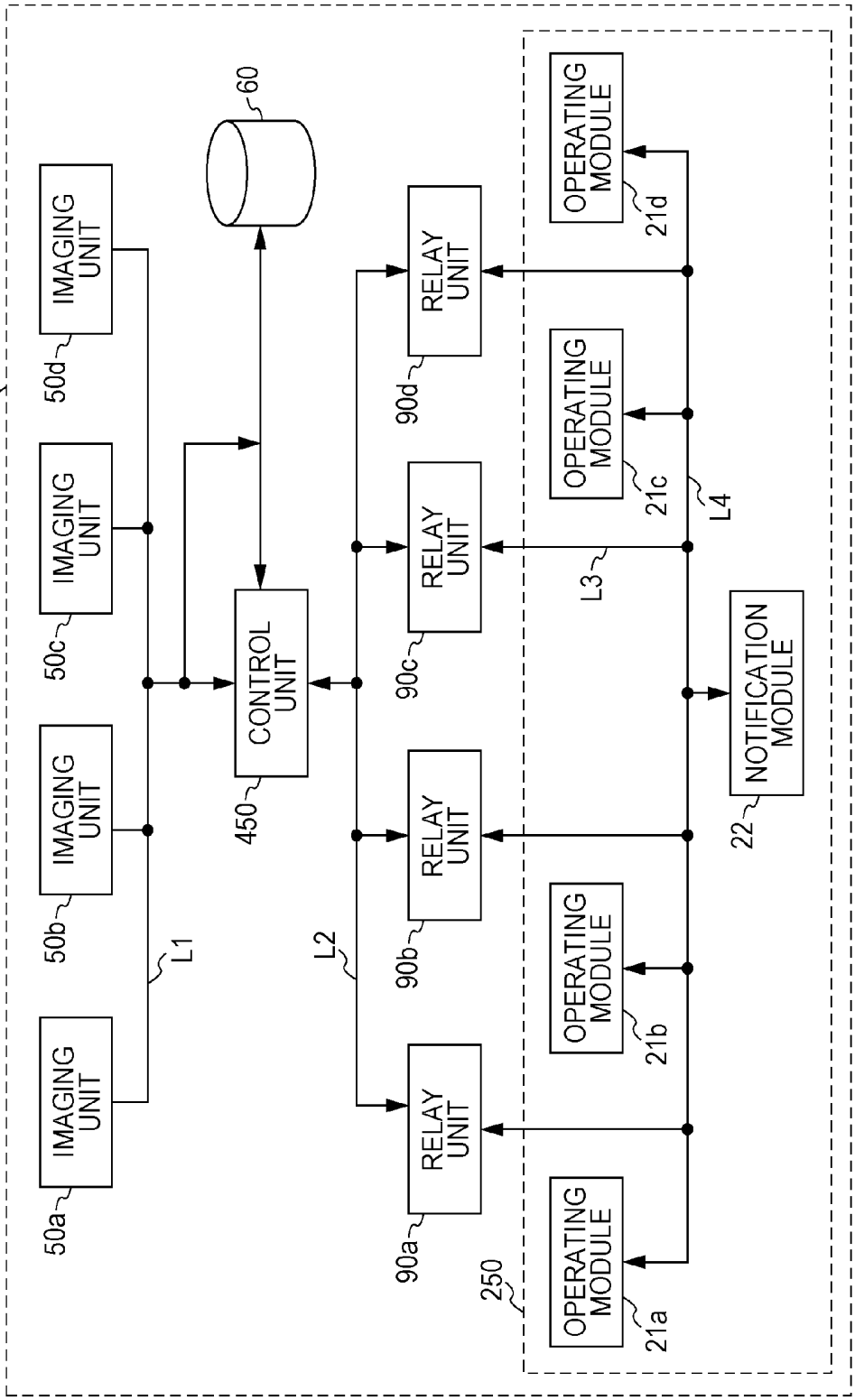

10
60
IMAGING UNIT
50d
IMAGING UNIT
50c
IMAGING UNIT
50b
IMAGING UNIT
50a
L1
CONTROL UNIT
450
L2
RELAY UNIT
90d
RELAY UNIT
90c
RELAY UNIT
90b
RELAY UNIT
90a
L3
OPERATING MODULE
21d
OPERATING MODULE
21c
OPERATING MODULE
21b
OPERATING MODULE
21a
L4
250
NOTIFICATION MODULE
22

FIG. 34

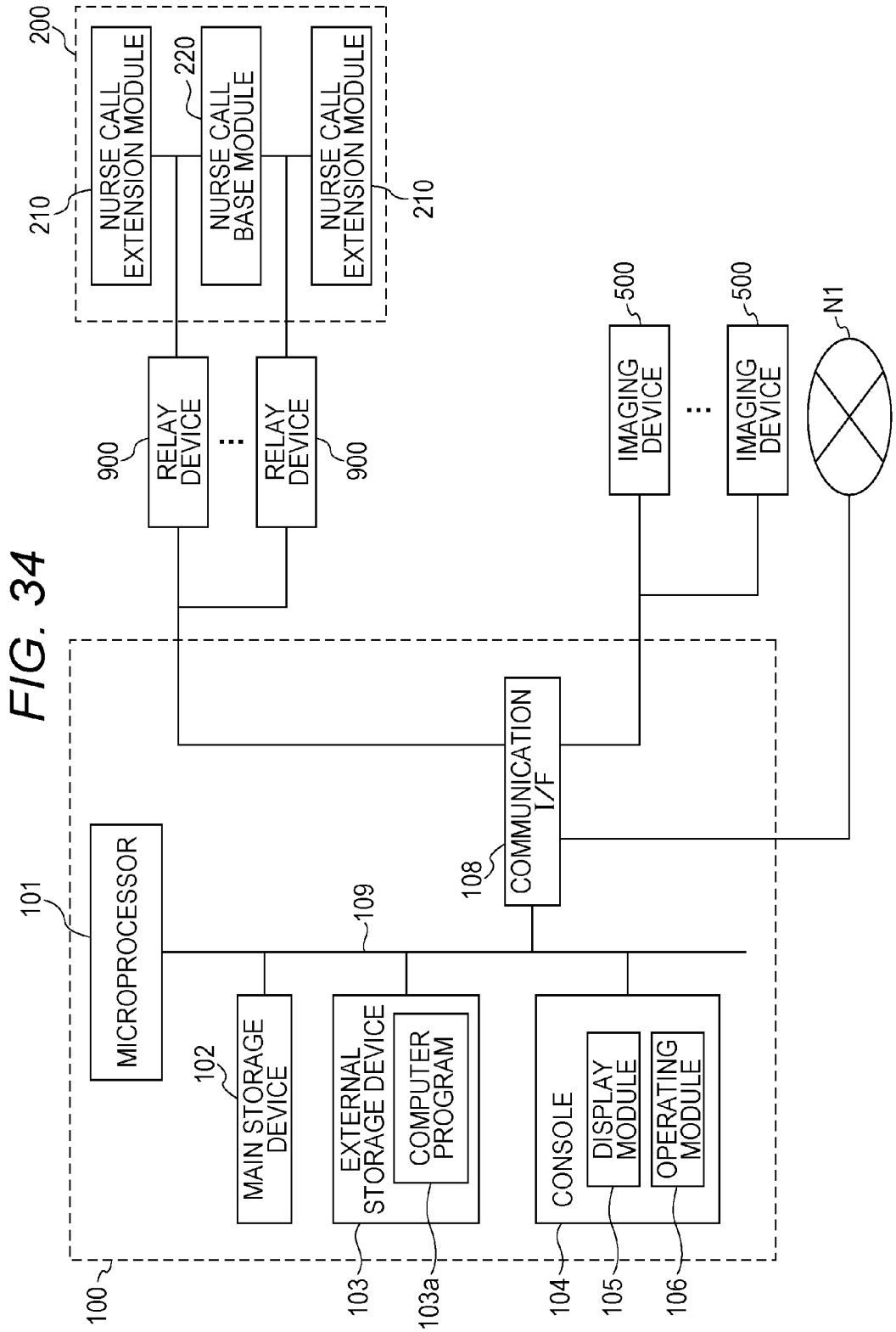

200
NURSE CALL EXTENSION MODULE
210
220
NURSE CALL BASE MODULE
NURSE CALL EXTENSION MODULE
210
900
RELAY DEVICE
RELAY DEVICE
900
500
IMAGING DEVICE
500
IMAGING DEVICE
N1
101
MICROPROCESSOR
102
MAIN STORAGE DEVICE
109
EXTERNAL STORAGE DEVICE
COMPUTER PROGRAM
108
COMMUNICATION I/F
CONSOLE
DISPLAY MODULE
OPERATING MODULE
100
103
103a
104
105
106

FIG. 35

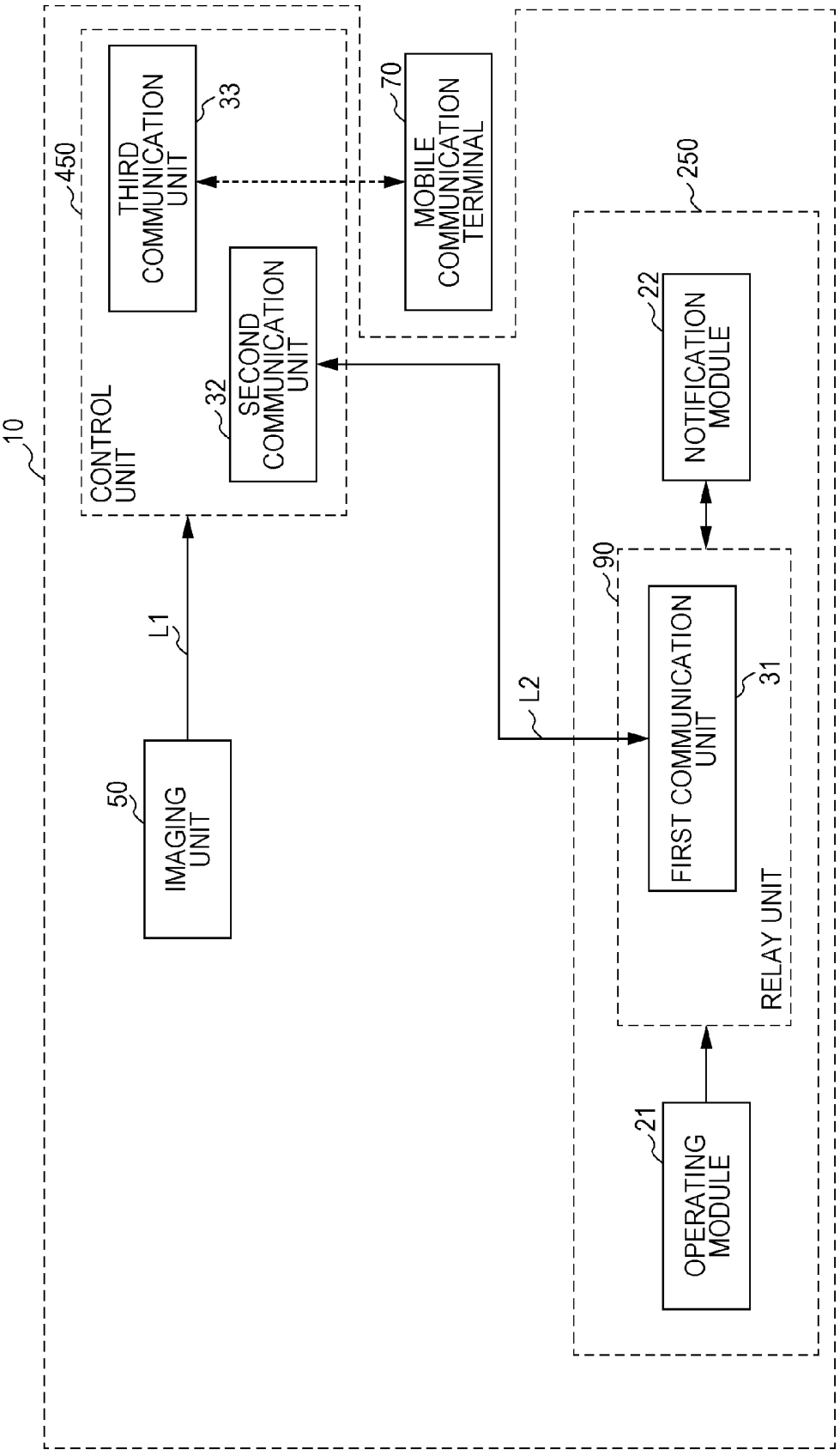

10
450
CONTROL UNIT
THIRD COMMUNICATION UNIT
33
SECOND COMMUNICATION UNIT
32
70
MOBILE COMMUNICATION TERMINAL
250
22
NOTIFICATION MODULE
90
FIRST COMMUNICATION UNIT
31
RELAY UNIT
21
OPERATING MODULE
L1
L2
50
IMAGING UNIT

FIG. 36

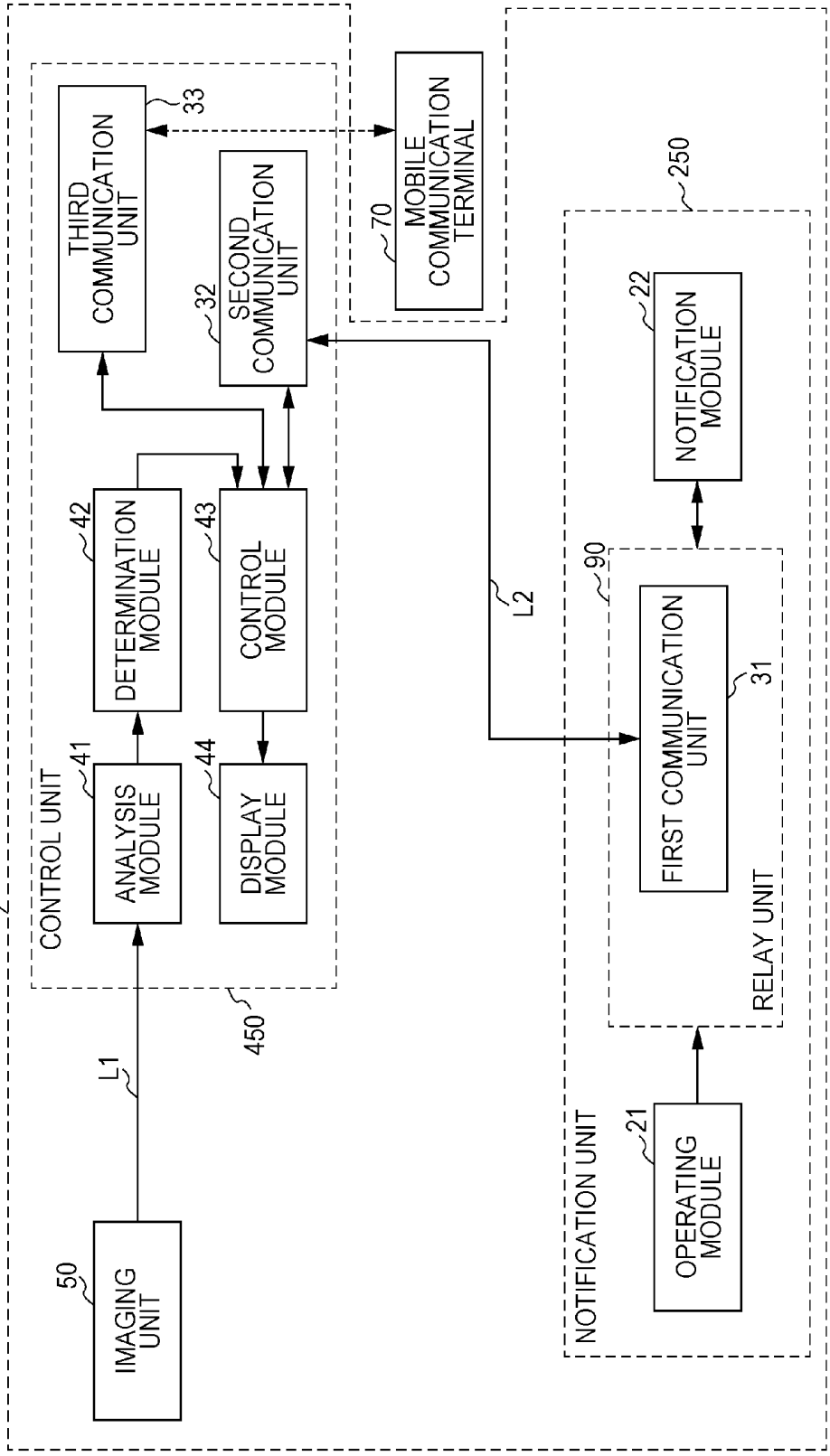

10
CONTROL UNIT
450
IMAGING UNIT
50
L1
ANALYSIS MODULE
41
DETERMINATION MODULE
42
DISPLAY MODULE
44
CONTROL MODULE
43
THIRD COMMUNICATION UNIT
33
SECOND COMMUNICATION UNIT
32
MOBILE COMMUNICATION TERMINAL
70
L2
NOTIFICATION UNIT
250
OPERATING MODULE
21
RELAY UNIT
90
FIRST COMMUNICATION UNIT
31
NOTIFICATION MODULE
22

FIG. 37

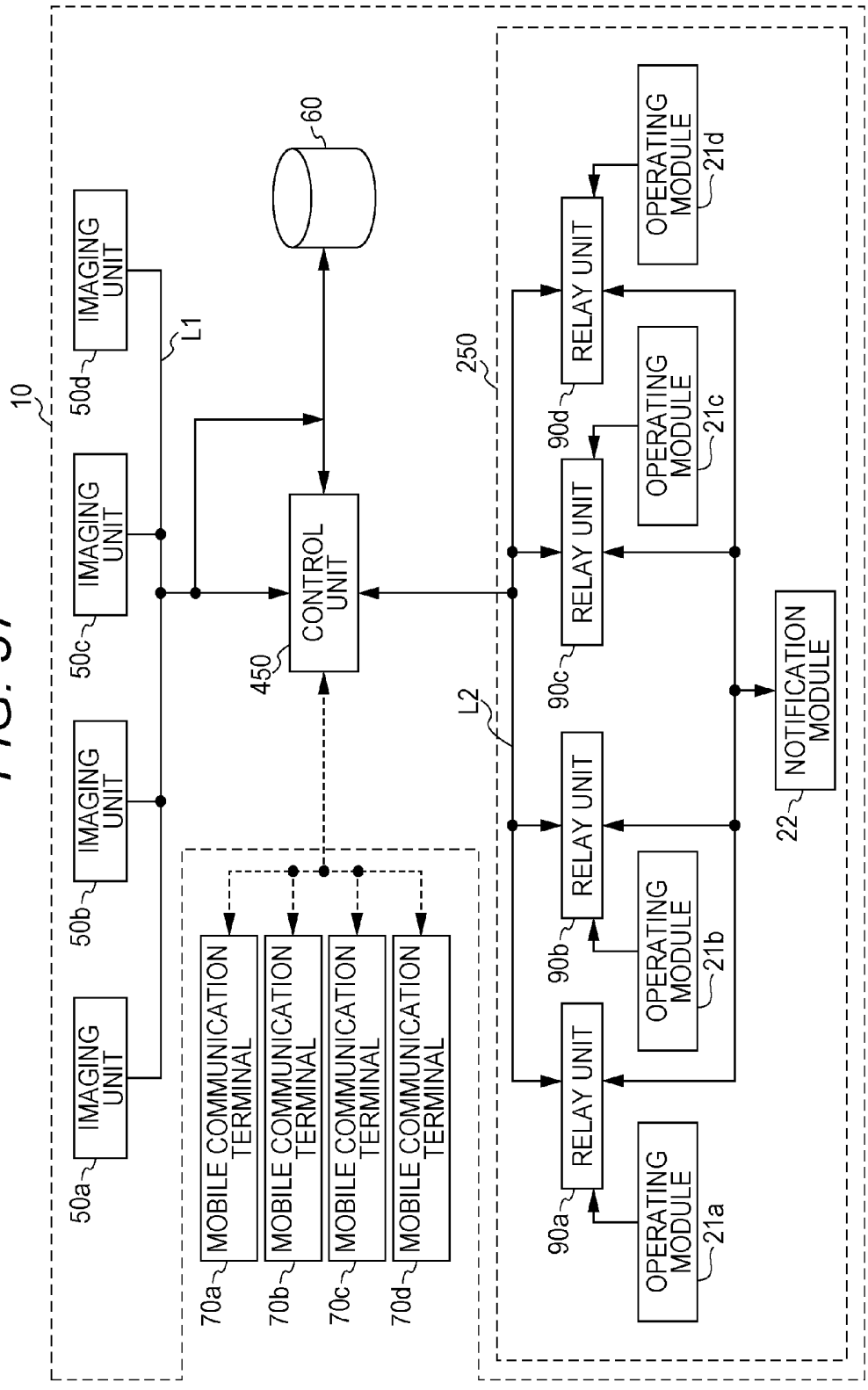

10
IMAGING UNIT
50a
IMAGING UNIT
50b
IMAGING UNIT
50c
IMAGING UNIT
50d
L1
60
CONTROL UNIT
450
MOBILE COMMUNICATION TERMINAL
70a
MOBILE COMMUNICATION TERMINAL
70b
MOBILE COMMUNICATION TERMINAL
70c
MOBILE COMMUNICATION TERMINAL
70d
250
L2
RELAY UNIT
90a
RELAY UNIT
90b
RELAY UNIT
90c
RELAY UNIT
90d
OPERATING MODULE
21a
OPERATING MODULE
21b
OPERATING MODULE
21c
OPERATING MODULE
21d
NOTIFICATION MODULE
22

FIG. 38

SICKBED NUMBER	IMAGING UNIT UID	RELAY UNIT UID	OPERATING MODULE UID	MOBILE INFORMATION TERMINAL UID	...
1	50	60	70	110	
2	51	61	71	111	
3	52	62	72	112	
4	53	63	73	113	
⋮					

FIG. 39

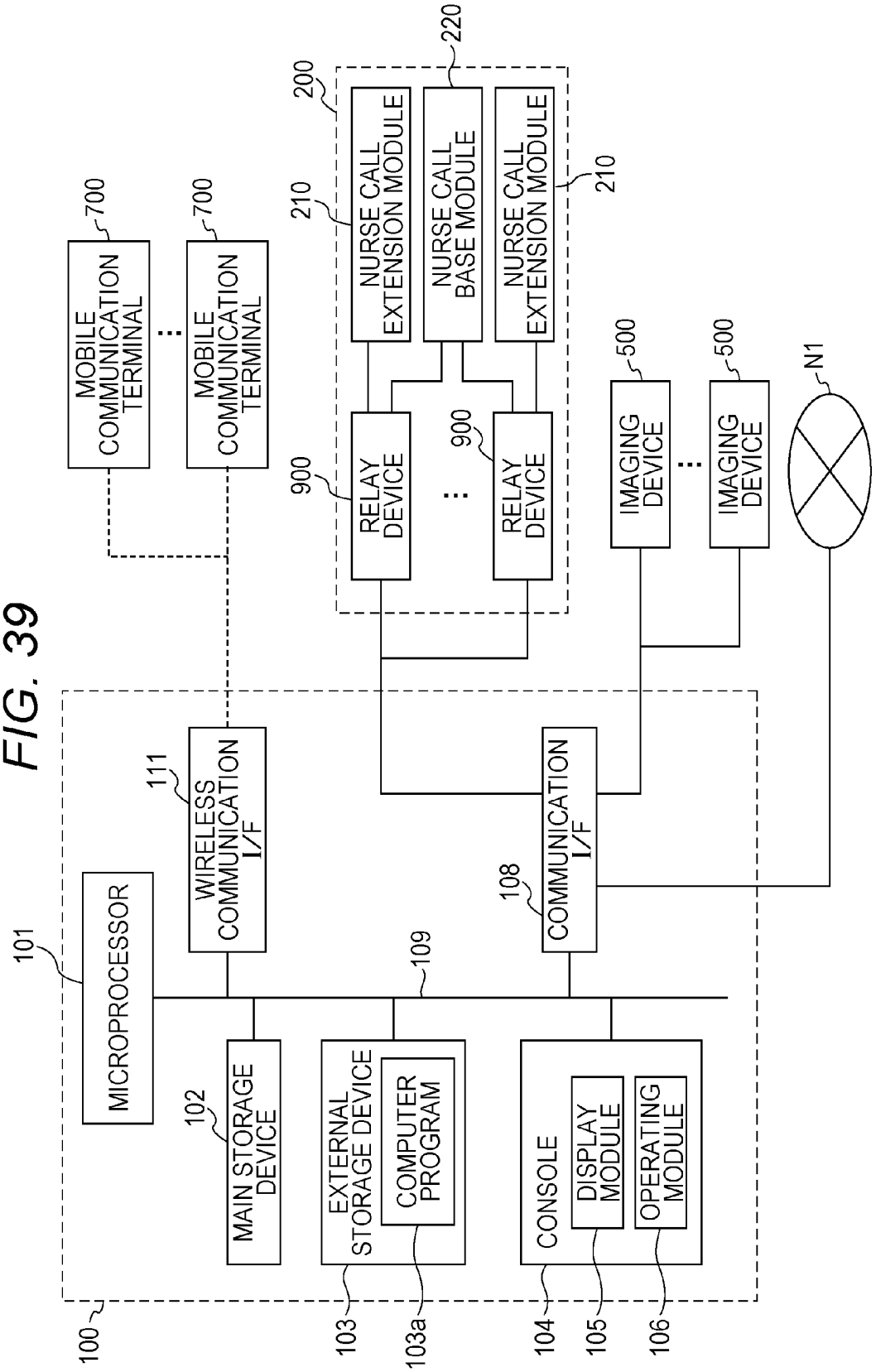

100
101
MICROPROCESSOR
102
MAIN STORAGE DEVICE
103
EXTERNAL STORAGE DEVICE
103a
COMPUTER PROGRAM
104
CONSOLE
105
DISPLAY MODULE
106
OPERATING MODULE
108
COMMUNICATION I/F
109
111
WIRELESS COMMUNICATION I/F
200
210
NURSE CALL EXTENSION MODULE
220
NURSE CALL BASE MODULE
210
NURSE CALL EXTENSION MODULE
900
RELAY DEVICE
900
RELAY DEVICE
500
IMAGING DEVICE
500
IMAGING DEVICE
N1
700
MOBILE COMMUNICATION TERMINAL
700
MOBILE COMMUNICATION TERMINAL

FIG. 40

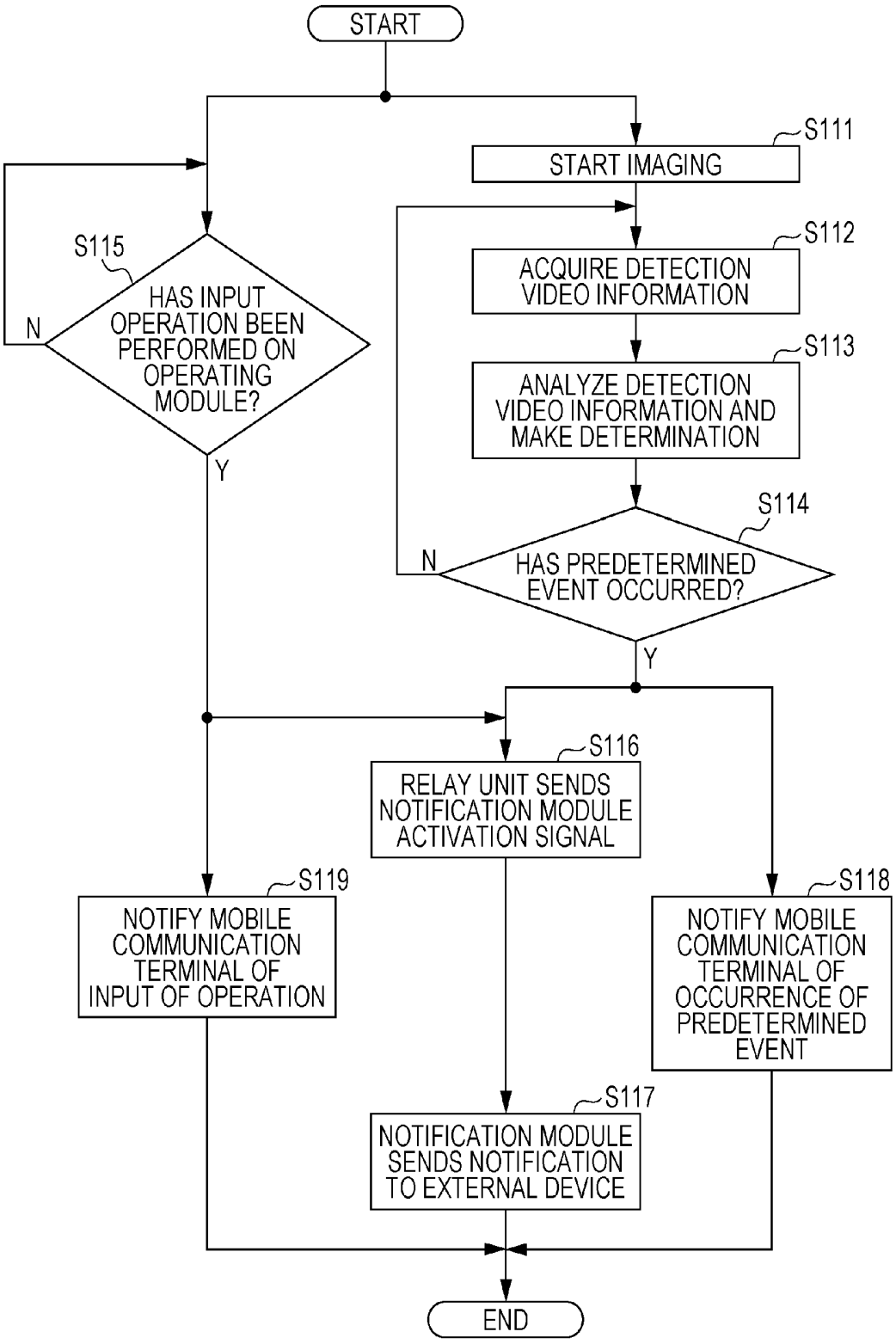
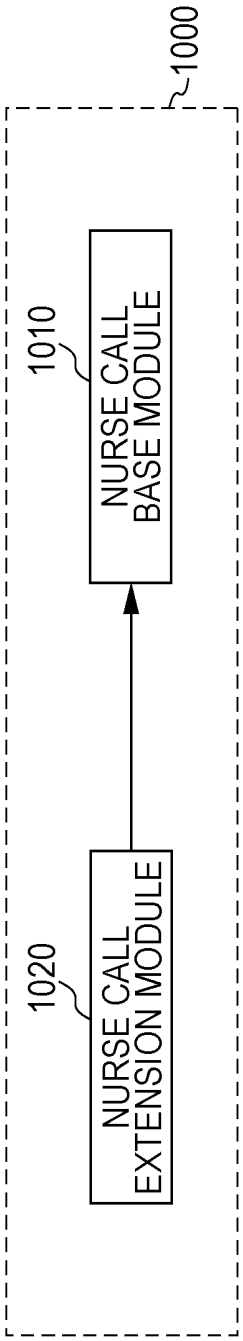

START
S111
START IMAGING
S112
ACQUIRE DETECTION VIDEO INFORMATION
S113
ANALYZE DETECTION VIDEO INFORMATION AND MAKE DETERMINATION
S114
HAS PREDETERMINED EVENT OCCURRED?
N
Y
S115
HAS INPUT OPERATION BEEN PERFORMED ON OPERATING MODULE?
N
Y
S116
RELAY UNIT SENDS NOTIFICATION MODULE ACTIVATION SIGNAL
S117
NOTIFICATION MODULE SENDS NOTIFICATION TO EXTERNAL DEVICE
S118
NOTIFY MOBILE COMMUNICATION TERMINAL OF OCCURRENCE OF PREDETERMINED EVENT
S119
NOTIFY MOBILE COMMUNICATION TERMINAL OF INPUT OF OPERATION
END

FIG. 41


1000
1010
NURSE CALL BASE MODULE
1020
NURSE CALL EXTENSION MODULE

NOTIFICATION SYSTEM

TECHNICAL FIELD

[0001] The present invention relates to a notification system that outputs a notification in response to a predetermined call signal and is ideally used for substitution of a nurse call system which is provided in hospitals, healthcare facilities, and the like, for example.

BACKGROUND ART

[0002] A nurse call system is known as a notification system which is broadly used in hospitals. In this nurse call system, when a call button is operated by a patient in a sickroom, for example, a notification module provided in a nurse's station or the like outputs a notification. A healthcare provider such as a nurses or a caregiver present in a nurse's station responds to the notification.

[0003] In a conventional general nurse call system, an extension module is provided in each bed of a patient, provided in a sickroom. The extension module has a call button that allows patients to call a healthcare provider. This call button is placed at the hands of a patient, for example. The extension module is communicably connected to a base module. The base module has a notification module and the notification module operates when the call button is pressed.

[0004] The base module is provided as a panel on the wall of a nurse's station which is a headquarter, for example. An arbitrary notification module such as a display panel or a speaker, for example, is provided in the panel. When the base module has a function of displaying information and outputting sound as a notification function, information that can identify a patient is displayed on the display panel when the patient operates the call button. Further, the speaker emits a notification sound indicating that the call button has been operated. Moreover, when a PBX module or the like is incorporated into the nurse call system, the base module may send an external notification (call) to a mobile terminal such as PHS using an operation of the call button as a trigger.

[0005] In recent years, a configuration in which a camera is combined with a nurse call system has been proposed. This camera is provided in a sickroom, for example. In this configuration, the camera is associated with an extension module. When a call button associated with the extension module is operated, the surroundings of the patient's bed in which the extension module is provided is imaged by the corresponding camera and video information is generated. This video information is transmitted to the base module, and a video based on the video information is displayed on a display monitor provided in the base module. With this configuration, a healthcare provider can visually understand the patient's state when the call button was operated (for example, see Patent Literature 1).

[0006] In this way, in the nurse call system, a notification sound is output from the notification module provided in the base module in response to an operation of the call button, and information such as a video is transmitted to the display monitor or the speaker provided in the base module. When the base module is provided in a nurse's station, a healthcare provider or the like can understand a change or the like in the patient's state while sitting in the nurse's station and can take quick countermeasures when a serious change (a serious event) occurs in the patient's body, for example.

CITATION LIST

Patent Literature

[0007] Patent Literature 1: JP 2008-079800 A

SUMMARY OF INVENTION

Technical Problem

[0008] As described above, in the conventional nurse call system, a video is displayed when a patient recognizes a change in his or her state and presses the call button. That is, the image displayed on the display monitor shows the state after a serious change occurs in the patient's body. Thus, a healthcare provider viewing the image may be unable to understand which event has caused this situation. For example, when the call button was pressed after a patient fell off a bed, the situation during falling is not displayed on the display monitor. Thus, it is difficult for the healthcare provider to understand how the fall occurred. That is, it may be difficult for the healthcare provider to specify an injured part, and in this case, the healthcare provider cannot take quick countermeasures such as medical aids.

[0009] As a method of solving this problem, a method of storing all items of video information and the like imaged and generated by a camera and allowing a healthcare provider to retrieve and specify a video corresponding to a situation in which a serious change occurs in a patient's body when such a change occurs may be used. However, the amount of the video information may be too large in a large hospital having a large number of inpatients. Thus, the volume of a storage device in which the video information is stored may be insufficient and it may be impossible to store the information. Moreover, management of the large amount of video information is very troublesome.

[0010] Since such a multi-functional nurse call system as described above eliminates and substitutes an existing nurse call system, it may take a very large cost to introduce such a system.

[0011] Therefore, an object of the present invention is to provide a notification system that appropriately notifies a healthcare provider of a change in the state of a patient in a sickroom. For example, the present invention provides a notification system which enables a healthcare provider to understand a patient's state in a period before and after the occurrence time of a change when the change occurs in a patient and a notification is issued.

Solution to Problem

[0012] In order to solve the above problem, a notification system of the present invention includes: a detection unit that generates movement information of a subject according to a change over time; a storage unit that is connected to the detection unit and stores the movement information; and a control unit that receives the movement information from the detection unit, analyzes the movement information, makes a determination on the occurrence of a predetermined event from the result of the analysis, specifies the movement information in a predetermined period including the time when the determination was made, applies a storage priority value to the movement information according to a type of the predetermined event occurred, and transmits the movement information to the storage unit.

[0013] For example, one of a plurality of detection unit is connected to the control unit. When a plurality of detection unit is connected to the control unit, the control unit is configured to collectively process the detection information received from the plurality of detection unit.

[0014] The "subject" means a person who stays for a predetermined period in a confined space and who is monitored in this space. Examples of the subject include a patient, a caretaker, a person who performs dangerous works, and the like. Here, the "movement information of the subject" is a movement of the subject specified by performing a predetermined process on the detection information generated by the detection unit, for example.

[0015] The detection unit may include an arbitrary configuration as long as it has a configuration capable of continuously detecting the motion of a person. Examples of the detection unit include a non-contact detection device capable of detecting the motion without making contact with the subject (patient). Examples of the detection device include an imaging device such as a video camera, a sound recording device such as a digital recorder or an analog recorder, and a moving object detection device such as an ultrasound sensor, a microwave Doppler sensor, or an infrared sensor. At least two of the above-mentioned detection devices may be combined to form the detection unit.

[0016] The control unit determines whether a predetermined event has occurred based on the event determination information and the movement information of the subject, specified by the analysis, for example. The event determination information includes information corresponding to the predetermined event. The event determination information is stored in advance in a storage module or a storage unit (hereinafter sometimes referred to as a storage unit or the like) included in the control unit, for example.

[0017] The "predetermined event" means an event that is to be noticed when the subject is monitored. The "event" means a change in the subject's state occurring accidentally. Among the state changes, tumbling and falling are set as the "predetermined event," for example. The "predetermined event" can be appropriately set according to the type of the subject. When the subject is an inpatient, getting up, leaving bed, wandering, and the like in addition to these state changes are set as the "predetermined event." These state changes correspond to a specific movement of the subject, for example. That is, the information corresponding to the predetermined event can be used as information on the specific movement of the subject.

[0018] The "storage priority value" indicates the degree of priority of storage of the movement information of the subject, stored in the storage unit. In other words, the storage priority value indicates the degree of priority of removal, and the movement information is removed preferentially from the information of which "the storage priority value" is lower. The degree of priority of storage is set by correlating a number, for example, with each of the respective predetermined events. The correlation is performed based on a correlation table stored in advance in the storage unit or the like, for example.

[0019] In the notification system of the present invention, the control unit performs the specification in the predetermined period including the time when the determination was made. The predetermined period starts a first predetermined period earlier than the determination time and ends a second predetermined period later than the determination time.

[0020] A notification system of the present invention further includes notification module configured to output a notification to an external device. The control unit transmits, to the notification module, the movement information of the subject in the predetermined period including the time when the determination was made when it is determined that the predetermined event has occurred.

[0021] In the notification system of the present invention, the detection unit is an imaging unit configured to be capable of perform imaging. The imaging unit generates video including the movement information of the subject. The control unit includes a first display module configured to be able to display a video. Moreover, the control unit analyzes the video information to determine the presence of a predetermined movement of the subject as the occurrence of the predetermined event based on a change in a luminance value of a pixel that forms the video. Further, the control unit displays a video imaged by the imaging unit in the predetermined period on the first display module according to the result of the determination.

[0022] The imaging unit may include an arbitrary configuration as long as it can generate videos such as moving images or still images. A conventional existing imaging device can be appropriately selected and used as the imaging unit. Examples of the imaging device include a digital camera (a digital still camera, a digital video camera, or the like) which is a general visible-light camera. Moreover, in order to perform imaging during lights-out periods in the night, an imaging device such as an infrared night-vision device (an infrared camera) or a thermography night-vision device (a thermography camera) may be used as the imaging unit. Moreover, the imaging unit may be a visible-light camera having the night-vision function.

[0023] A video generated by the imaging unit is displayed on the first display module. This video is displayed when the video information stored in the storage unit is reproduced, for example. In this case, a reproduction unit for reproducing the video information is connected to the control unit. Moreover, the control unit may have a function of reproducing the video information. The first display module is a display monitor provided in a headquarter such as a nurse's station, for example.

[0024] In the notification system of the present invention, a video indicating a predetermined movement of the subject is a video imaged by the imaging unit in a predetermined period including the time of the determination, stored in the storage unit.

[0025] In the notification system of the present invention, the detection unit is a microwave Doppler sensor that includes a transmitting module that emits microwaves to an area including the chest of the subject and a receiving module that receives reflection waves from the subject as the movement information. The control unit analyzes a respiratory state of the subject based on a Doppler shift of the reflection waves. Moreover, the control unit determines whether the respiratory state has reached a predetermined respiratory state as the occurrence of the predetermined event based on the result of the analysis. Further, the control unit transmits control information of the notification module when the predetermined respiratory state is reached.

[0026] In the notification system of the present invention, the control unit removes the movement information of the

subject stored in the storage unit under a predetermined condition. The removal is executed in ascending order of the storage priority values.

[0027] In the notification system of the present invention, the control unit performs the removal when a predetermined period has elapsed from the storage in the storage unit as the predetermined condition. Alternatively, the control unit performs the removal when an available volume of the storage unit is lower than a predetermined value as the predetermined condition.

[0028] The notification system according to the present invention includes a transceiving unit configured to be able to transmit information to at least one mobile communication terminal. The control unit transmits information based on the occurrence of the predetermined event specified by the determination to the mobile communication terminal via the transceiving unit.

[0029] In the notification system of the present invention, the mobile communication terminal includes a second display module configured to be able to display information based on the movement information. The control unit transmits the storage priority value and the information based on the movement information corresponding to the predetermined event specified by the determination to the mobile communication terminal via the transceiving unit. The mobile communication terminal displays the information on the second display module.

[0030] The mobile communication terminal is a device capable of performing wireless communication. Examples of a communication form of the wireless communication include an ad-hoc mode and an infrastructure mode. A combination of these communication forms may be used as the communication form of the wireless communication. The "ad-hoc mode" means a communication form in which a plurality of terminals can communicate with each other in parallel. Moreover, the "infrastructure mode" means a communication form in which communication is performed using one terminal or device as a base module and the other terminal as an extension module. Examples of the mobile communication terminal include a device having a display monitor corresponding to the second display module. A specific example of this device includes a PDA, a tablet terminal, a mobile phone, a smartphone, and the like.

[0031] In this case, the control unit can specify a subject corresponding to the video and transmit the movement information of the subject to a specific mobile communication terminal. This specification is performed based on the movement information generated by the detection unit and predetermined correlation information between the detection unit and the subject.

[0032] The notification system according to the present invention includes a transceiving unit configured to be able to transmit a video to at least one mobile communication terminal. The mobile communication terminal includes a second display module configured to be able to display the video. The control unit transmits alive video of the subject being imaged by the imaging unit to the mobile communication terminal via the transceiving unit when a predetermined movement of the subject has occurred. The mobile communication terminal is configured so that a terminal operator who operates the mobile communication terminal can make communication or a telephone call with the subject while viewing the live video by performing a predetermined operation.

[0033] In the notification system of the present invention, the subject and the mobile communication terminal are correlated and the transceiving unit is configured to be able to transmit information to a specific mobile communication terminal. The detection unit is correlated with the subject. Upon receiving the movement information of the subject from the detection unit, the control unit specifies the subject based on the correlation between the detection unit and the subject. Further, the control unit specifies the mobile communication terminal to which information is to be transmitted based on the correlation between the subject and the mobile communication terminal. After that, the control unit transmits the movement information of the subject to the specified mobile communication terminal via the transceiving unit.

[0034] A notification system of the present invention is provided with a notification unit. The notification unit includes an operating module configured to be able to input operations. The notification unit also includes a notification module disposed at a position separated from the operating module and configured to be able to output a notification to an external device. The notification unit is configured such that the notification module operates to output a notification to the external device in response to a first signal for operating the notification module, transmitted from the operating module when an operator inputs an operation. The notification system is further provided with a detection unit that generates movement information of the operator according to a change over time. The notification system is further provided a control unit that receives the movement information from the detection unit, analyzes the movement information, and makes a determination on the occurrence of a predetermined event from the result of the analysis. The notification system is further provided with a relay unit that is provided between the operating module and the notification module and is configured to allow the notification module and the control unit to communicate with each other, the relay unit transmitting the first signal to the notification module. The control unit transmits a second signal to the relay unit when the determination is executed. The relay unit transmits a third signal for operating the notification module to the notification module in response to the second signal.

[0035] The "notification unit" may be an arbitrary element as long as it has a configuration that outputs a notification to an external device in response to an input operation. The notification system of the present invention can be formed by appropriately selecting and using a conventional existing notification unit and combining a relay unit with the notification unit. Moreover, the connection form between the operating module and the notification module included in the notification unit may be wireless connection or cable connection.

[0036] The "operator" means a person who uses the operating module among the subjects. Those mentioned in relation to the subject can be appropriately applied to the operator. Examples of the operator include a patient, a caretaker, a person who performs dangerous works, and the like. If the place where the detection unit is provided is a sickroom, the operator is a patient, for example.

[0037] The relay unit has a configuration capable of transmitting a "third signal" for operating the notification module by being controlled by the control unit. The relay unit may have a configuration capable of transmitting signals output from one or both of the notification module and the operating

module to the control unit. When this function is executed, the "first signal" is regarded as the "third signal."

[0038] The relay unit has the function of one or both of a path switcher and a signal converter, for example. Here, when the "second signal" includes the "third signal," the relay unit functions as the path switcher. When this function is executed, a path of the relay unit connected to the notification module is connected. This connection may be performed by being controlled by the control unit and may be performed according to a connection control signal or the like included in the "second signal." As a result, the "third signal" transmitted from the control unit reaches the notification module via the relay unit.

[0039] Moreover, when the "second signal" includes a "signal for transmitting the "third signal" to the relay unit," the relay unit functions as the signal converter. When this function is executed, the relay unit receives the "second signal" from the control unit and performs processes such as analysis, determination, conversion, and the like on the signal to generate the third signal. Further, the relay unit transmits the generated "third signal" to the notification module. When the information for identifying the detection unit is associated with the "second signal," the relay unit functions as the signal converter and this information is analyzed. With this analysis, it is possible to identify the detection unit from which the "second signal" was transmitted. The relay unit transmits a specific control signal to the notification module together with the "second signal," for example, based on the identification result. As a result, specific display control is performed on the first display module provided in the notification module based on the control signal.

[0040] The "specific display control" means control of specifying the information of the operator specified by the control signal and displaying the information. According to an example of this control, the LED corresponding to the operator specified by the control signal may be turned on and off. In this case, the first display module is configured to include a plurality of LEDs provided so as to correspond to the names of operators. When the first display module is a display monitor, the first display module displays information on the name or the like of the operator as a character video.

[0041] The notification system of the present invention includes: a first communication unit provided in the relay unit; and a second communication unit provided in the detection unit or the control unit. The first communication unit and the second communication unit communicate bidirectionally whereby the notification module can communicate with the detection unit or the control unit bidirectionally via the relay unit.

[0042] When the second communication unit is provided in the control unit, the relay unit is provided in or near a headquarter. When a facility in which the notification system of the present invention is provided is a hospital, the headquarter is a nurse's station, for example. On the other hand, when the second communication unit is provided in the detection unit, the relay unit is provided near the detection unit (that is, in or near the room where the operator is present). When the facility in which the notification system of the present invention is provided is a hospital, the room is a sickroom of the patient.

[0043] In the notification system of the present invention, when it is determined that the predetermined event has occurred, the control unit transmits the second signal to the relay unit via the second communication unit and the first communication unit.

[0044] In the notification system of the present invention, the first communication unit and the second communication unit are wireless communication unit.

[0045] In the notification system of the present invention, the detection unit is an imaging unit configured to be able to generate videos. The control unit includes a third display module configured to be able to display videos. The control unit displays a video imaged by the imaging unit in a predetermined period including the time when the determination was made or the input operation was executed on the third display module when it is determined that the predetermined event has occurred or the input operation was performed.

[0046] In the notification system of the present invention, the control unit determines the occurrence of the predetermined event based on a change in a luminance value of a pixel that forms the video in response to a predetermined movement of the operator.

[0047] The notification system of the present invention includes a third communication unit configured to be able to communicate with at least one mobile communication terminal. When it is determined that the predetermined event has occurred, the control unit transmits information based on the result of the determination to the mobile communication terminal via the third communication unit. The relay unit notifies the mobile communication terminal of information indicating that the third signal has been transmitted via the first communication unit.

[0048] The control unit can specify the operator based on the movement information of the operator generated by the detection unit and the predetermined correlation information between the detection unit and the operator. The control unit determines a notification destination corresponding to the operator by this specification. Further, the control unit may control so that the information on the determined notification destination is displayed on the display module via the relay unit.

[0049] In the notification system of the present invention, the mobile communication terminal includes a fourth display module configured to be able to display videos. The control unit transmits a video corresponding to the predetermined event occurred to the mobile communication terminal via the second communication unit or the third communication unit together with the information indicating the execution of the determination. The mobile communication terminal displays the video on the fourth display module.

[0050] In the notification system of the present invention, the notification unit includes a switch which is the operating module and a call module which is the notification module. The notification unit is a nurse call system in which the call module operates when the operator operates the switch.

Advantageous Effects of Invention

[0051] According to the present invention, it is possible to appropriately notify a healthcare provider of a change in a patient's state in a sickroom. For example, when a change occurs to a patient and a notification is output to a headquarter, it is possible to understand the patient's state in a period before and after the occurrence time with a predetermined operation. Alternatively, it is possible to output a notification to a headquarter when a change occurs to a patient or the like regardless of the presence of a call operation while using an existing notification system.

BRIEF DESCRIPTION OF DRAWINGS

[0052] FIG. **1** is a functional block diagram illustrating an example of a nurse call system according to a first embodiment.

[0053] FIG. **2** is a functional block diagram illustrating an example of the nurse call system according to the first embodiment.

[0054] FIG. **3** is a table illustrating an example of correlation between the type of event movement information and an event threshold.

[0055] FIG. **4** is a table illustrating an example of correlation among the presence of occurrence of an event, the type of the occurred event, and an applied storage priority value.

[0056] FIG. **5** is a functional block diagram illustrating an example of an overall configuration of the nurse call system according to the first embodiment.

[0057] FIG. **6** is a table illustrating an example of an imaging unit and an operating module corresponding to a sickbed number.

[0058] FIG. **7** is a block diagram illustrating an example of a hardware configuration of the nurse call system according to the first embodiment.

[0059] FIG. **8** is a flowchart illustrating an example of a use form of the nurse call system according to the first embodiment.

[0060] FIG. **9** is a functional block diagram illustrating an example of a nurse call system according to a second embodiment.

[0061] FIG. **10** is a functional block diagram illustrating an example of the nurse call system according to the second embodiment.

[0062] FIG. **11** is a functional block diagram illustrating an example of an overall configuration of the nurse call system according to the second embodiment.

[0063] FIG. **12** is a table illustrating an example of an imaging unit, an operating module, and a mobile communication terminal corresponding to a sickbed number.

[0064] FIG. **13** is a block diagram illustrating an example of a hardware configuration of the nurse call system according to the second embodiment.

[0065] FIG. **14** is a flowchart illustrating an example of a use form of the nurse call system according to the second embodiment.

[0066] FIG. **15** is a flowchart illustrating a use form of a nurse call system according to Example.

[0067] FIG. **16** is a functional block diagram illustrating an example of a nurse call system according to a third embodiment.

[0068] FIG. **17** is a functional block diagram illustrating an example of the nurse call system according to the third embodiment.

[0069] FIG. **18** is a functional block diagram illustrating an example of an overall configuration of the nurse call system according to the third embodiment.

[0070] FIG. **19** is a table illustrating an example of a microwave Doppler sensor, an operating module, and a mobile communication terminal corresponding to a sickbed number.

[0071] FIG. **20** is a block diagram illustrating an example of a hardware configuration of the nurse call system according to the third embodiment.

[0072] FIG. **21** is a flowchart illustrating an example of a use form of the nurse call system according to the third embodiment.

[0073] FIG. **22** is a functional block diagram illustrating an example of a nurse call system according to a fourth embodiment.

[0074] FIG. **23** is a functional block diagram illustrating an example of the nurse call system according to the fourth embodiment.

[0075] FIG. **24** is a functional block diagram illustrating an example of a communication form of a control unit and a relay unit.

[0076] FIG. **25** is a functional block diagram illustrating an example of a communication form of a control unit and a relay unit.

[0077] FIG. **26** is a functional block diagram illustrating an example of an overall configuration of the nurse call system according to the fourth embodiment.

[0078] FIG. **27** is a table illustrating an example of an imaging unit, a relay unit, and an operating module corresponding to a sickbed number.

[0079] FIG. **28** is a block diagram illustrating an example of a hardware configuration of the nurse call system according to the fourth embodiment.

[0080] FIG. **29** is a flowchart illustrating an example of a use form of the nurse call system according to the fourth embodiment.

[0081] FIG. **30** is a functional block diagram illustrating an example of a nurse call system according to a fifth embodiment.

[0082] FIG. **31** is a functional block diagram illustrating an example of a communication form of a control unit and a relay unit.

[0083] FIG. **32** is a functional block diagram illustrating an example of a communication form of a relay unit and a notification unit.

[0084] FIG. **33** is a functional block diagram illustrating an example of an overall configuration of the nurse call system according to the fifth embodiment.

[0085] FIG. **34** is a block diagram illustrating an example of a hardware configuration of the nurse call system according to the fifth embodiment.

[0086] FIG. **35** is a functional block diagram illustrating an example of a nurse call system according to a sixth embodiment.

[0087] FIG. **36** is a functional block diagram illustrating an example of the nurse call system according to the sixth embodiment.

[0088] FIG. **37** is a functional block diagram illustrating an example of an overall configuration of the nurse call system according to the sixth embodiment.

[0089] FIG. **38** is a table illustrating an example of an imaging unit, an operating module, and a mobile communication terminal corresponding to a sickbed number.

[0090] FIG. **39** is a block diagram illustrating an example of a hardware configuration of the nurse call system according to the sixth embodiment.

[0091] FIG. **40** is a flowchart illustrating an example of a use form of the nurse call system according to the sixth embodiment.

[0092] FIG. **41** is a functional block diagram illustrating a conventional nurse call system.

DESCRIPTION OF EMBODIMENTS

[0093] Hereinafter, embodiments of the present invention will be described with reference to the drawings. Constituent

elements having the same configuration throughout the respective drawings will be denoted by the same reference numerals.

First Embodiment

Nurse Call System

[0094] Hereinafter, a configuration of a nurse call system according to this embodiment will be described with reference to the drawings. The description will be given in the following order: Functional configuration of nurse call system; Overall configuration of nurse call system; and Hardware configuration for realizing functional configuration.

[0095] [Functional Configuration of Nurse Call System]

[0096] FIGS. **1** and **2** are functional block diagrams illustrating an example of a nurse call system according to this embodiment. FIG. **2** illustrates an example of a detailed configuration of a nurse call system **10** illustrated in FIG. **1**. In the following description, a case in which a subject is a "patient" will be described.

[0097] [Nurse Call System **10**]

[0098] As illustrated in FIG. **1**, the nurse call system **10** includes an imaging unit **50**, a notification unit **20**, and a storage unit **60**. The imaging unit **50** generates video information of a patient and outputs the video information to the notification unit **20**. The video information includes movement information of the patient. The notification unit **20** includes an operating module **21**, a notification module **22**, and a control unit **40**. The control unit **40** analyzes the video information received from the imaging unit **50**. The control unit **40** further determines the presence of the occurrence of a predetermined event based on the analysis result. When it is determined that a predetermined event has occurred, the notification module **22** notifies an external device of the occurrence of the event. Moreover, the control unit **40** receives the determination result and outputs video information (hereinafter sometimes referred to as "detection video information") including the patient movement information, corresponding to the occurred event, to the storage unit **60**. Here, the "patient movement information" includes information that the patient has no movement as well as the information on the patient's movement. Examples of the "information that the patient has no movement" include an immovable state of the patient, a state in which the patient moves out of a detection range and is not in an imaging range which is the detection range, and the like.

[0099] (Imaging Unit **50**)

[0100] The imaging unit **50** functions as a first sensor that generates detection video information. The detection video information is continuously generated for a predetermined period, for example.

[0101] The imaging unit **50** is provided so as to be able to generate a video (hereinafter sometimes referred to as a "detection video") including the movement of a patient with a change over time among videos. The imaging unit **50** can be configured by selecting appropriately from those described as examples of an imaging device. The imaging unit **50** is provided at such a position that the bed of a patient is included in an imaging area thereof, for example.

[0102] The imaging unit **50** is configured so that the detection video information can be output from the imaging unit **50** to the control unit **40** by being connected to the control unit **40** via a communication line L**1**. The communication line L**1** may be an arbitrary element as long as it includes a configuration that realizes input and output between the imaging unit **50** and the control unit **40** by communication. The communication line L**1** may be configured by a wireless element, a cable element, or a combination thereof, for example. Moreover, the communication line L**1** preferably includes a configuration that can periodically check establishment of communication.

[0103] When the communication line L**1** is a cable LAN path, a router having the function of PoE (Power over Ethernet (registered trademark)) is preferably provided in the LAN path. In this case, the use of the PoE function enables power to be supplied from the router to the imaging unit **50** via the cable LAN.

[0104] (Storage Unit **60**)

[0105] The storage unit **60** stores the detection video information generated by the imaging unit **50**. The imaging unit **50** is connected to the storage unit **60** via the control unit **40** whereby the detection video information subjected to predetermined processing by the control unit **40** is input to the storage unit **60**. The detection video information is detection video information to which a storage priority value described later is applied, for example. Moreover, the detection video information is detection video information which has been subjected to privacy processing, for example. Examples of the privacy processing include mosaic processing on the face of a patient, processing of painting the silhouette of a person in single color.

[0106] The storage unit **60** may have a function of removing or moving the stored detection video information according to a predetermined condition. Examples of the predetermined condition include the elapse of a predetermined period from the time when it was stored in the storage unit **60**, an available volume of the storage unit **60** being lower than a predetermined value, and the like. The removal or the movement is executed on a plurality of items of stored detection video information in ascending order of the storage priority values applied thereto. As a specific example, a storage determination module (not illustrated) included in the storage unit **60** determines whether the detection video information of which the storage period has elapsed a predetermined period from the time when it was stored in the storage unit **60** will be removed or moved. This determination is made based on the storage priority value applied to the detection video information. In this determination, when the storage priority value is smaller than a predetermined threshold, the detection video information is removed or moved.

[0107] The detection video information of which the movement is determined to be needed may be moved, for example, to a cloud server (not illustrated) or the like connected to the storage unit **60** via a network (not illustrated). Moreover, the storage unit **60** may not always need to have the function of removing or moving the detection video information, and for example, a determination module **42** or a control module **43** may remove or move the detection video information stored in the storage unit **60**.

[0108] The storage unit **60** may be a server provided via a network N. In communication between the servers, a communication system compliant with DICOM may be used for communication of videos or the like. In this case, the storage unit **60** forms a picture archive communication system (PACS) in which videos are stored, a hospital information system (HIS) in which patient information, hospital information, and the like are stored, and the like.

[0109] (Notification Unit **20**)

[0110] The notification unit **20** is a nurse call device that outputs a notification to an external device based on the input of a predetermined operation by the patient.

[0111] The operating module **21** and the notification module **22** are provided so that a signal can be output from at least the operating module **21** to the notification module **22** via the control unit **40**. This output is performed via communication of a transceiver module (not illustrated), for example. In this case, the signal transmitted (output) from the operating module **21** to the notification module **22** is received (input) to the notification module **22** via the control unit **40**.

[0112] The notification module **22** is provide at a position separated from the operating module **21**. Specifically, the operating module **21** is provided in a sickroom and the notification module **22** is provided in a nurse's station. For example, when a patient operates the operating module **21**, at least a signal (hereinafter sometimes referred to as a "notification module activation signal") instructing the control unit **40** to activate the notification module **22** is transmitted (output) from the operating module **21** in response to the input of the operation. The control unit **40** controls the notification module **22** in response to this signal whereby the notification module **22** is activated and a notification is output to an external device. In this case, although various items of information such as control information or identification information of the operating module **21** are output from the operating module **21** in addition to the notification module activation signal, the notification module activation signal may include these various items of information.

[0113] <<Operating Module **21**>>

[0114] The operating module **21** may be an arbitrary element as long as it includes a configuration capable of outputting a predetermined signal to the control unit **40** based on the input of an operation. In this case, the predetermined signal includes a predetermined instruction on the control unit **40**. The predetermined instruction is an instruction to activate the notification module **22** to output a notification to an external device, for example. That is, the predetermined signal includes a notification module activation signal. A conventional existing button or trigger-type nurse call extension module, a conventional existing nurse call button having a switch button, and the like can be appropriately selected and used as the operating module **21**, for example.

[0115] <<Notification Module **22**>>

[0116] The notification module **22** may be an arbitrary element as long as it is configured to output a notification to an external device in response to the notification module activation signal. Examples of the form of the notification output by the notification module **22** include those sensed by the five senses of a person, such as sound, light, or vibration.

[0117] Moreover, the notification unit **20** may include a PBX module **25**. For example, the PBX module **25** is provided in the notification module **22** as illustrated in FIG. **2**. The notification module **22** outputs a notification to an external device in response to a control signal from the control unit **40** and activates the PBX module **25**. The PBX module **25** transmits a signal to a PHS terminal **26**. The PHS terminal **26** having received this signal performs an operation of outputting a notification to an external device.

[0118] <<PBX Module **25**>>

[0119] As long as the PBX module **25** can receive the signal from the control unit **40**, the installation form and the connection form thereof are not particularly limited. Moreover, the PHS terminal **26** may be connected to the notification module **22** and may be connected to the notification unit **20**.

[0120] <<Control Unit **40**>>

[0121] The control unit **40** analyzes the detection video information received from the imaging unit **50**. The control unit **40** determines the presence of the occurrence of a predetermined event based on the analysis result. When it is determined that a predetermined event has occurred, the control unit **40** outputs detection video information corresponding to the event to the storage unit **60**.

[0122] As illustrated in FIG. **2**, the control unit **40** includes an analysis module **41**, a determination module **42**, a control module **43**, a display module **44**, an event condition storage module **45**, and a storage priority application module **47**. Moreover, a storage module **46** in which the detection video information is temporarily stored is provided as necessary between the storage priority application module **47** and the storage unit **60**.

[0123] <Analysis Module **41**>

[0124] The analysis module **41** analyzes the detection video information received from the imaging unit **50** to specify movement information of the patient and outputs the movement information to the determination module **42**. When the detection video information is continuously generated by the imaging unit **50**, the analysis module **41** continuously receives the detection video information, analyzes the detection video information on a real-time basis, and outputs the analysis result to the determination module **42**.

[0125] The analysis module **41** analyzes the detection video information based on a predetermined algorithm (method). In this way, the movement information of the patient is specified from the detection video information. According to an example of a video analysis algorithm, edges are extracted from the detection video information, and the shapes of the edges, a moving object, and the like are analyzed to detect that the object is a person. When this algorithm is used, video analysis is performed in the following manner, for example.

[0126] First, the analysis module **41** applies a predetermined filter to the detection video information received from the imaging unit **50** to extract edges. Examples of the filter include a filter that enables a boundary of an object to be detected based on the luminance value of a pixel, a filter that enables a moving object to be detected based on a change in the luminance value of a pixel.

[0127] Subsequently, the analysis module **41** performs a matching process based on the size, the shape, the movement, or the like of a portion surrounded by the extracted edges. With this matching process, a portion of the detection video, surrounded by the edges is selected. This matching process is performed by comparing matching information stored in advance in a matching information storage module (not illustrated) with information on the portion surrounded by the edges. The matching information includes information such as the size of a person, the shape of a person, or the movement of a person, for example. With this process, the portion surrounded by the edges is specified as a person. Further, the movement information of the portion surrounded by the edges is specified as the patient movement information and is output to the determination module **42**.

[0128] According to another example of the video analysis algorithm, a filtering process is performed on the detection video information generated by a thermography camera to specify an area of the detection video, corresponding to a

specific temperature distribution. In this example, a matching process is similarly performed on the specified area.

[0129] The video analysis is not limited to that based on the algorithms mentioned above. For example, a conventional existing algorithm can be appropriately selected and used for the video analysis. Further, a plurality of alignments may be combined and used for the video analysis. When the determination module **42** determines that a predetermined event has occurred, the determination module **42** outputs information (hereinafter sometimes referred to as "event occurrence information") indicating the occurrence of the event to the control module **43**.

[0130] <Determination Module **42**>

[0131] The determination module **42** determines the presence of the occurrence of a predetermined event based on the analysis result received from the analysis module **41**. The determination module **42** determines whether the patient movement information received from the analysis module **41** is identical to predetermined movement information (predetermined event; hereinafter sometimes referred to as "event movement information").

[0132] The "predetermined event" means a specific movement of a patient. Examples of the specific movement include a "movement that a patient tries to get up from a bed," a "movement that a patient tries to leave a bed," a "movement that a patient has tumbled," and the like. When the determination module **42** determines that the "predetermined event has occurred," the determination module **42** outputs the determination result to at least the control module **43**. In this case, the "identical" includes "substantially identical" as well as "perfectly identical." Examples of the "substantially identical" include a case in which a portion of a series of movements of a patient is identical to the predetermined movement information. Moreover, the analysis module **41** may specify a body axis of the patient from the matching process, for example. The determination module **42** may determine that the predetermined event has occurred when the movement of the specified body axis is identical to movement information of the body axis included in the event movement information.

[0133] The determination module **42** is not limited to determine the presence of the occurrence of the predetermined event based on the identicalness of the movement information of the patient only. For example, when the patient is absent in a sickroom in a specific period, it is determined that the movement information of the patient is "Absent." However, in this state, the determination module **42** may determine that the predetermined event has occurred. The predetermined event is "Wandering," for example. As an example, when the determination time of the occurrence of the event is "night (after lights-out)" and a patient is absent from a sickroom in a specific period, the determination module **42** determines that an event of "Wandering" has occurred.

[0134] Moreover, the determination module **42** specifies detection video information (hereinafter sometimes referred to as "event detection video information") including a video indicating the occurrence of the predetermined event from the detection video information stored in the storage unit **60** and sequentially outputs the specified detection video information to the storage unit **60**.

[0135] Specifically, the event detection video information is detection video information generated by the imaging unit **50** in a predetermined period including the occurrence time (hereinafter sometimes referred to as an event occurrence time) of the predetermined event. For example, the starting point of the predetermined period is the time occurring a first predetermined period earlier than the event occurrence time and the ending point thereof is the time occurring a second predetermined period after the event occurrence time. Moreover, the event detection video information may be generated in the above-described manner using the time at which the operation of the operating module **21** is input to the control module **43** as the event occurrence time, for example. When the determination of the determination module **42** is performed on a real-time basis, the "event occurrence time" is the time at which it is determined that the predetermined event has occurred.

[0136] <Event Condition Storage Module **45**>

[0137] Event condition information is stored in advance in the event condition storage module **45**. The "event condition information" is information used for determination of the occurrence of the predetermined event. The "event movement information" is included in the event condition information. Moreover, an "event threshold" is included in the "event condition information" as a threshold of the number of times of the identicalness determination. In this case, the determination module **42** determines that "the predetermined event has occurred" when the number of times of the identicalness determination reaches a predetermined number. The event condition storage module **45** is connected to the determination module **42**. In this way, when the above-described determination is performed, the "event condition information" is output to the determination module **42**.

[0138] The "event threshold value" is set according to the type of the event movement information, for example. FIG. **3** is a table illustrating an example of the correlation between the type of the event movement information and the "event threshold."

[0139] As illustrated in FIG. **3**, an event name is set as the type of the predetermined event, and for example, "Falling," "Tumbling," "Wandering," "Leaving Bed," "Getting Up," and the like are set as the event name. In such a correlation as illustrated in FIG. **3**, an event threshold is set for each event type. For example, the event threshold is set to "1" for the event type such as "Falling," "Tumbling," and "Wandering." That is, when the number of determinations associated with the identicalness between the patient movement information received from the analysis module **41** and the event movement information corresponding to these types is "1," it is determined that the predetermined event has occurred. This is because the movements of a patient associated with these types of events are highly likely to lead to a serious accident which can change the life of the patient. Thus, these types of events have a high level of urgency to response among the predetermined events and require an immediate notification of the notification module **22**.

[0140] <Control Module **43**>

[0141] The control module **43** controls respective constituent elements of the nurse call system **10** in response to the event occurrence information from the determination module **42**. The control module **43** controls the display module **44** and the notification module **22**, for example, among the respective constituent elements. In this case, a live video based on the detection video information output from the imaging unit **50** or a detection video based on the event detection video information is displayed on the display module **44**, for example. Moreover, the notification module **22** emits a notification sound based on the notification module activation signal output from the control module **43**.

[0142] The control module **43** may control the respective constituent elements of the nurse call system **10** in response to the notification module activation signal output from the operating module **21**. The control module **43** controls the display module **44** in the above-described manner, for example, among the respective constituent elements.

[0143] The control module **43** can appropriately control the imaging unit **50**, the notification module **22**, and the respective constituent elements (the analysis module **41**, the determination module **42**, the storage module **46**, and the like) of the control unit **40** as necessary.

[0144] When a notification module activation signal is output to the notification module **22**, the control module **43** may store the transmission history of the notification module activation signal in the storage unit **60** or the like. In this case, the identification information of the imaging unit **50**, the type of the predetermined event, the event occurrence date and time, and the like when it is determined that the predetermined event has occurred are stored in association with the transmission history.

[0145] When the output of the notification module activation signal is based on the event occurrence information, the identification information of the operating module **21**, the identification information of the imaging unit **50**, the type of the predetermined event, the operation input data and time, the event occurrence date and time, and the like are stored in the storage unit **60** or the like in association with the transmission history, for example. Moreover, in this case, the occurrence information of the predetermined event may be selectively stored.

[0146] <Display Module **44**>

[0147] The display module **44** is configured to be able to display a live video based on the detection video information output from the imaging unit **50** or the detection video based on the event detection video information. The display module **44** may be an arbitrary element as long as it has a configuration capable of displaying videos. The display module **44** preferably has a configuration capable of displaying color videos, for example. The display module **44** corresponds to a "first display module" of the present invention.

[0148] The display module **44** may have the function of the notification module **22** by displaying notification information (for example, character information). Moreover, the display module **44** may be configured to emit a notification sound via a sound playback module (not illustrated) as well as displaying the information. In this case, the connection of the notification module **22** to the control unit **40** may be omitted. That is, the notification unit **20** may be configured to eliminate the notification module **22**. Moreover, when the notification of the nurse call system **10** is limited to a visual notification, the notification module **22** may be omitted.

[0149] The control unit **40** includes a storage module **46** and a storage priority application module **47** for performing a predetermined process on the detection video information output from the determination module **42** to the storage unit **60**. The storage module **46** is a temporary storage module in which the detection video information continuously generated by the imaging unit **50** is sequentially stored and is provided as necessary. Moreover, the storage priority application module **47** applies a storage priority value to the event detection video information among the items of input detection video information, for example.

[0150] <Storage Module **46**>

[0151] The detection video information generated by the imaging unit **50** is temporarily stored in the storage module **46**. The control module **43** can select the detection video information based on the event detection information. A specific example of how detection video information is selected will be described below.

[0152] The detection video information output from the imaging unit **50** is sequentially stored in the storage module **46**. In this case, the presence of the occurrence of the predetermined event is determined by the determination module **42** simultaneously with the storage. In this determination, when it is determined that the predetermined event has occurred, event occurrence information is output to the control module **43**. The control module **43** removes the detection video information other than the event detection video information among the items of detection video information stored in the storage module **46** in response to the event occurrence information. This removal is executed when it is determined that an event has not occurred after the elapse of a first predetermined period from the generation time of the detection video information. Moreover, the removal is resumed when a second predetermined period elapses from the determination time of the occurrence of the event and a new event has not occurred. In this way, the event detection video information is selectively left in the storage module **46**. The event detection video information is stored in the storage unit **60** after the storage priority value is applied thereto by the storage priority application module **47**, for example.

[0153] As described above, the storage module **46** functions as a temporary storage module when the event detection video information is specified from the detection video information and the storage priority value is applied to the detection video information. Since the storage module **46** is provided in the control unit **40**, an information readout speed of the storage module **46** may be faster than the storage unit **60**. Thus, the event detection video information which is highly likely to be reproduced may be stored in the storage module **46**.

[0154] In this case, the video information stored in the storage module **46** is event detection video information to which a high storage priority value is applied. The "high storage priority value" corresponding to the video information is the storage priority values "A" and "B" illustrated in the table of FIG. **4** described later. The event names corresponding to these storage priority values are specified as "Tumbling" and "Falling" from the table of FIG. **4**. That is, the event detection video information indicating the occurrence of "Tumbling" and "Falling" is left in the storage module **46** by being copied to the storage unit **60**. The event detection video information indicating the occurrence of the other events is removed from the storage module **46** by being moved to the storage unit **60**. In this way, the event detection video information to which a high storage priority value is applied is stored by being selectively left in the storage module **46**. Thus, even when an event having a high level of urgency to response occurs to a patient, a healthcare provider can check an event detection video corresponding to the event on the display module **44** or the like by reading the event detection video from the storage module **46** without accessing the storage unit **60**. Moreover, since the available volume of the storage module **46** is limited, the event detection video information is removed or moved based on the predetermined

conditions similarly to the storage unit **60**. In this case, the destination of the event detection video information is the storage unit **60**, for example.

[0155] <Storage Priority Application Module **47**>

[0156] The storage priority application module **47** applies a storage priority value to the detection video information including the event detection video information based on the event occurrence information and the storage condition information received from the determination module **42**. The detection video information may be received directly from the imaging unit **50** and may be received via the storage module **46**. In this case, it is assumed that all items of the detection video information generated by the imaging unit **50** are stored in the storage unit **60**.

[0157] Here, the "storage priority value" indicates the degree of priority of storage of the detection video information stored in the storage unit **60**. In other words, the storage priority value indicates the degree of priority of removal or movement, and the detection video information is removed or moved preferentially from the detection video information of which the applied storage priority value is lower. Moreover, the items of detection video information having the same storage priority value are removed or moved in ascending order of the storage date and time, for example. The degree is determined according to the importance of the detection video information (that is, the degree of need to store), for example. The degree of need to store is determined depending on "whether the event movement information is included in the detection video information," "the type of an event occurred," and the like, for example. Although the storage priority value is applied to the detection video information, the storage priority value may be applied to the event detection video information only.

[0158] The "storage condition information" indicates the correlation between the event occurrence information and the storage priority value. The event occurrence information includes information indicating the presence of the occurrence of the event and information on the type of an event occurred. The "storage condition information" is stored in advance in the storage module **46**, for example.

[0159] FIG. **4** is a table illustrating an example of the correlation among the "presence of occurrence of event," the "type of occurred event," and the applied storage priority value.

[0160] In the correlation illustrated in FIG. **4**, the storage priority value is set to a case of no event occurred. Moreover, the same event name as illustrated in FIG. **3** is set as the type of the predetermined event for a case where an event has occurred. In the correlation, the storage priority value is set for each event type. The storage priority values are represented by A to Z. Among the storage priority values in the correlation, A has the highest storage priority value, the storage priority values decrease in the alphabetical order from A, and Z has the lowest storage priority value.

[0161] That is, the lowest storage priority value "Z" is correlated with the case of "No event occurred." On the other hand, when events have occurred and the event types correspond to "Falling" and "Tumbling," high storage priority values "A" and "B" are correlated with such cases. That is, the event detection video information corresponding to the event type of "Falling" and "Tumbling" has a high degree of need to store.

[0162] The "high degree of need to store" means that the event detection video information is highly likely to be used later, for example. For example, when a subject patient is injured by tumbling, the event detection video information at the time of tumbling may be stored and protected so that the information is used as a guideline for treatment of the injury. Moreover, the process of the tumbling may be extracted from the event detection video information and be stored for each patient as a history so that the history can be used later. Further, when the tumbling causes a dispute as a medical accident, by protecting the storage of the event detection video information, the event detection video information can be used as an evidence video in the place of dispute.

[0163] On the other hand, in the correlation, a storage priority value C is correlated with the event type of "Wandering." This is because the "Wandering" state requires a higher level of urgency to response than the "Getting Up" and "Leaving Bed" states and it is determined that the need to leave the same as a history is high. Moreover, when an accident occurs during "Wandering," the corresponding event detection video information can be used in later inspection. Further, when a plurality of events occurs simultaneously, a highest value among the storage priority values corresponding to these events is applied to the detection video information thereof, for example.

[0164] The storage condition information may not include a storage priority value corresponding to the case of "No event occurred." Based on this correlation information, the storage priority application module **47** does not apply a storage priority value to the detection video information other than the event detection video information. In this case, the detection video information corresponding to the storage priority value "Z" illustrated in FIG. **4** is detection video information to which the storage priority value is not applied. Moreover, when the detection video information other than the event detection video information is selectively removed by the control module **43**, the storage condition information may not include the storage priority value corresponding to the case of "No event occurred."

[0165] In this way, a high storage priority value is applied to the event detection video information that is to be used later, the event detection video information that is to be left as a history, and the like, whereby these items of event video information are protected in the storage unit **60**.

[0166] [Overall Configuration of Nurse Call System **10**]

[0167] Next, an overall configuration of the nurse call system **10** according to this embodiment will be described. FIG. **5** is a block diagram illustrating an example of an overall configuration of the nurse call system **10** according to this embodiment. A number of patients are hospitalized in a hospital in which the nurse call system. **10** is used. Thus, the nurse call system **10** includes the same number of operating modules **21** as the number of sickbeds and includes the same number of imaging unit **50** as the number of sickbeds.

[0168] As illustrated in FIG. **5**, the nurse call system **10** is configured such that a plurality of imaging unit **50** is connected to the control unit **40** so that the imaging unit **50** can output and input information to and from the control unit **40**. The plurality of imaging unit **50** (**50***a* to **50***d*) are connected by a communication line L**1** so as to be able to transmit and receive (output and input) information to and from the control unit **40**. Further, the storage unit **60** and the notification module **22** are connected to the control unit **40**. The storage unit **60** is connected so as to be able to transmit and receive information to and from the control unit **40**. The notification module **22** is connected so that at least information can be transmitted

from the control unit **40** to the notification module **22**. Although the nurse call system **10** illustrated in the drawing illustrates a case in which the number of sickbeds is four, the number of sickbeds is not limited thereto but can be set appropriately (the same herein below).

[0169] The correlation between the nurse call system **10** illustrated in FIG. **5** and the nurse call system **10** illustrated in FIG. **1** will be described by way of an example of the imaging unit **50***a* and the operating module **21***a* illustrated in FIG. **5**. In the nurse call system **10** illustrated in FIG. **5**, the imaging unit **50***a* and the operating module **21***a* which are correlated are connected so as to be able to transmit and receive information to and from the control unit **40** and the notification module **22**, whereby the same configuration as the nurse call system **10** illustrated in FIG. **1** is obtained. Moreover, the same correlation is similarly applied to the imaging unit **50***b* to **50***d* and the operating modules **21***b* to **21***d*. That is, the overall configuration of the nurse call system **10** is configured such that the plurality of sets of imaging unit and operating modules which are correlated are connected so as to be able to transmit and receive information to and from the control unit **40** and the notification module **22**.

[0170] Correlation information among a sickbed number, the imaging unit **50**, and the operating module **21**, for example, is stored in advance in the storage unit **60** or the storage module **46** (hereinafter sometimes referred to as the "storage unit **60** or the like"). This correlation information is represented by a correlation between the unique IDs (hereinafter sometimes referred to as "UIDs") which are identifiers applied to the sickbed number, the imaging unit **50**, and the operating module **21**, for example.

[0171] FIG. **6** is a table illustrating an example of the imaging unit **50** and the operating module **21** corresponding to the sickbed number. As illustrated in FIG. **6**, this table illustrates the correlation among a sickbed number (hereinafter sometimes referred to as a "sickbed UID") applied to each sickbed, an imaging unit UID (hereinafter sometimes referred to simply as "imaging unit UID") applied to each imaging unit **50**, and an operating module UID (hereinafter sometimes referred to simply as "operating module UID") applied to each operating module **21**.

[0172] The determination module **42** outputs "event occurrence information that specifies the sickbed" to the control module **43** and the storage unit **60** or the like based on the correlation. The "event occurrence information that specifies the sickbed" includes "information (sickbed number or the like) for specifying the sickbed" and "event detection information that specifies the sickbed." The control module **43** outputs the "information for specifying the sickbed" and the like to the notification module **22**, the display module **44**, and the like. Moreover, the "event detection information that specifies the sickbed" is output to the storage unit **60** or the like.

[0173] The notification module **22** outputs a notification (an audio notification such as a sickbed number) that specifies the sickbed in response to the "information for specifying the sickbed." The display module **44** displays information (information such as a sickbed number) that specifies the sickbed in response to the "information for specifying the sickbed." With the notification and the information, a healthcare provider can recognize the sickbed in which an event has occurred. The storage unit **60** stores the event detection information in association with the sickbed information in response to the "event detection information that specifies the sickbed."

[0174] With reference to the table in FIG. **6**, an example in which the determination module **42** outputs "the event occurrence information that specifies the sickbed" will be described.

[0175] First, as a first example, a case in which the detection video information is generated by the imaging unit **50***a* will be described. In this case, the imaging unit UID "**50**" is associated with the detection video information. Upon receiving the detection video information, the determination module **42** specifies the sickbed number "1" corresponding to the detection video information based on the associated imaging unit UID "**50**" and the correlation information. Further, the determination module **42** outputs information including the information of the sickbed number "1." The determination module **42** outputs a notification module activation signal (notification information that specifies the sickbed) including the information of sickbed number "1," for example, to the notification module **22**. The notification module **22** outputs a notification including the sound of "sickbed number **1**" in response to the information. The determination module **42** outputs the event detection video information corresponding to the event to the display module **44** in association with the information of sickbed number "1," for example. The display module **44** displays the event detection video together with the character of sickbed number "1" in response to the information. The determination module **42** outputs the event detection video information (the event detection information that specifies the sickbed) corresponding to the event to the storage unit **60** in association with the sickbed number "1." The storage unit **60** stores the event detection video together with the character information of sickbed number "1" in response to the information.

[0176] As a second example, a case in which a notification module activation signal is output from the operating module **21***a* will be described. In this case, the operating module UID "**70**" is associated with the signal. Upon receiving the signal, the determination module **42** specifies the sickbed number "1" and the imaging unit UID "**50**" corresponding to the signal based on the operating module UID "**70**" and the correlation information. Further, the determination module **42** generates event detection video information from the detection video information generated by the imaging unit **50***a* corresponding to the imaging unit UID "**50**." Further, the determination module **42** outputs information including the information of sickbed number "1." This information is output similarly to the first example.

[0177] An identifier correlated with the sickbed number is not limited to that described above but may be set arbitrarily. For example, an identifier (a patient UID, a nurse UID, an assistant UID, a physician UID, or the like) applied to a patient, a healthcare provider, or the like may be used for setting the correlation information. The same is true for the correlation information illustrated below.

[0178] When a patient UID is correlated with a sickbed number, the event threshold illustrated in FIG. **3** may be changed based on the patient UID. That is, the determination module **42** specifies an event which is likely to occur to a specific patient and increases or decreases the event threshold from a standard value based on the specification result.

[0179] Specifically, the determination module **42** specifies a sickbed in which the same event has occurred a number of

times within a predetermined period from an event occurrence history. The determination module **42** specifies the patient UID from the sickbed number. When the event is "Wandering," for example, the event threshold thereof is decreased.

[0180] Specifically, when the standard value of the event threshold of "Wandering" is "3," the event threshold of "Wandering" is changed to "1." This change is performed according to an event type, for example. Specifically, the event threshold is decreased only for an event such as "Tumbling" of which the degree of urgency to response is high (for example, the storage priority value is high), whereas the event threshold is increased only for an event such as "Getting Up" of which the degree of urgency to response to low (for example, the storage priority value is low).

[0181] The determination module **42** may generate new event condition information corresponding to a patient from the content (a combination of the types of occurred events) of an event occurrence history. In this case, the event condition information may be stored in the event condition storage module **45** together with the corresponding patient UID. The patient is a patient whose movement during occurrence of the event, for example, is characteristic. This "characteristic movement" is correlated with the patient as "event movement information" whereby the new event condition information is generated. In this manner, when new event condition information corresponding to a patient is generated and used for determination, the healthcare provider can more properly recognize the patient's state in each sickbed.

[0182] When the patient UID and the sickbed number are correlated, the determination module **42** may change the storage priority value illustrated in FIG. **5** based on the patient UID. As an example, when the event threshold is changed, for example, the determination module **42** specifies a sickbed in which the same event has occurred a number of times within a predetermined period from the event occurrence history. The determination module **42** specifies the patient UID from the sickbed number. The determination module **42** changes the storage priority value corresponding to the event based on the specification result. This change is performed according to an event type, for example. For example, the storage priority value is increased only for an event such as "Tumbling" of which the degree of urgency to response is high, whereas the storage priority value is decreased only for an event such as "Getting Up" of which the degree of urgency to response to low. The plurality of processes of specifying the sickbed or the patient may be performed by the control module **43** instead of the determination module **42**.

[0183] [Hardware Configuration of Nurse Call System **10**]

[0184] Next, a hardware configuration of the nurse call system **10** (mainly a computer **100**) for realizing the above-described functions will be described with reference to FIG. **7**. FIG. **7** is a block diagram illustrating an example of a hardware configuration of the nurse call system **10** according to this embodiment.

[0185] (Computer **100**)

[0186] First, a computer having the function of the control unit **40** will be described. The computer **100** is configured to include a microprocessor **101**, a main storage device **102**, an external storage device **103**, and a communication interface **108**. Reference numeral **109** indicates a bus that connects these respective constituent elements. Hereinafter, these constituent elements of the computer **100** will be described.

[0187] The microprocessor **101** includes an arithmetic control device such as a CPU or a MPU. The operation of the control unit **40** is realized by the microprocessor **101**. The main storage device **102** is configured to include a memory device such as a RAM. The external storage device **103** is configured to include a storage device such as a ROM or a hard disk drive. Information collected according to an instruction from the microprocessor **101** is temporarily stored in the main storage device **102** and the external storage device **103**, for example. At least one of these storage devices corresponds to an example of the storage module **46** illustrated in FIG. **2**. Moreover, at least one of these storage devices corresponds to an example of the event condition storage module **45** illustrated in FIG. **2**.

[0188] A computer program **103***a* is stored in advance in the external storage device **103**. The microprocessor **101** loads the computer program **103***a* on the main storage device **102** to cause the nurse call system **10** to perform the characteristic processes of this embodiment. The microprocessor **101** performs the processes to at least have the functions of the analysis module **41**, the determination module **42**, the control module **43**, and the storage priority application module **47** illustrated in FIG. **2**, for example.

[0189] The computer **100** has a console **104** as necessary. The console **104** is used by a healthcare provider, for example. This console includes a display module **105** and an operating module **106**. The display module **105** is configured to include an arbitrary display device such as a liquid crystal (LCD) display, an organic EL (OLED) display, an electronic paper, or a CRT display. This display module **105** has the function of the display module **44** illustrated in FIG. **2**, for example. Moreover, the operating module **106** is configured to include an arbitrary operating device or input device such as a keyboard, a mouse, a trackball, a joystick, or a console panel. Moreover, the display module **105** may include the operating module **106**, and a touch panel display is an example thereof. The touch panel display is operated with the fingers of a healthcare provider, a touch pen, or the like. The operating module **106** has the function of the operating module **21** illustrated in FIG. **2**, for example.

[0190] The communication interface (I/F) **108** is configured to include a network adapter (NIC) such as a LAN card and an arbitrary communication device such as a modem for connecting to the Internet.

[0191] A nurse call extension module **210**, a nurse call base module **220**, an imaging device **500**, and an external network **N1** are connected to the computer **100** via the communication interface **108**. A communication interface (not illustrated) is also provided in these connected devices and has the same configuration as the communication interface **108**, for example.

[0192] The imaging device **500** may be an arbitrary device as long as it has the function of the imaging unit **50** described above. The imaging device described above can be appropriately selected and used as the imaging device **500**, for example. The detection video information generated by the imaging device **500** is transmitted to the main storage device **102**, for example, via the communication interface **108**, and is processed by the microprocessor **101**. The imaging device **500** continuously generates the detection video information and sequentially transmits the same to the main storage device **102**, for example. The microprocessor **101** sequentially processes the detection video information based on the above-described algorithm to make determination on the

occurrence of a predetermined event on a real-time basis. Moreover, the detection video information is further transmitted to the external storage device **103** and the detection video information is continuously recorded on the external storage device **103**.

[0193] The imaging device **500** is one form of the detection device and the detection device is not limited to this form. For example, the imaging device **500** may be configured by a moving object detection sensor so as to generate detection information. The detection information is processed by the computer **100** and the occurrence of a predetermined event is detected in a similar manner. The details of this form will be described in a third embodiment.

[0194] A communication interface (not illustrated) is provided in the nurse call extension module **210** and the nurse call base module **220**. These communication interfaces are connected to the communication interface **108**. Due to this, the computer **100** can receive (input) the signals from the nurse call extension module **210** via the communication interface **108** and transmit (output) a control signal to the nurse call base module **220**.

[0195] The computer **100** is connected to the external network **N1** by the communication interface **108**. A file server (a NIS server, a FTP server, or the like), a picture server (a PACS server or the like), a mail server (a POPS server, a SMTP server, or the like), a WEB server (a HTTP server or the like), and the like are connected to the external network **N1** so as to be able to transmit and receive (output and input) information. The computer **100** can output and input information to and from an external device by being connected to these servers as necessary.

[0196] [Use Form of Nurse Call System **10**]

[0197] Next, a use form of the nurse call system **10** according to this embodiment will be described. FIG. **8** is a flowchart illustrating an example of a use form of the nurse call system **10**. In description of the use form, the configuration illustrated in FIG. **2** is appropriately used.

[0198] As illustrated in FIG. **8**, the imaging unit **50** starts imaging a predetermined range (step **S001**). The imaging starts when a patient is hospitalized and comes to a sickbed first. However, the imaging unit **50** may perform imaging regardless of whether patients are correlated with individual sickbeds. This imaging is performed continuously so that the detection video information is generated continuously, and the detection video information is output to the control unit **40** whenever it is generated.

[0199] Subsequently, the control unit **40** acquires the detection video information generated by the imaging unit **50** (step **S002**).

[0200] The determination module **42** temporarily stores all of the acquired detection video information in the storage module **46** (step **S003**). The determination module **42** also outputs the acquired detection video information to the analysis module **41**. The analysis module **41** analyzes the acquired detection video information and outputs the analysis result to the determination module **42**. This analysis is performed using the above-described algorithm or the like, whereby the movement information of the patient (subject) is generated. The determination module **42** performs the above-described matching process or the like on the analysis result received from the analysis module **41** to make determination on the occurrence of the predetermined event (step **S004**). In this way, it is determined whether the movement information of the patient included in the detection video information matches the event movement information. In this determination, an event threshold is set as necessary according to the importance of the event.

[0201] When the determination module **42** determines that the predetermined event has occurred (step **S005**: YES), the control module **43** outputs a notification to the notification module **22** (step **S006**). In this case, the "notification" means outputting a notification module activation signal to the notification module **22**. In parallel with this process, event detection video information which is the detection video information before and after the occurrence of the predetermined event is preferentially stored and this process ends (step **S005**: YES, step **S007**). Here, "preferential storage" means storing the event detection video information in the storage unit **60** with a storage priority value applied thereto.

[0202] When the determination module **42** determines that the predetermined event has not occurred (step **S005**: NO), the detection video information stored in the storage module **46** is removed (step **S008**) and the process ends.

[0203] The process illustrated in the drawing ends in relation to a video of a predetermined period generated by the imaging unit **50**. That is, after a series of processes ends in relation to the video of the predetermined period, when detection video information is further generated by the imaging unit **50**, the processes of steps **S002** to **S008** resume.

[0204] [Effects of Nurse Call System **10**]

[0205] According to the nurse call system. **10** of this embodiment, when it is determined that a predetermined event has occurred, event detection video information is stored and protected in the storage unit **60**. In this way, the event detection video information that is to be used as a history can be automatically stored in the storage unit **60** based on the determination on the occurrence of the predetermined event. As a result, a tumbling accident of a patient in a hospital causes a dispute later, it is possible to understand the situation before and after the occurrence of the tumbling accident from the stored event detection video information, which can be helpful to correct judgment. Moreover, the movement information of the patient included in the event detection video information can be used as a guideline for treatment after the occurrence of the event. Further, even when the storage unit **60** has a function of automatically removing the information stored in the storage unit **60**, since the event detection video information is protected based on the storage priority value, it is possible to prevent important event detection video information from being removed automatically. In this way, the event detection video information which is to be used later after being stored in the storage unit **60** can be stored for a long period.

Second Embodiment

Nurse Call System **10**

[0206] A configuration of a nurse call system according to this embodiment will be described with reference to the drawings. This description will be given in the following order: Functional configuration of nurse call system; Overall configuration of nurse call system; and Hardware configuration for realizing functional configuration.

[0207] [Functional Configuration of Nurse Call System. **10**]

[0208] FIGS. **9** and **10** are functional block diagrams illustrating an example of a nurse call system according to this embodiment. FIG. **10** illustrates an example of a detailed

configuration of a nurse call system **10** illustrated in FIG. **9**. In the drawings, broken-line arrows indicate wireless connections and the same is true herein below.

[0209] As illustrated in FIG. **9**, the nurse call system **10** is configured to be able to output and input (transmit and receive) information to and from a mobile communication terminal **70** due to a wireless communication unit **30** included in the control unit **40**. Besides this, the nurse call system **10** has the same configuration as the nurse call system of the first embodiment.

[0210] <Wireless Communication Unit **30**>

[0211] As illustrated in FIG. **10**, the wireless communication unit **30** is provided so as to be able to transmit and receive information to and from the control module **43**. The wireless communication unit **30** communicates with the mobile communication terminal **70** by being controlled by the control module **43**. The wireless communication unit **30** may be an arbitrary element as long as it has a wireless communication function. The communication form illustrated as an example of the wireless communication can be appropriately used for the wireless communication unit **30**.

[0212] <Control Module **43**>

[0213] When a notification module activation signal is output to the notification module **22**, the control module **43** transmits (outputs) information indicating the output of the notification module activation signal to the mobile communication terminal **70** via the wireless communication unit **30**. The information indicating the output of the notification module activation signal may include information indicating the type of the output notification module activation signal. Examples of the type of the notification module activation signal include a signal based on an operation of the operating module **21** and a signal based on the determination of the occurrence of the predetermined event. Moreover, the information indicating the output of the notification module activation signal may include patient information specified from the notification module activation signal based on the correlation information illustrated in FIG. **6**.

[0214] <Operating Module **21**>

[0215] A voice communication module **21**A is provided in the operating module **21**. The voice communication module **21**A is configured to output and input audio information to and from the mobile communication terminal **70** via the control module **43** and the wireless communication unit **30**. The voice communication module **21**A includes at least a unit for collecting sound and a unit for outputting sound, for example. A specific example thereof is a combination of a microphone and a speaker.

[0216] (Mobile Communication Terminal **70**)

[0217] The mobile communication terminal **70** is configured to be able to transmit and receive information by being connected to the nurse call system **10** via wireless communication. The mobile communication terminal **70** includes a voice communication module **70**A, a display module **70**B, and an operating module **70**C. The mobile communication terminal **70** can receive event occurrence information, event detection video information, detection video information, and the like, for example, from the control unit **40** and can display characters and videos on the display module **70**B based on these items of information.

[0218] Those described as examples of the mobile communication terminal can be appropriately selected as the mobile communication terminal **70**, and a mobile phone, a smartphone, or the like capable of displaying videos and making telephone calls is preferred.

[0219] <<Voice Communication Module **70**A>>

[0220] The voice communication module **70**A is configured to be able to output and input audio information to and from the voice communication module **21**A. The voice communication module **70**A is configured similarly to the voice communication module **21**A, for example.

[0221] <<Display Module **70**B>>

[0222] The display module **70**B is configured to be able to display various items of information output from the control unit **40**. Moreover, a live video of a patient being imaged by the imaging unit **50** may be displayed on the display module **70**B. Moreover, the voice communication module **70**A and the display module **70**B are configured to be used simultaneously. Due to this, a healthcare provider (for example, a nurse) who is a terminal operator can make a telephone call while viewing the live video of a patient displayed on the display module **70**B when making a telephone call with the patient using the voice communication module **70**A. As a result, the healthcare provider can check the patient's state via visual and auditory senses at a place remote from the patient. The display module **70**B corresponds to a "second display module" of the present invention.

[0223] <<Operating Module **70**C>>

[0224] The operating module **70**C causes a control module (not illustrated) included in the mobile communication terminal **70** to perform control based on an input operation. The operation is input when a healthcare provider selects a specific process from a list of processes displayed on the display module **70**B and the control is executed by the selecting.

[0225] As an example, when event occurrence information is transmitted from the control unit **40** to the mobile communication terminal **70**, information for prompting selection of a process is displayed on the display module **70**B of the mobile communication terminal **70**. The selected process may be a process for making a telephone call with a patient to which it is determined that the predetermined event has occurred while viewing the live video and a process for checking the event detection video, for example.

[0226] [Overall Configuration of Nurse Call System **10**]

[0227] Next, an overall configuration of the nurse call system **10** according to this embodiment will be described. FIG. **11** is a block diagram illustrating an example of an overall configuration of the nurse call system **10** according to this embodiment.

[0228] As illustrated in FIG. **11**, a plurality of mobile communication terminals **70***a* to **70***d* are connected to the control unit **40** so as to be able to transmit and receive information. The other constituent elements are the same as those of the first embodiment. The mobile communication terminals **70***a* to **70***d*, the imaging unit **50***a* to **50***d*, and the operating modules **21***a* to **21***d* are correlated with each other in a manner similarly to the above. As a result, the configuration corresponding to the imaging unit **50***a* is the same as the configuration illustrated in FIG. **9**, for example.

[0229] Correlation information among the sickbed number, the imaging unit **50**, the operating module **21**, and the mobile communication terminal **70** is stored in advance in the storage unit **60** or the like, for example. The correlation information is represented by the correlation of the identifiers (UIDs) applied thereto.

[0230] FIG. **12** is a table illustrating an example of the imaging unit **50**, the operating module **21**, and the mobile communication terminal **70** corresponding to the sickbed number. As illustrated in FIG. **12**, the correlation table illustrates the correlation among the sickbed number, the imaging unit UID, the operating module UID, and a mobile communication terminal UID (hereinafter sometimes referred to simply as a "mobile communication terminal UID") applied to each mobile communication terminal **70**.

[0231] The control unit **40** specifies the mobile communication terminal **70** that transmits "event occurrence information" based on the correlation and transmits "event occurrence information," "event detection video information," and the like to the specified mobile communication terminal **70**. The specified mobile communication terminal **70** displays a video based on the "event detection video information" on the display module **70**B, for example, in response to these items of information.

[0232] An example in which the control unit **40** outputs the event occurrence information to the specific mobile communication terminal **70** will be described using the table illustrated in FIG. **12**.

[0233] First, as a first example, a case in which the detection video information is generated by the imaging unit **50***a* will be described. In this case, the imaging unit UID "**50**" is associated with the detection video information. Upon receiving the detection video information, the control unit **40** specifies the sickbed number "1" the mobile communication terminal UID "**110**" corresponding to the detection video information based on the associated imaging unit UID "**50**" and the correlation information. When it is determined that the predetermined event has occurred, the control unit **40** outputs event detection video information or the like to the mobile communication terminal **70***a* corresponding to the mobile communication terminal UID "**110**" in association with the information of sickbed number "1."

[0234] As a second example, a case in which a notification module activation signal is output from the operating module **21***a* will be described. In this case, the operating module UID "**70**" is associated with the signal. Upon receiving the signal, the control unit **40** specifies the sickbed number "1," the imaging unit UID "**50**," and the mobile communication terminal UID "**110**" corresponding to the signal based on the operating module UID "**70**" and the correlation information. Upon receiving the signal, the control unit **40** generates an event detection video from the detection video information generated by the imaging unit **50***a* corresponding to the imaging unit UID "**50**." Further, the control unit **40** outputs the event detection video information to the mobile communication terminal **70***a* in association with the information of sickbed number "1." The mobile communication terminal **70***a* displays the event detection video on the display module **70**B together with the character of sickbed number "1" in response to the information.

[0235] The nurse call system **10** of this embodiment can cause the mobile communication terminal **70** to output a notification via the control unit **40**. Thus, the notification module **22** may be omitted from the configuration of the nurse call system **10**.

[0236] [Hardware Configuration of Nurse Call System **10**]

[0237] Next, a hardware configuration of the nurse call system **10** (mainly a computer **100**) for realizing the above-described functions will be described with reference to FIG. **13**. FIG. **13** is a block diagram illustrating an example of a hardware configuration of the nurse call system **10** according to this embodiment.

[0238] In the hardware configuration of the nurse call system **10** of this embodiment, a plurality of mobile communication terminals are connected via a wireless communication interface (I/F) **111** so as to be able to communicate with each other. Besides this, the nurse call system **10** has the same configuration as the nurse call system **10** of the first embodiment.

[0239] The wireless communication interface **111** is an interface that connects at least the computer **100** and the mobile communication terminal **700**. As illustrated in FIG. **13**, the wireless communication interface **111** may be provided independently from the communication interface **108**, for example. Moreover, the communication interface **108** may be a constituent element that also serves as the wireless communication interface **111**. The wireless communication interface **111** realizes the function of the wireless communication unit **30** illustrated in FIG. **9**, for example.

[0240] The mobile communication terminal **700** includes a voice communication device (not illustrated) having the function of the voice communication module **70**A, a display device (not illustrated) having the function of the display module **70**B, and an operating device (not illustrated) having the function of the operating module **70**C.

[0241] The wireless communication form may be an ad-hoc mode in which terminals and devices communicate in parallel, for example, and an infrastructure mode in which the computer **100** is used as a base module and terminals and devices are used as extension modules, for example. Examples of the wireless communication interface (I/F) **111** include a wireless LAN compliant with IEEE 802.11 series and IEEE 802.15 series.

[0242] The configuration of the nurse call base module **220** corresponding to the notification module **22** may be omitted from the hardware configuration.

[0243] [Use Form of Nurse Call System **10**]

[0244] Next, a use form of the nurse call system **10** according to this embodiment will be described. FIG. **14** is a flowchart illustrating an example of a use form of the nurse call system **10**. In description of the use form, the flowchart illustrated in FIG. **8** and the functional block illustrated in FIG. **10** are appropriately used.

[0245] As illustrated in FIG. **14**, this flowchart illustrate the processes that the control unit **40** outputs a notification to the mobile communication terminal **70** only when it is determined that the predetermined event has occurred among the processes illustrated in FIG. **8**.

[0246] The processes of steps S**011** to S**015** are performed similarly to the processes of steps S**001** to S**005** of the flowchart illustrated in FIG. **8** (steps S**011** to S**015**).

[0247] When the determination module **42** determines that the predetermined event has occurred (step S**015**: YES), the control module **43** outputs a notification to the mobile communication terminal **70** (step S**016**). In this case, the "notification" means outputting event occurrence information to the mobile communication terminal **70** via the wireless communication interface **111**. The mobile communication terminal **70** notifies the external device of the occurrence of the predetermined event in response to the notification. This notification may be realized in an arbitrary form as long as it can be sensed by the five senses of a person and may be realized via sound, characters, videos, vibration, and the like, for

example. In parallel with this process, the control module **43** preferentially stores the "event detection video information" which is the detection video information of a period before and after the occurrence of the predetermined event in the storage unit **60** or the like (step S**015**: YES, step S**020**).

[0248] A terminal operator selects a subsequent process in response to the notification. This selection is performed by the terminal operator using the operating module **70**C. When "Check the current state of a patient" is selected as the subsequent process (step S**017**: YES), the control unit **40** displays a video including the patient, generated by the corresponding imaging unit **50** on the display module **70**B on a real-time basis. Further, the terminal operator makes a telephone call with the patient using the voice communication module **70**A as necessary (step S**018**) and the flow proceeds to step S**019**. On the other hand, when the terminal operator does not select to check the current state of the patient (step S**017**: NO), the flow proceeds to step S**019**.

[0249] In step S**019**, it is determined whether "Check the state before and after the occurrence of the event" is selected as the subsequent process. In this case, the "state before and after occurrence of the event" is the video information before and after the occurrence of the event.

[0250] When the terminal operator selects to check the state before and after occurrence of the event (step S**019**: YES), the "event detection video information" stored in the storage unit **60** or the like is acquired in step S**020**, the "event detection video" based on the event detection video information is displayed on the display module **70**B, and this process ends (step S**021**). Moreover, steps S**017** to S**018** may be replaced with step S**019** as necessary.

[0251] On the other hand, when the determination module **42** determines that the predetermined event has not occurred (step S**015**: NO), the detection video information stored in the storage module **46** is removed and the process ends (step S**022**).

[0252] The process may be performed by substituting the mobile communication terminal **70** with the control unit **40**. For example, an operating module (not illustrated) may be provided in the control unit **40**, the process may be selected in the above-described manner, and the patient's state may be displayed on the display module **44**. Moreover, a voice communication module (not illustrated) may be provided in the control unit **40**, and the operator may make a telephone call with a patient while displaying a patient's state on the display module **44**.

[0253] In the nurse call system **10** of this embodiment, the event occurrence information may be output to the notification module **22** and the mobile communication terminal **70**. In this case, the process when YES is obtained in step S**015** of the process illustrated in FIG. **14** is performed in parallel with the process (step S**006**) of outputting a notification to the notification module **22** illustrated in FIG. **8**, for example.

[0254] The other features of the use form of the nurse call system **10** according to this embodiment are the same as those of the use form of the nurse call system **10** according to the first embodiment.

EXAMPLE

[0255] FIG. **15** is a flowchart illustrating a use form of a nurse call system according to Example of the nurse call system **10** of this embodiment. This nurse call system **10** is configured using hardware components corresponding to the respective functions. Examples of the hardware components include the configuration illustrated in FIG. **13**. The flow of operations according to Example will be described appropriately with reference to FIG. **13**.

[0256] First, video data imaged by the imaging device **500** is transmitted to the computer **100** (step S**040**).

[0257] Subsequently, the computer **100** analyzes the acquired video, and when it is determined that a predetermined event has occurred, notifies the mobile communication terminal **700** of the occurrence of the event (step S**041**). In this case, the "notification" means outputting the event occurrence information to the mobile communication terminal **70** via the wireless communication interface **111**.

[0258] Subsequently, the mobile communication terminal **700** displays information indicating that the notification (event occurrence information) has been received on a display screen. This information is displayed as a popup icon (step S**042**).

[0259] Subsequently, the terminal operator who operates the mobile communication terminal **700** selects a "view-video button" included in the information indicating the reception of the event occurrence information by clicking or tapping (step S**043**: YES), and a live video of the patient, imaged by the imaging device **500** is displayed on the display screen and the process ends (step S**046**).

[0260] When the terminal operator selects a "view-state button" included in the information (step S**044**) rather than selecting the "view-video button" (step S**043**: NO), a type corresponding to the event is displayed on the display screen (step S**045**). Further, the live video of the patient, imaged by the imaging device **500** is displayed on the display screen (step S**046**), and the process ends.

[0261] [Effects of Nurse Call System **10**]

[0262] The nurse call system **10** of this embodiment has the same configuration as the first embodiment except that the nurse call system **10** includes the mobile communication terminal **70** as a notification unit. Thus, the same effects as the first embodiment are obtained. Further, a healthcare provider who uses the nurse call system **10** of this embodiment can be informed of an abrupt change in the condition of the patient through the mobile communication terminal **70** at a place remote from the patient, for example. Moreover, when the mobile communication terminal **70** is configured to be able to display the detection video of the patient and to make a telephone call with the patient, the healthcare provider can understand the patient's state visually and through the telephone call at a remote place.

Third Embodiment

Nurse Call System **10**

[0263] A configuration of a nurse call system according to this embodiment will be described with reference to the drawings. The description will be given in the following order: Functional configuration of nurse call system; Overall configuration of nurse call system; and Hardware configuration for realizing functional configuration.

[0264] [Functional Configuration of Nurse Call System **10**]

[0265] FIGS. **16** and **17** are functional block diagrams illustrating an example of a nurse call system according to this embodiment. FIG. **17** illustrates an example of a detailed configuration of a nurse call system **10** illustrated in FIG. **16**.

[0266] As illustrated in FIGS. **16** and **17**, the nurse call system **10** includes a microwave Doppler sensor **80** as a

detection unit. The other constituent elements have the same configurations as those of the nurse call system of the second embodiment.

[0267] (Microwave Doppler Sensor **80**)

[0268] The microwave Doppler sensor **80** continuously generates body motion data (a respiratory state or a daily rhythm) of a patient who is a subject. The microwave Doppler sensor **80** includes a transmitter antenna (transmitting module), a receiver antenna (receiving module), and a phase detector which are not illustrated.

[0269] The transmitter antenna is connected to an oscillator having a certain frequency to transmit radio waves to the subject. The receiver antenna receives radio waves (reflected waves) reflected from the subject to output the reflected waves to the phase detector. The phase detector combines a signal indicating the transmitted radio waves and a signal indicating the received radio waves. As signal output from the phase detector as the result of the signal combination has a highest intensity when the transmitted radio waves have the same phase as the received radio waves and has a lowest intensity when the two types of radio waves have the opposite phases. Thus, when the subject is moving, an interference fringe appears in the signal output from the phase detector (this is the Doppler shift effect). In this way, the microwave Doppler sensor **80** can detect a body motion by using the Doppler shift effect. Examples of the body motion of the patient, detected by the microwave Doppler sensor **80** include a respiratory state, a heart beat state, and the like.

[0270] The microwave Doppler sensor **80** detects the body motion by receiving radio waves reflected from the body surface (a portion including the chest, for example) of a patient. The radio waves used for detecting the body motion can pass through clothes, a blanket, and the like. Thus, the body motion can be detected without a large influence of the movement of clothes, a blanket, or the like, and falling of an object such as a blanket or clothes other than the patient is rarely detected as a body motion. Thus, it is possible to selectively detect the body motion of the patient.

[0271] <<Control Unit **40**>>

[0272] Although the control unit **40** has the same overall configuration as that of the first to second embodiment, the analysis module **41** that specifies the detection information may be omitted as necessary. This is because the body motion information is generated by the microwave Doppler sensor **80**. Moreover, the control unit **40** includes the determination module **42**. The determination module **42** detects a predetermined event from the body motion information generated by the microwave Doppler sensor **80**.

[0273] <Determination Module **42**>

[0274] The determination module **42** detects the predetermined event based on known frequency analysis such as FFT analysis or wavelet analysis. This analysis is performed in such a way that a body motion frequency related to the respiration is specified from features of the signal frequency and the respiratory state is estimated from the body motion frequency, for example. The determination module **42** determines whether the body motion frequency is within a certain frequency range, for example. When a body motion frequency that is out of the certain frequency range is detected, the determination module **42** determines that a predetermined event has occurred. A specific example of the body motion frequency which results in such a determination includes a body motion frequency in an apnea condition, which is a very low frequency and a body motion frequency in a hyperpnea, which is a very high frequency.

[0275] When a very large signal variation is detected in the analysis, the determination module **42** determines that a movement (tossing or the like), a body motion, or the like other than the respiration has occurred to the subject. A large signal variation is detected by setting a threshold to a time-derivative of signals, for example.

[0276] Although the determination of the determination module **42** has been described by way of an example of a specific movement, the determination module **42** may determine the occurrence of the predetermined event by matching the body motion information with the body motion information of the patient, received from the microwave Doppler sensor **80**.

[0277] <Control Module>

[0278] When the occurrence of the predetermined event is detected, the control module **43** preferentially stores the "event detection body motion information" which is the body motion information before and after the occurrence of the predetermined event in the storage unit **60** or the like. The "event detection body motion information" is the body motion information including the body motion indicating the occurrence of the predetermined event. The body motion information including the body motion indicating the occurrence of the predetermined event is the body motion information generated by the microwave Doppler sensor **80** in a predetermined period including the event occurrence time. The starting point of the predetermined period is the time occurring a first predetermined period earlier than the event occurrence time and the ending point thereof is the time occurring a second predetermined period after the event occurrence time. Moreover, the body motion information of a predetermined period may be generated in the above-described manner using the time at which the operation of the operating module **21** is input to the control module **43** as the event occurrence time, for example.

[0279] The nurse call system **10** may include a plurality of detection unit. In this case, the imaging unit **50** and the microwave Doppler sensor **80** are used as the plurality of detection unit, for example. The imaging unit **50** and the microwave Doppler sensor **80** monitor the corresponding patient and generate the movement information thereof. The movement information of the patient, generated by the plurality of detection unit is analyzed by the control unit **40**, whereby the occurrence of the predetermined event is determined. By detecting the movement information using a plurality of detection unit, it is possible to improve the determination accuracy of the occurrence of the predetermined event.

[0280] When the imaging unit **50** and the microwave Doppler sensor **80** are used as the plurality of detection unit, the control unit **40** generates the movement information of the patient using any one of the plurality of detection unit. In this case, the occurrence of the predetermined event is determined based on the detection information detected by the microwave Doppler sensor **80**, for example. The detection video information generated by the imaging unit **50** is used for displaying the event detection video when it is determined that the predetermined event has occurred. In this case, since the control unit **40** does not perform image analysis, the load of a computer or the like used as the control unit **40** can be reduced.

[0281] An event occurrence time may be used as a trigger for the analysis of the detection video information of the

control unit **40** based on detection information detected by another detection unit. When it is determined that the occurrence of the predetermined event has occurred, a moving image including the occurrence time thereof is acquired from the storage unit **60**, and the moving image is analyzed by the control unit **40**, whereby the occurrence of the predetermined event is verified. By doing so, since the control unit **40** does not regularly perform the image analysis, the load of the computer or the like used as the control unit **40** can be reduced.

[0282] The nurse call system **10** of this embodiment can output a notification to the mobile communication terminal **70** via the control unit **40**. Thus, the notification module **22** may be omitted from the configuration of the nurse call system **10**.

[0283] [Overall Configuration of Nurse Call System **10**]

[0284] Next, an overall configuration of the nurse call system **10** according to this embodiment will be described. FIG. **18** is a block diagram illustrating an example of an overall configuration of the nurse call system **10** according to this embodiment.

[0285] As illustrated in FIG. **18**, a plurality of microwave Doppler sensors **80** as the detection unit is connected to the control unit **40**. A microwave Doppler sensor **80***a* is correlated with the operating module **21***a* and the mobile communication terminal **70***a* and is connected to the control unit **40** so as to be able to output and input information. In this way, the microwave Doppler sensor **80***a* is configured similarly to the nurse call system **10** illustrated in FIG. **16**. The same is true for the microwave Doppler sensors **80***b* to **80***d*.

[0286] FIG. **19** is a table illustrating an example of the microwave Doppler sensor **80**, the operating module **21**, and the mobile communication terminal **70** corresponding to the sickbed number.

[0287] As illustrated in FIG. **19**, this correlation table illustrates a correlation among the sickbed number, a UID (hereinafter sometimes referred to simply as a "microwave Doppler sensor UID") applied to each microwave Doppler sensor **80**, the operating module UID, and the mobile communication terminal UID. The information correlated with the sickbed number is not limited to these items of information, but those illustrated in the tables of FIGS. **6** and **12** may be appropriately correlated with the sickbed number, for example.

[0288] When the predetermined event is determined from the predetermined body motion information, the control unit **40** can transmit the event occurrence information and the like to the corresponding mobile communication terminal **70** from the correlation between the microwave Doppler sensor **80** and the mobile communication terminal **70**. Further, the control unit **40** can output a notification to the external device by controlling the mobile communication terminal **70**.

[0289] [Hardware Configuration of Nurse Call System **10**]

[0290] Next, a hardware configuration of the nurse call system **10** (mainly a computer **100**) for realizing the above-described functions will be described with reference to FIG. **20**. FIG. **20** is a block diagram illustrating an example of a hardware configuration of the nurse call system **10** according to this embodiment.

[0291] The hardware configuration of the nurse call system **10** of this embodiment includes a plurality of microwave Doppler sensors **800** instead of the plurality of imaging devices **500** as the detection unit. The other constituent elements have the same configuration as those of the nurse call system **10** of the second embodiment but may have the same configuration as those of the nurse call system **10** of the first embodiment.

[0292] The configuration of the nurse call base module **220** corresponding to the notification module **22** may be omitted from the hardware configuration.

[0293] [Use Form of Nurse Call System **10**]

[0294] Next, a use form of the nurse call system **10** according to this embodiment will be described. FIG. **21** is a flowchart illustrating an example of a use form of the nurse call system **10**. In description of the use form, the flowchart illustrated in FIG. **16** and the functional block illustrated in FIG. **16** are appropriately used.

[0295] As illustrated in FIG. **21**, in this flowchart, the microwave Doppler sensor **80** is used the detection unit in the process illustrated in FIG. **14**. Specifically, the control unit **40** makes a determination on the occurrence of the predetermined event based on the body motion information generated by the microwave Doppler sensor **80**. Hereinafter, the respective steps will be described in detail.

[0296] The microwave Doppler sensor **80** emits microwaves to a patient to start detecting the body motion. With the body motion detection, the body motion information of the patient is continuously generated and the body motion information is output to the control unit **40** whenever it is generated (step S**061**).

[0297] Subsequently, the control unit **40** acquires the body motion information of the patient output from the microwave Doppler sensor **80** (step S**062**).

[0298] All the acquired body motion information is temporarily stored in the storage module **46** (step S**063**). In parallel with this, the analysis module **41** analyzes the acquired body motion information as necessary and the determination module **42** determines whether the predetermined event has occurred. With this process, the body motion information of a subject is acquired. The subject is a patient corresponding to the sickbed (step S**064**). When an event threshold corresponding to the importance of the event is set in the above-described manner, the determination of the predetermined event is executed according to the event threshold.

[0299] When the determination module **42** determines that the predetermined event has occurred (step S**065**: YES), the control module **43** outputs a notification to the mobile communication terminal **70** (step S**066**). In this case, the "notification" means outputting the event occurrence information to the mobile communication terminal **70** via the wireless communication interface **111**. The mobile communication terminal **70** informs the external device of the occurrence of the predetermined event in response to the notification. This notification may be realized in an arbitrary form as long as it can be sensed by the five senses of a person and may be realized via sound, characters, videos, vibration, and the like, for example. In parallel with this process, the control module **43** preferentially stores the "event detection body motion information" which is the body motion information of a period before and after the occurrence of the predetermined event in the storage unit **60** or the like (step S**065**: YES, step S**070**).

[0300] A terminal operator selects a subsequent process in response to the notification. This selection is performed by the terminal operator using the operating module **70**C. When "Check the current state of a patient" is selected as the subsequent process (step S**067**: YES), the terminal operator displays the body motion information generated by the corresponding imaging unit **50** on the display module **70**B on a

real-time basis (step S**068**), and the flow proceeds to step S**069**. On the other hand, when the terminal operator does not select to "check the current state of the patient" (step S**067**: NO), the flow proceeds to step S**069**.

[0301] In step S**069**, it is determined whether "Check the state before and after the occurrence of the event" is selected as the subsequent process. In this case, the "state before and after occurrence of the event" is the body motion information before and after the occurrence of the event.

[0302] When "Check the state before and after occurrence of the event" is selected (step S**069**: YES), the "event detection body motion information" stored in the storage unit **60** or the like is acquired in step S**070**, the "event detection body motion information" is displayed on the display module **70**B, and this process ends (step S**071**). Moreover, steps S**067** to S**068** may be replaced with step S**069** as necessary.

[0303] When the determination module **42** determines that the predetermined event has not occurred (step S**065**: NO), the body motion information stored in the storage module **46** is removed and the process ends (step S**072**).

[0304] [Effects of Nurse Call System **10**]

[0305] According to the nurse call system. **10** of this embodiment, the microwave Doppler sensor **80** is provided instead of the imaging unit **50** as the detection unit in the nurse call system of the first or second embodiment. Thus, the same effects as the first and second embodiments are obtained, and a minute body motion such as a respiratory state which is difficult to detect using the imaging unit **50** can be detected.

Fourth Embodiment

Nurse Call System **10**

[0306] A configuration of a nurse call system according to this embodiment will be described with reference to the drawings. The description will be given in the following order: Functional configuration of nurse call system; Overall configuration of nurse call system; and Hardware configuration for realizing functional configuration.

[0307] [Functional Configuration of Nurse Call System **10**]

[0308] FIGS. **22** and **23** are functional block diagrams illustrating an example of a nurse call system according to this embodiment. FIG. **23** illustrates an example of a detailed configuration of a nurse call system **10** illustrated in FIG. **22**.

[0309] As illustrated in FIG. **22**, the nurse call system **10** of this embodiment includes a notification unit **250** in which the control unit **40** is replaced with a relay unit **90** in the notification unit **20** of the nurse call system **10** of the first embodiment. This "replacement" may involve physical replacement and may involve functional replacement by adding the function of the relay unit **90** and disabling the control unit **40**. The control unit **450** is connected to the relay unit **90** provided independently from the notification unit **250** so as to be able to output and input information. Although the control unit **450** may be configured similarly to the control unit **40**, the control unit **450** may not include the storage module **46** and the storage priority application module **47** of the control unit **40**. The nurse call system **10** of this embodiment may not include the storage unit **60**.

[0310] (Notification unit **250**)

[0311] The notification unit **250** is a nurse call device that outputs a notification to a headquarter such as a nurse's station when a patient who is an operator inputs a predetermined operation. The notification unit **250** includes the operating module **21**, the notification module **22**, and the relay unit **90**. The operating module **21** and the notification module **22** are provided so that a signal can be output from at least the operating module **21** to the notification module **22** via the relay unit **90**.

[0312] For example, when the notification module activation signal is transmitted (output) from the operating module **21** to the notification module **22**, the signal is received (input) in the notification module **22** via the relay unit **90** provided therebetween. The notification module **22** operates in response to the input of the signal and a notification is output to the external device based on the signal. The notification module activation signal is transmitted based on the operation of the patient, for example. In this case, the notification module activation signal corresponds to a "first signal." Moreover, the operating module **21** and the notification module **22** may have the same configuration as those of the first embodiment.

[0313] The notification unit **250** can be configured by providing the relay unit **90** to the notification unit such as a conventional existing nurse call device. FIG. **41** is a functional block diagram illustrating a conventional nurse call device **1000**. The nurse call device **1000** is configured by connecting a nurse call base module **1010** and a nurse call extension module **1020**. Here, the nurse call base module **1010** corresponds to the notification module **22** and the nurse call extension module **1020** corresponds to the operating module **21**.

[0314] The relay unit **90** illustrated in FIG. **22** is provided between the nurse call extension module **1020** and the nurse call base module **1010** of the conventional nurse call device **1000** whereby the notification unit **250** is formed. Further, by connecting the control unit **450** to the relay unit **90**, the nurse call system **10** of this embodiment can be formed. The configuration of the control unit **450** can be appropriately selected from the configurations of the control unit **40** described in the first to third embodiments.

[0315] In the first to third embodiments, the control unit **40** may be replaced with the relay unit **90** and the control unit **450** connected to the relay unit **90** may be further included. In this way, the nurse call system **10** of this embodiment can be formed. In this case, the imaging unit **50** is connected to the control unit **450**. The transmission and reception of signals among the operating module **21**, the notification module **22**, and the relay unit **90** may be realized via wireless communication or cable communication.

[0316] <<Relay Unit **90**>>

[0317] The relay unit **90** outputs the signal received from the operating module **21** to the notification module **22**. Moreover, the control unit **450** is connected to the relay unit **90** so as to be able to transmit and receive signals (information). The relay unit **90** is connected to the control unit **450** so as to be able to output and input information. The input and output is realized by transmission and reception via communication, for example. The imaging unit **50** is connected to the control unit **450**. The imaging unit **50** continuously generates information including the movement information of the patient.

[0318] The relay unit **90** may have the function of a path switching unit, may include the function of a signal conversion unit, or may include the functions of both.

[0319] As illustrated in FIG. **23**, the control unit **450** includes a display module **44** that displays at least a detection video based on the detection video information received from the imaging unit **50**, a control module **43** that controls at least

the display module **44** based on an input signal, and an event condition storage module **45** that is connected to the determination module **42**.

[0320] (Control Unit **450**)

[0321] When the control unit **450** determines that the predetermined event has occurred based on the process of the analysis module **41** and the determination module **42**, a transceiver module **48** having received the determination result transmits a notification module activation signal to the relay unit **90**. The notification module **22** having received the signal is operated to output a notification to the external device. As a result, a healthcare provider present in a nurse's station, for example, can understand that a certain abnormality has occurred to the patient.

[0322] The control unit **450** includes at least the analysis module **41**, the determination module **42**, and the transceiver module **48**, and further includes the control module **43** and the display module **44**. The analysis module **41**, the determination module **42**, the control module **43**, and the display module **44** can have the same configurations as those described in the control unit **40**.

[0323] <<Transceiver Module **48**>>

[0324] The transceiver module **48** is connected to a transceiver module (not illustrated) provided in the relay unit **90** so as to be able to transmit and receive information. The transceiver module **48** transmits a predetermined signal (information) to the transceiver module (not illustrated) provided in the relay unit **90** by being controlled by the control module **43** based on the determination result received from the determination module **42**. The relay unit **90** having received the predetermined signal outputs a notification module activation signal to the notification module **22**. The predetermined signal corresponds to a "second signal" of the present invention. The notification module **22** receives the notification module activation signal and operates based on the notification module activation signal whereby a notification is output to the external device. In this case, the notification module activation signal corresponds to a "third signal" of the present invention.

[0325] The transceiver module **48** may be an arbitrary element as long as it has at least the configuration as a transmitting module that can transmit signal to the relay unit **90**. The transmission form of the transceiver module **48** may be wireless communication or cable communication. The signal transmitted to the relay unit **90** corresponds to the second signal of the present invention. The signal transmitted to the relay unit **90** may be appropriately selected from those examples described as the second signal. The transceiver module **48** corresponds to a "transceiving unit" of the present invention.

[0326] FIGS. **24** and **25** are block diagrams illustrating an example of a communication form between the control unit **450** and the relay unit **90**. Although not illustrated in these drawings, the control unit **450** has the same functional configuration as that illustrated in FIG. **23**, for example.

[0327] As illustrated in FIG. **24**, the relay unit **90** is configured to include a first communication unit **31**, and the control unit **450** is configured to include a second communication unit **32**. These communication unit are connected by a communication line L**2** so as to be able to transmit and receive signals, whereby the transmission and reception of signals between the control unit **450** and the relay unit **90** is enabled. In FIG. **23**, the transceiver module **48** corresponds to one form of the second communication unit **32**. Moreover, a transceiver module (not illustrated) provided in the relay unit **90** corresponds to one form of the first communication unit **31**. The second communication unit **32** transmits and receives signals by being controlled by the control module **43**, for example. The first communication unit **31** transmits and receives signals by being controlled by a control module (not illustrated) provided in the relay unit **90**. The first communication unit **31** may transmit and receive signals by being controlled by the control module **43** via the second communication unit **32**. In this way, the first communication unit **31** and the second communication unit **32** are configured so as to be able to communicate bidirectionally.

[0328] As illustrated in FIG. **25**, the imaging unit **50** may be configured to include the second communication unit **32**. The second communication unit **32** and the first communication unit **31** included in the relay unit **90** are connected by the communication line L**2** so as to be able to transmit and receive signals. Moreover, the second communication unit **32** and the transceiver module **48** included in the control unit **450** are connected by the communication line L**1** so as to be able to transmit and receive signals. In this way, transmission and reception of signals between the control unit **450** and the relay unit **90** is enabled via the communication line L**1** and the imaging unit **50**. Here, the transmission and reception via the communication line L**2** may be wireless communication or cable communication.

[0329] [Overall Configuration of Nurse Call System **10**]

[0330] Next, an overall configuration of the nurse call system **10** of the present invention according to this embodiment will be described. FIG. **26** is a block diagram illustrating an example of an overall configuration of the nurse call system **10** according to this embodiment.

[0331] As illustrated in FIG. **26**, a plurality of imaging unit **50** and the plurality of relay unit **90***a* to **90***d* are connected to the control unit **450** so as to be able to communicate with each other. The communication line L**1** connects the plurality of imaging unit **50***a* to **50***d* and one control unit **450**. Moreover, the communication line L**2** connects the plurality of relay unit **90***a* to **90***d* and one control unit **450**. Moreover, the plurality of relay unit **90***a* to **90***d* is connected to the notification module **22**. The plurality of corresponding operating modules **21***a* to **21***d* is connected to each of the plurality of relay unit **90***a* to **90***d*.

[0332] The imaging unit **50***a* is correlated with the relay unit **90***a* and the operating module **21***a*, and these constituent elements are connected to the control unit **450** and the notification module **22** so as to be able to transmit and receive signals. In this way, the imaging unit **50***a* is configured similarly to the nurse call system **10** illustrated in FIG. **22**. The same is true for a case where the imaging unit **50***b* to **50***d*, the relay unit **90***b* to **90***d*, and the operating modules **21***b* to **21***d* are correlated with each other.

[0333] The storage unit **60**, for example, is connected to the control unit **450**. The correlation information among the imaging unit **50**, the relay unit **90**, and the operating module **21** is stored in advance in the storage unit **60**. The control unit **450** transmits the information processed based on the detection video information generated by the imaging unit **50** to the corresponding relay unit **90** based on the correlation information. Moreover, the control unit **450** can specify the imaging unit **50** and the sickbed corresponding to the notification module activation signal transmitted from the operating module **21** based on the correlation information.

[0334] FIG. **27** is a table illustrating the imaging unit **50**, the relay unit **90**, and the operating module **21** corresponding to the sickbed number (sickbed UID).

[0335] As illustrated in FIG. **27**, this correlation table illustrates the correlation among the sickbed number, the imaging unit UID, an UID (hereinafter sometimes referred to simply as a "relay unit UID") applied to each relay unit **90**, and the operating module UID. The information correlated with the sickbed number is not limited to these items of information, but those illustrated in the tables of FIGS. **6**, **12**, and **19** may be appropriately correlated with the sickbed number, for example.

[0336] When it is determined that the predetermined event has occurred based on certain detection video information, the control unit **450** can transmit the event occurrence information that specifies the sickbed to the notification module **22** based on the correlation between the detection video information and the sickbed. Specifically, the control unit **450** transmits the event occurrence information associated with the sickbed number information to the relay unit **90** specified based on such correlation as illustrated in FIG. **27**. The relay unit **90** transmits the event occurrence information received from the control unit **450** to the notification module **22**. The notification module **22** outputs a notification that specifies the sickbed based on the sickbed number information associated with the information. In this way, the healthcare provider having received the notification can recognize the sickbed in which the predetermined event has occurred. Moreover, the event occurrence information associated with the sickbed number information is stored in the storage unit **60**. Further, for example, during determination on the occurrence of the predetermined event, the event detection video that specifies the sickbed number can be displayed on the display module **44** provided in the control unit **450**. In this case, for example, the number of the corresponding sickbed number is also displayed on the display module **44** together with the event detection video.

[0337] [Hardware Configuration of Nurse Call System **10**]

[0338] Next, a hardware configuration of the nurse call system **10** (mainly a computer **100**) will be described with reference to FIG. **28**. FIG. **28** is a block diagram illustrating an example of a hardware configuration of the nurse call system **10** according to this embodiment.

[0339] According to the hardware configuration of the nurse call system **10** of this embodiment, a plurality of nurse call extension modules **210** is connected to the communication interface **108** and the nurse call base module **220** via a plurality of corresponding relay devices **900**.

[0340] The relay device **900** may be an arbitrary element as long as it has the above-described function of the relay unit **90**. Examples of the relay device **900** include a path switcher, a signal converter, and the like.

[0341] The nurse call extension module **210** and the nurse call base module **220** are connected to the relay device **900** to form the nurse call device **200**. A communication interface (not illustrated) is provided in the nurse call extension module **210** and the nurse call base module **220**. In this way, the computer **100** can receive signals from the nurse call extension module **210** via the relay device **900**. As a result, the computer **100** can control the nurse call base module **220** via the relay device **900**.

[0342] The other constituent elements other than those described above, of the nurse call system. **10** of this embodiment may have the same configuration as those of the first to third embodiments.

[0343] [Use Form of Nurse Call System **10**]

[0344] Next, a use form of the nurse call system **10** according to this embodiment will be described. FIG. **29** is a flowchart illustrating an example of a use form of the nurse call system **10** according to this embodiment. In description of the use form, the constituent elements illustrated in FIG. **24** are appropriately used.

[0345] As illustrated in FIG. **29**, this flowchart illustrates processes in which the relay unit **90** transmits a notification module activation signal to the notification module **22** in a specific case by analyzing the detection video information transmitted from the imaging unit **50**. Here, examples of the "specific case" include a case in which the control unit **450** determines that a predetermined event has occurred and a case in which an operation is input by the operating module **21**.

[0346] First, the imaging unit **50** starts imaging a certain range including a sickbed as an imaging range, for example. With this imaging, the detection video information is continuously generated, and the detection video information is transmitted to the control unit **450** whenever it is generated (step **S101**).

[0347] Subsequently, the control unit **450** generates the detection video information transmitted from the imaging unit **50** (step **S102**).

[0348] Subsequently, the analysis module **41** of the control unit **450** analyzes the generated detection video information. The analysis result is output to the determination module **42**. The determination module **42** receives the analysis result and makes determination on the occurrence of the predetermined event. This analysis is performed using the above-described algorithm or the like whereby the movement information of a subject is generated. The subject is the operator who operates the operating module **21**. Subsequently, it is determined whether the generated movement information matches the movement information of a predetermined event using the above-described matching process (step **S103**). Moreover, as described above, an event threshold may be set according to the importance of the event, and the determination on the predetermined event is executed based on the event threshold.

[0349] When the determination module **42** determines that the predetermined event has occurred, the control module **43** controls the relay unit **90** to transmit a notification module activation signal to the notification module **22** (step **S104**: YES, step **S106**). When the determination module **42** determines that the predetermined event has not occurred, the processes of steps **S102** and **S103** are continued (step **S104**: NO, steps **S102** to **S103**).

[0350] The relay unit **90** monitors whether an operation has been input from the operating module **21** to the notification module **22** (step **S105**). This process is performed in parallel with the processes of steps **S101** to **S104**. When a notification module activation signal is input from the operating module **21** to the relay unit **90**, the relay unit **90** transmits the notification module activation signal to the notification module **22** (step **S105**: YES, step **S106**). The notification module activation signal is input to the notification module **22** when the operating module **21** inputs an operation. On the other hand,

when the notification module activation signal is not input to the relay unit **90**, the monitoring is performed continuously (step S**105**: NO).

[0351] Upon receiving the notification module activation signal from the relay unit **90**, the notification module **22** outputs a notification to the external device using a notification buzzer or the like provided in the notification module **22** (step S**107**), and the process ends.

[0352] When the process of step S**106** is performed, the transmission history of the notification module activation signal from the relay unit **90** to the notification module **22** is recorded on the storage unit **60** or the like. In this case, if the process of step S**106** results from the process of step S**105**, information such as the UID of the operating module used for inputting the operation and the date and time when the operation was input is stored in association with the transmission history. If the process of step S**106** results from the process of step S**104**, information such as the UID of the imaging unit **50**, the type of the predetermined event, and the date and time when the event occurred is stored in association with the transmission history. If the process of step S**106** results from the processes of steps S**104** and S**105**, information such as the UID of the operating module **21**, the UID of the imaging unit **50**, the type of the predetermined event, the date and time when the operation was input, and the date and time when the event occurred is stored in association with the transmission history. Moreover, in this case, the occurrence history of the predetermined event may be selectively stored.

[0353] This flowchart illustrates the processes performed until the notification module **22** outputs a notification to the external device when the control unit **450** receives the notification module activation signal. However, this embodiment is not limited to this, but the imaging unit **50** may continuously generate the detection video information even when the notification module activation signal is received, for example. Moreover, whenever the notification module activation signal is received, the flow may proceed to the process routine of steps S**104** to S**107**.

[0354] [Effects of Nurse Call System **10**]

[0355] According to the nurse call system **10** of this embodiment, the control unit **40** of the nurse call system according to any one of the first to third embodiments is replaced with the relay unit **90**, and the control unit **450** connected to the relay unit **90** is added. The imaging unit **50** is connected to the control unit **450**. The control unit **450** can have the same configuration as the control unit **40**. Thus, the same effects as those of the first to third embodiments can be obtained.

[0356] In the notification unit **250** of the nurse call system **10** of this embodiment, the relay unit **90** is provided between the operating module **21** and the notification module **22**. Further, the operating module **21** and the notification module **22** can communicate with each other via the relay unit **90**. Thus, a conventional notification device can be easily modified to the nurse call system **10** of the present invention. Specifically, the notification unit **250** of the present invention can be formed by providing the relay unit **90** on a communication line path of the conventional notification device in which the operating module **21** and the notification module **22** are connected by a communication line. In this way, the nurse call system **10** of the present invention can be constructed by utilizing the nurse call base module and the nurse call extension module of the nurse call device which is already installed in a hospital, for example.

[0357] As a result, an existing nurse call device can be utilized in a hospital or the like in which the nurse call device is already installed. That is, it is possible to simplify a construction work as compared to when a new nurse call system is constructed by replacing the existing nurse call device. Moreover, the cost associated with the construction can be reduced.

[0358] Since the control unit **450** is configured to be independent from the notification unit **250**, the specification of the nurse call system **10** of the present invention can be changed easily by replacing the control unit **450** even after the construction.

Fifth Embodiment

Nurse Call System **10**

[0359] A configuration of a nurse call system according to this embodiment will be described with reference to the drawings. The description will be given in the following order: Functional configuration of nurse call system; Overall configuration of nurse call system; and Hardware configuration for realizing functional configuration.

[0360] [Functional Configuration of Nurse Call System. **10**]

[0361] FIG. **30** is a functional block diagram illustrating an example of a nurse call system according to this embodiment. As illustrated in FIG. **30**, the nurse call system **10** has a configuration in which the notification unit **250** is connected by a communication line L**3** so that information (signals) can be transmitted at least from the operating module **21** to the notification module **22**.

[0362] (Relay Unit **90**)

[0363] The relay unit **90** is provided outside the notification unit **250**. The relay unit **90** is connected to the communication line L**3** via a communication line L**4**. The communication lines L**3** and L**4** are configured so that information can be transmitted at least from the operating module **21** to the relay unit **90** and information can be transmitted and received between the relay unit **90** and the notification module **22**. According to an example of such a configuration, the communication line L**4** may branch halfway from the communication line L**3** so as to extend toward the relay unit **90**. The other constituent elements are the same as those of the nurse call system of the fourth embodiment. The communication via the communication lines L**3** and L**4** may be wireless communication or cable communication, which can be selected appropriately as necessary.

[0364] The signals transmitted from the relay unit **90** to the notification unit **250** via the communication line L**4** are input to the notification module **22** via the communication line L**3**. Moreover, the notification module activation signal transmitted from the operating module **21** is input to the notification module **22** via the communication line L**3** and is also input to the relay unit **90** via the communication line L**4**. That is, the communication line L**4** has a function of squeezing signals into the communication line L**3**.

[0365] The communication line L**4** may be connected directly to the operating module **21**, for example. In this way, the control unit **450** can directly control the operating module **21** via the relay unit **90**. In this case, the operating module **21** can transmit the notification module activation signal to the notification module **22**. Moreover, the communication line L**4** may be connected directly to the notification module **22**,

for example. In this case, the control unit **450** can directly control the notification module **22** via the relay unit **90**.

[0366] FIG. **31** is a functional block diagram illustrating an example of a communication form between the control unit **450** and the relay unit **90**. FIG. **32** is a functional block diagram illustrating an example of a communication form between the relay unit **90** and the notification unit **250**. As illustrated in FIGS. **31** and **32**, the first communication unit **31** is connected via the communication lines L**3** and L**4** so as to be able to communicate with the notification unit **250**. In this way, when the notification module activation signal is transmitted from the control unit **450**, the first communication unit **31** can transmit the notification module activation signal to the notification module **22** via the communication lines L**3** and L**4**.

[0367] [Overall Configuration of Nurse Call System **10**]

[0368] Next, an overall configuration of the nurse call system **10** according to this embodiment will be described. FIG. **33** is a block diagram illustrating an example of an overall configuration of the nurse call system **10** according to this embodiment.

[0369] As illustrated in FIG. **33**, a plurality of operating modules **21***a* to **21***d* and the notification module **22** are connected by the communication line L**4**. A plurality of relay unit **90***a* to **90***d* is connected to the communication line L**4** via the communication line L**3**.

[0370] The imaging unit **50***a* is correlated with the relay unit **90***a* and the operating module **21***a*. These constituent elements are connected to the control unit **450** and the notification module **22** so as to be able to output and input information similarly to the configuration of the above-described embodiments. In this way, the nurse call system **10** of this embodiment is configured similarly to the nurse call system **10** illustrated in FIG. **30**. The same is true for a case where the imaging unit **50***b* to **50***d* are correlated with the relay unit **90***b* to **90***d* and the operating modules **21***b* to **21***d*.

[0371] The information processed by the control unit **450** can be transmitted to the corresponding relay unit **90** based on the correlation information among the imaging unit **50**, the relay unit **90**, and the operating module **21**. This information is the information which is processed based on the detection video information generated by the imaging unit **50**. Moreover, when the notification module activation signal is transmitted from the operating module **21**, the identification information of the operating module **21** is associated with this signal. The control unit **450** can specify the relay unit **90**, the imaging unit **50**, and the sickbed corresponding to the signal based on the correlation information. The information correlated with the sickbed number is not limited to these items of information, but those illustrated in the tables of FIGS. **6**, **12**, **19**, and **27** may be appropriately correlated with the sickbed number, for example.

[0372] [Hardware Configuration of Nurse Call System **10**]

[0373] Next, a hardware configuration of the nurse call system **10** (mainly a computer **100**) of the present invention, for realizing the above-described functions will be described with reference to FIG. **34**. FIG. **34** is a block diagram illustrating an example of a hardware configuration of the nurse call system **10** according to this embodiment.

[0374] The hardware configuration of the nurse call system **10** according to this embodiment is the same as that of the nurse call system **10** of the present invention according to the third embodiment except that the nurse call extension module **210** and the nurse call base module **220** are connected by a communication line to form the nurse call device **200** and the relay device **900** is connected to the communication line.

[0375] [Use Form of Nurse Call System **10**]

[0376] The use form of the nurse call system **10** of this embodiment is the same as the use form of the nurse call system **10** of the third embodiment.

[0377] [Effects of Nurse Call System **10**]

[0378] In the nurse call system **10** of this embodiment, the notification unit **250** and the control unit **450** which are formed by connecting the operating module **21** and the notification module **22** can transmit and receive signals via the relay unit **90** connected to the notification unit **250**. Thus, the same effects as the fourth embodiment can be obtained. Moreover, the nurse call system **10** of this embodiment provides the relay unit **90** using the communication line L**4** having the function of squeezing signals into the communication line L**3**. Thus, the conventional notification device of the nurse call system can be used as it is as the notification unit **250** that forms the nurse call system **10** of the present invention. As a result, when the present embodiment is applied to an existing nurse call device installed in advance, it is possible to further simplify the construction work and to further reduce the cost associated with the construction.

Sixth Embodiment

Nurse Call System **10**

[0379] A configuration of a nurse call system according to this embodiment will be described with reference to the drawings. The description will be given in the following order: Functional configuration of nurse call system; Overall configuration of nurse call system; and Hardware configuration for realizing functional configuration.

[0380] [Functional Configuration of Nurse Call System **10**]

[0381] FIGS. **35** and **36** are functional block diagrams illustrating an example of a nurse call system according to this embodiment. FIG. **36** illustrates an example of a detailed configuration of the nurse call system **10** illustrated in FIG. **35**.

[0382] As illustrated in FIG. **36**, the control unit **450** of the nurse call system **10** of the present invention includes a third communication unit capable of transmitting and receiving signals to and from the mobile communication terminal **70**. The mobile communication terminal **70** can be configured as described in the second embodiment, for example. Moreover, the third communication unit **33** may be configured as described in the second embodiment by substituting the control unit **40** with the control unit **450**.

[0383] The third communication unit **33** transmits information indicating that "the notification module activation signal has been output to the notification module **22**" to the mobile communication terminal **70**. This signal is input to the control unit **450** via the relay unit **90** when the notification module activation signal is transmitted according to the operation of the operating module **21**, for example. The control unit **450** having received the signal transmits information indicating that a "call operation has been performed on the operating module **21**" from the third communication unit **33** to the mobile communication terminal **70** (notification of call operation). Moreover, when it is determined that the predetermined event has occurred, the control unit **450** controls the relay unit **90**. In this case, the control unit **450** transmits the event occurrence information to the mobile communication terminal **70** via the third communication unit **33** (notification

of occurrence of event). Moreover, when the second communication unit **32** has a wireless communication function, the second communication unit **32** may perform the function of the third communication unit **33**.

[0384] When the mobile communication terminal **70** has the display module **70**B, the event detection video is displayed on the display module **70**B. The items of information described above, for example, can be appropriately selected and used for the information displayed on the display module **70**B. In this case, the display module **70**B corresponds to a "fourth display module" of the present invention.

[0385] [Overall Configuration of Nurse Call System **10**]

[0386] Next, an overall configuration of the nurse call system **10** according to this embodiment will be described. FIG. **37** is a block diagram illustrating an example of an overall configuration of the nurse call system **10** according to this embodiment.

[0387] As illustrated in FIG. **37**, a plurality of mobile communication terminals **70***a* to **70***d* are connected to the control unit **450**. The mobile communication terminal **70***a* is correlated with the imaging unit **50***a*, the relay unit **90***a*, and the operating module **21***a* and these constituent elements are connected to the control unit **450** so as to be able to communicate with each other. In this way, the mobile communication terminal **70***a* is configured similarly to the nurse call system **10** of the present invention illustrated in FIG. **35**. The same is true for the mobile communication terminals **70***b* to **70***d*.

[0388] FIG. **38** is a table illustrating the imaging unit **50**, the relay unit **90**, the operating module **21**, and the mobile communication terminal **70** corresponding to the sickbed number (sickbed UID). For example, in this table, similarly to the examples illustrated in FIG. **6** and other drawings, UIDs may be applied to the patient and the healthcare provider and may be correlated with the sickbed number to form the correlation information.

[0389] As illustrated in FIG. **38**, this correlation table illustrates the sickbed number, the imaging unit UID, the relay unit UID, the operating module UID, and the mobile communication terminal UID. The information correlated with the sickbed number is not limited to these items of information, but those illustrated in the tables of FIG. **6** and other drawings may be appropriately correlated with the sickbed number, for example. For example, when a healthcare provider (a physician in charge, a nurse in charge, or the like) who preferentially rushes to a specific patient is determined, a UID may be applied to such a person in charge, a mobile information terminal carried by the person in charge may be selected, and information may be output to the mobile information terminal.

[0390] Since the correlation between the imaging unit **50** and the mobile communication terminal **70** can be identified from this table, for example, when a predetermined event is determined based on predetermined detection video information, the corresponding mobile communication terminal UID is specified from the information (the imaging unit UID) of the imaging unit **50** associated with the detection video information. The control unit **450** can notify the specified mobile communication terminal **70** of the determination result and display a live video, an event detection video, or the like on the display module **70**B provided in the mobile communication terminal **70** as necessary. Moreover, since the correlation between the operating module **21** and the mobile communication terminal **70** can be identified from the table, for example, when the operating module **21** is operated, the control unit **450** can transmit information indicating that the operating module **21** was "operated" to the corresponding mobile communication terminal **70** with the notification module activation signal and can display the information on the display module **70**B provided in the mobile communication terminal **70** as the event detection video as necessary.

[0391] [Hardware Configuration of Nurse Call System **10**]

[0392] Next, a hardware configuration of the nurse call system **10** (mainly a computer **100**) of the present invention, for realizing the above-described functions will be described with reference to FIG. **39**. FIG. **39** is a block diagram illustrating an example of a hardware configuration of the nurse call system **10** according to this embodiment.

[0393] According to the hardware configuration of the nurse call system **10** of this embodiment, a plurality of mobile communication terminals **700** is connected via the wireless communication interface (I/F) **111** so as to be able to communicate with each other. The wireless communication interface **111** can be configured as described in the second embodiment, for example.

[0394] The other constituent elements other than those described above, of the nurse call system **10** of this embodiment may have the same configuration as those of the first to fifth embodiments.

[0395] [Use Form of Nurse Call System **10**]

[0396] Next, a use form of the nurse call system **10** according to this embodiment will be described. FIG. **40** is a flowchart illustrating an example of a use form of the nurse call system **10** according to this embodiment. In description of the use form, the constituent elements illustrated in FIG. **36** are appropriately used.

[0397] As illustrated in FIG. **40**, this flowchart illustrate processes in which, when the control unit **450** determines that a predetermined event has occurred or the control unit **450** receives the notification module activation signal, information indicating the notice thereof is transmitted to the mobile communication terminal **70** in addition to the processes of the flowchart illustrated in FIG. **29**. Hereinafter, the respective steps will be described in detail.

[0398] The processes of steps S**111** to S**115** are performed similarly to the processes of steps S**101** to S**105** of the flowchart illustrated in FIG. **29** (steps S**111** to S**115**).

[0399] When the determination module **42** determines that the predetermined event has occurred (step S**114**: YES), the control module **43** controls the relay unit **90** to transmit the notification module activation signal to the notification module **22** (step S**116**). The control module **43** outputs a notification of the event occurrence information to the mobile communication terminal **70** (step S**118**). The mobile communication terminal **70** informs the external device of the occurrence of the predetermined event in response to the notification. This notification may be realized in an arbitrary form as long as it can be sensed by the five senses of a person and may be realized via sound, characters, videos, vibration, and the like, for example. When it is determined that the predetermined event has not occurred (step S**114**: NO), the processes of steps S**112** and S**113** are continued (steps S**112** to S**113**).

[0400] When the notification module activation signal from the operating module **21** is input to the relay unit **90** (step S**115**: YES), the relay unit **90** transmits the notification module activation signal to the notification module **22** (step S**116**). The relay unit **90** further notifies the mobile communication terminal **70** of the fact that an input operation was performed

on the operating module **21** (step S**119**). The mobile communication terminal **70** notifies the external device of the information on the input operation in response to the notification. When the notification module activation signal from the operating module **21** is not input to the relay unit **90**, the monitoring is continued (step S**115**: NO).

[0401] Upon receiving the notification module activation signal from the relay unit **90**, the notification module **22** outputs a notification to the external device using a notification buzzer or the like provided in the notification module **22**, and the process ends (step S**117**).

[0402] Although this flowchart illustrates the processes performed until the notification module **22** outputs a notification to the external device when the control unit **450** receives the notification module activation signal. The imaging unit **50** may continuously generate the detection video information even when the notification module activation signal is received. Moreover, whenever the notification module activation signal is received, the flow may proceed to the process routine of steps S**114** to S**119**.

[0403] The other features of the use form of the nurse call system **10** of the present invention according to this embodiment are the same as those of the use form of the nurse call system **10** according to the fourth and fifth embodiments.

[0404] [Effects of Nurse Call System **10**]

[0405] According to the nurse call system **10** of this embodiment, the notification unit **250** and the control unit **450** which are formed by connecting the operating module **21** and the notification module **22** can transmit and receive signals via the relay unit **90**. Thus, the same effects as the fourth and fifth embodiments can be obtained.

[0406] According to the nurse call system **10** of this embodiment, since the third communication unit that can communicate with the mobile communication terminal **70** is provided in the control unit **450**, when the control unit **450** determines that a predetermined event has occurred or the control unit **450** receives the notification module activation signal, information indicating the notice thereof can be transmitted to the mobile communication terminal **70**. Due to this, for example, even when a healthcare provider in a hospital is not present in a nurse's station, the healthcare provider can be informed of an abrupt change in the condition of the patient through the mobile communication terminal **70**. Moreover, when the mobile communication terminal **70** has a display module, the video during the occurrence of a predetermined event is displayed on the display module, and a quick response such as treatment can be performed.

[0407] While embodiments of the present invention have been described in detail, the present invention is not limited to the above-described embodiments, and various modifications based on the technical ideal of the present invention can be made. Moreover, some or all of the embodiments may be appropriately combined to form another embodiment. The nurse call system is one form of the notification system, and the same configuration can be applied to a caring system, a home nursing system, and the like.

[0408] The numbers, structures, configurations, shapes, materials, and the like mentioned in the above-described embodiments are examples only, and other numbers, structures, configurations, shapes, materials, and the like different from those above may be used.

REFERENCE SIGNS LIST

[0409] **10**: Nurse call system
[0410] **20**, **250**: Notification unit
[0411] **21**: Operating module
[0412] **22**: Notification module
[0413] **30**: Wireless communication unit
[0414] **40**, **450**: Control unit
[0415] **41**: Analysis module
[0416] **42**: Determination module
[0417] **43**: Control module
[0418] **46**: Storage module
[0419] **47**: Storage priority application module
[0420] **50**: Imaging unit
[0421] **60**: Storage unit
[0422] **70**: Mobile communication terminal
[0423] **80**: Microwave Doppler sensor
[0424] **90**: Relay unit

1. A notification system comprising:
a detection unit that generates movement information of a subject according to a change over time;
a storage unit that is connected to the detection unit and stores the movement information; and
a control unit that receives the movement information from the detection unit, analyzes the movement information, makes a determination on the occurrence of a predetermined event from the result of the analysis, specifies the movement information in a predetermined period including the time when the determination was made, applies a storage priority value to the movement information according to a type of the predetermined event occurred, and transmits the movement information to the storage unit.

2. The notification system according to claim **1**, wherein
the control unit performs the specification using a period that starts a first predetermined period earlier than the time when the determination was made and ends a second predetermined period later than the time when the determination was made as the predetermined period.

3. The notification system according to claim **1** or **2**, further comprising:
a notification module configured to output a notification to an external device, wherein
the control unit transmits, to the notification module, the movement information of the subject in the predetermined period including the time when the determination was made when it is determined that the predetermined event has occurred.

4. The notification system according to any one of claims **1** to **3**, wherein
the detection unit is an imaging unit configured to be capable of perform imaging,
the imaging unit generates video information including the movement information of the subject, and
the control unit includes a first display module configured to be able to display a video and analyzes the video information, and when the presence of a predetermined movement of the subject is determined as the occurrence of the predetermined event based on a change in a luminance value of a pixel that forms the video, the control unit displays a video imaged by the imaging unit in the predetermined period on the first display module according to the result of the determination.

5. The notification system according to claim 4, wherein

a video indicating a predetermined movement of the subject is a video imaged by the imaging unit in a predetermined period including the time of the determination, stored in the storage unit.

6. The notification system according to claim 3, wherein

the detection unit is a microwave Doppler sensor that includes a transmitting module that emits microwaves to an area including the chest of the subject and a receiving module that receives reflection waves from the subject as the movement information,

the control unit analyzes a respiratory state of the subject based on a Doppler shift of the reflection waves,

the control unit determines whether the respiratory state has reached a predetermined respiratory state as the occurrence of the predetermined event based on the result of the analysis, and

the control unit transmits control information of the notification module when the predetermined respiratory state is reached.

7. The notification system according to any one of claims 1 to 6, wherein

the control unit removes the movement information of the subject stored in the storage unit under a predetermined condition, and the removal is executed in ascending order of the storage priority values.

8. The notification system according to claim 7, wherein

the control unit performs the removal when a predetermined period has elapsed from the storage in the storage unit or when an available volume of the storage unit is lower than a predetermined value as the predetermined condition.

9. The notification system according to any one of claims 1 to 8, further comprising:

a transceiving unit configured to be able to transmit information to at least one mobile communication terminal, wherein

the control unit transmits information based on the occurrence of the predetermined event specified by the determination to the mobile communication terminal via the transceiving unit.

10. The notification system according to claim 9, wherein

the mobile communication terminal includes a second display module configured to be able to display information based on the movement information, and

the control unit transmits the storage priority value and the information based on the movement information corresponding to the predetermined event specified by the determination to the mobile communication terminal via the transceiving unit, and the mobile communication terminal displays the information on the second display module.

11. The notification system according to claim 4, further comprising:

a transceiving unit configured to be able to transmit a video to at least one mobile communication terminal, wherein

the mobile communication terminal includes a second display module configured to be able to display the video,

the control unit transmits a live video of the subject being imaged by the imaging unit to the mobile communication terminal via the transceiving unit when a predetermined movement of the subject has occurred, and

the mobile communication terminal is configured so that a terminal operator who operates the mobile communication terminal can make communication or a telephone call with the subject while viewing the live video by performing a predetermined operation.

12. The notification system according to any one of claims 9 to 11, wherein

the subject and the mobile communication terminal are correlated and the transceiving unit is configured to be able to transmit information to a specific mobile communication terminal,

the detection unit is correlated with the subject,

upon receiving the movement information of the subject from the detection unit, the control unit specifies the subject based on the correlation between the detection unit and the subject, specifies the mobile communication terminal to which information is to be transmitted based on the correlation between the subject and the mobile communication terminal, and transmits the movement information of the subject to the specified mobile communication terminal via the transceiving unit.

13. A notification system comprising:

a notification unit including an operating module configured to be able to input operations and a notification module disposed at a position separated from the operating module and configured to be able to output a notification to an external device, the notification unit being configured such that the notification module operates to output a notification to the external device in response to a first signal for operating the notification module, transmitted from the operating module when an operator inputs an operation;

a detection unit that generates movement information of the operator according to a change over time;

a control unit that receives the movement information from the detection unit, analyzes the movement information, and makes a determination on the occurrence of a predetermined event from the result of the analysis; and

a relay unit that is provided between the operating module and the notification module and is configured to allow the notification module and the control unit to communicate with each other, the relay unit transmitting the first signal to the notification module, wherein

the control unit transmits a second signal to the relay unit when the determination is executed, and the relay unit transmits a third signal for operating the notification module to the notification module in response to the second signal.

14. The notification system according to claim 13, further comprising:

a first communication unit provided in the relay unit; and

a second communication unit provided in the detection unit or the control unit, wherein

the first communication unit and the second communication unit communicate bidirectionally whereby the notification module can communicate with the detection unit or the control unit bidirectionally via the relay unit.

15. The notification system according to claim 14, wherein

when it is determined that the predetermined event has occurred, the control unit transmits the second signal to the relay unit via the second communication unit and the first communication unit.

16. The notification system according to claim 14 or 15, wherein

the first communication unit and the second communication unit are wireless communication unit.

17. The notification system according to any one of claims **13** to **16**, wherein

the detection unit is an imaging unit configured to be able to generate videos, and

the control unit includes a third display module configured to be able to display videos and displays a video imaged by the imaging unit in a predetermined period including the time when the determination was made or the input operation was executed on the third display module when it is determined that the predetermined event has occurred or the input operation was performed.

18. The notification system according to claim **17**, wherein

the control unit determines the occurrence of the predetermined event based on a change in a luminance value of a pixel that forms the video in response to a predetermined movement of the operator.

19. The notification system according to claim **16**, wherein

the control unit includes a third communication unit configured to be able to communicate with at least one mobile communication terminal,

when it is determined that the predetermined event has occurred, the control unit transmits information based on the result of the determination to the mobile communication terminal via the third communication unit, and

the relay unit notifies the mobile communication terminal of information indicating that the third signal has been transmitted via the first communication unit.

20. The notification system according to claim **19**, wherein

the mobile communication terminal includes a fourth display module configured to be able to display videos, and

the control unit transmits a video corresponding to the predetermined event occurred to the mobile communication terminal via the second communication unit or the third communication unit together with the information indicating the execution of the determination, and the mobile communication terminal displays the video on the fourth display module.

21. The notification system according to any one of claims **13** to **20**, wherein

the notification unit is a nurse call system which includes a switch which is the operating module and a call module which is the notification module and in which the call module operates when the operator operates the switch.

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专利名称(译)	通知系统		
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[标]申请(专利权)人(译)	柯尼卡株式会社		
申请(专利权)人(译)	柯尼卡美能达，INC.		
当前申请(专利权)人(译)	柯尼卡美能达，INC.		
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发明人	ATARASHI, YUICHI OKADA, TAKASHI		
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摘要(译)

提供了一种通知系统，其适当地通知医疗保健提供者病房中患者状态的变化。通知系统包括：检测单元，其根据随时间的变化生成对象的运动信息;存储单元，连接到检测单元并存储移动信息;以及控制单元，其从检测单元接收移动信息，分析移动信息，根据分析结果确定预定事件的发生，在包括确定的时间的预定时段中指定移动信息如上所述，根据发生的预定事件的类型将存储优先级值应用于移动信息，并将移动信息发送到存储单元。