US009271124B2

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Sato et al.

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(45) **Date of Patent: Feb. 23, 2016**

(54) **INFORMATION PROCESSING APPARATUS, WIRELESS COMMUNICATION APPARATUS, COMMUNICATION SYSTEM, AND INFORMATION PROCESSING METHOD**

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 202 days.

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(51) **Int. Cl.**
H04W 12/06 (2009.01)
H04W 4/00 (2009.01)
(Continued)

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CPC ***H04W 4/08*** (2013.01); ***H04L 63/083*** (2013.01); ***H04L 63/104*** (2013.01); ***H04W 12/06*** (2013.01); *H04L 63/065* (2013.01); *H04W 4/005* (2013.01)

(58) **Field of Classification Search**
CPC H04L 63/104; H04L 12/66; H04L 63/083; H04L 63/065; H04L 63/107; H04W 12/06; H04W 12/08; H04W 4/005; H04W 4/08; H04W 4/10; H04W 72/005; H04W 76/002; H04W 76/005; H04W 48/02; H04W 4/02; H04M 2203/2044; H04M 3/38
See application file for complete search history.

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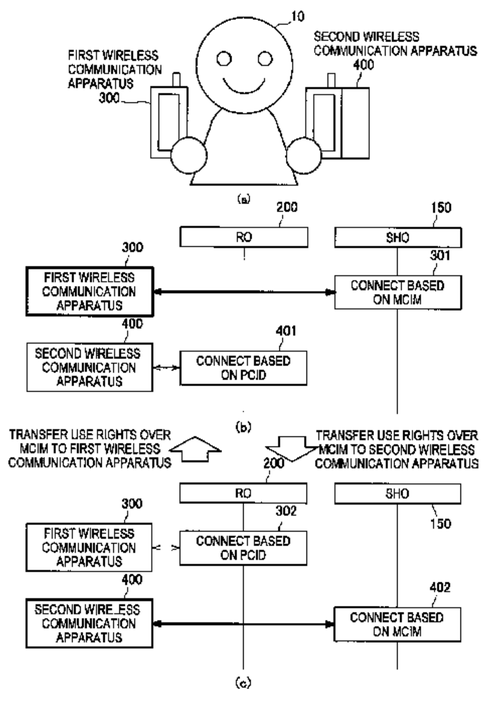
Primary Examiner — Sujatha Sharma
(74) *Attorney, Agent, or Firm* — Sony Corporation

(57) **ABSTRACT**

An information processing apparatus and method provide logic for processing information. In one implementation, an information processing apparatus may include a receiving unit configured to receive, from a first communications device, a first request to join a group of second communications devices. In such implementations, the first request includes first information identifying the group, and the group is associated with at least one connection right. The information processing apparatus may further includes control unit configured to associate the first communications device with the group, based at least the received information.

19 Claims, 21 Drawing Sheets



(51) **Int. Cl.**
H04L 29/06 (2006.01)
H04W 4/08 (2009.01)

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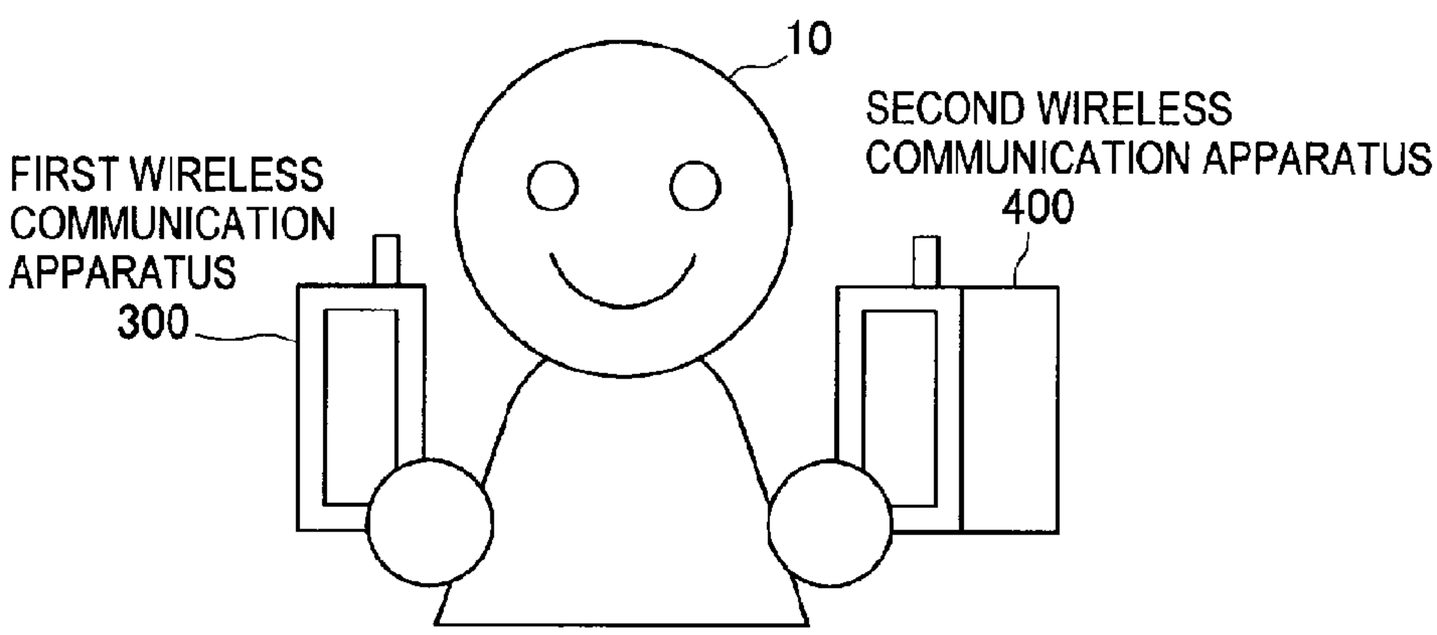
Fig. 1


10
FIRST WIRELESS COMMUNICATION APPARATUS
300
SECOND WIRELESS COMMUNICATION APPARATUS
400

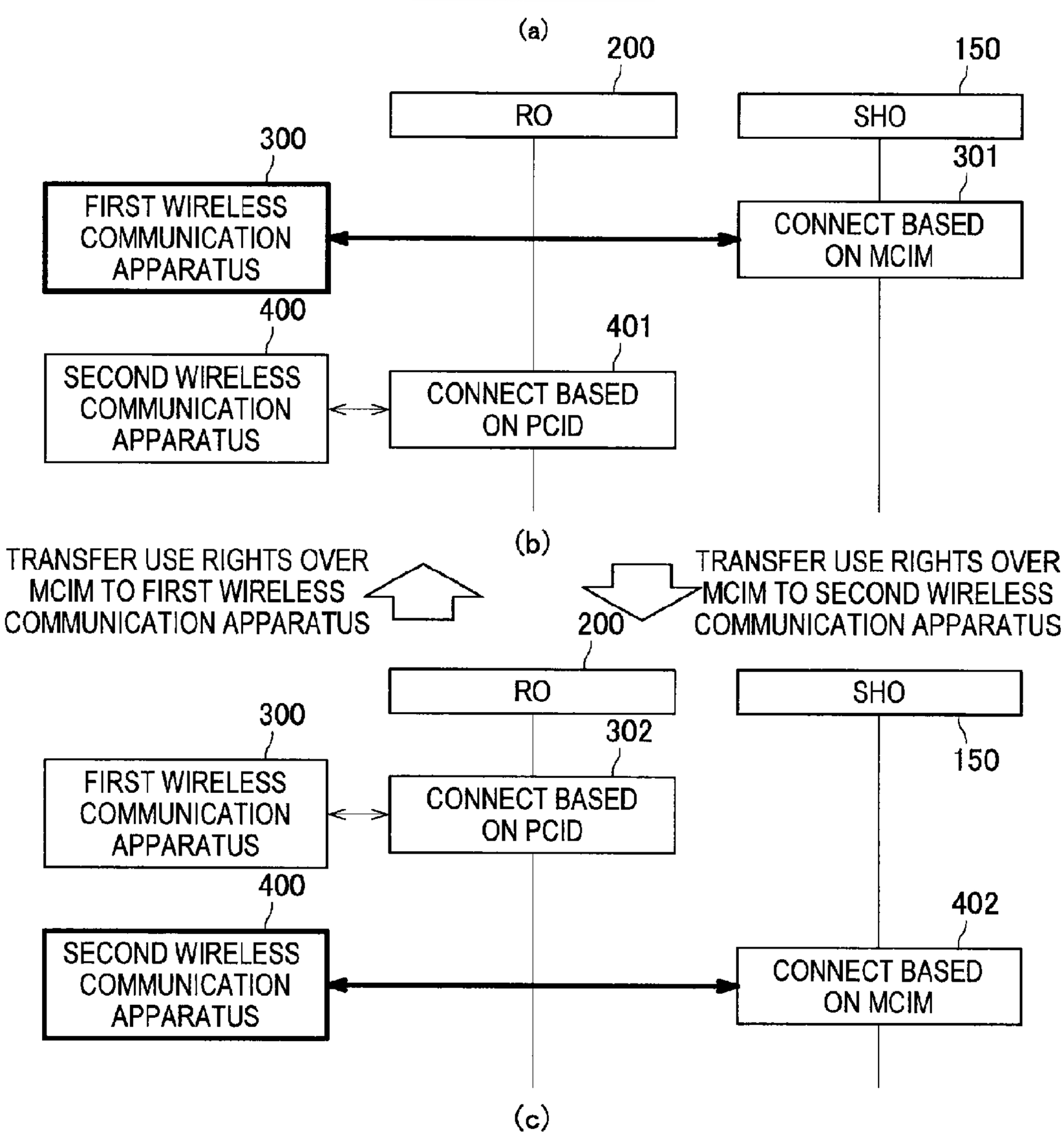

(a)
200
RO
150
SHO
300
FIRST WIRELESS COMMUNICATION APPARATUS
301
CONNECT BASED ON MCIM
400
SECOND WIRELESS COMMUNICATION APPARATUS
401
CONNECT BASED ON PCID
(b)
TRANSFER USE RIGHTS OVER MCIM TO FIRST WIRELESS COMMUNICATION APPARATUS
200
TRANSFER USE RIGHTS OVER MCIM TO SECOND WIRELESS COMMUNICATION APPARATUS
RO
150
SHO
300
FIRST WIRELESS COMMUNICATION APPARATUS
302
CONNECT BASED ON PCID
400
SECOND WIRELESS COMMUNICATION APPARATUS
402
CONNECT BASED ON MCIM
(c)

Fig. 2

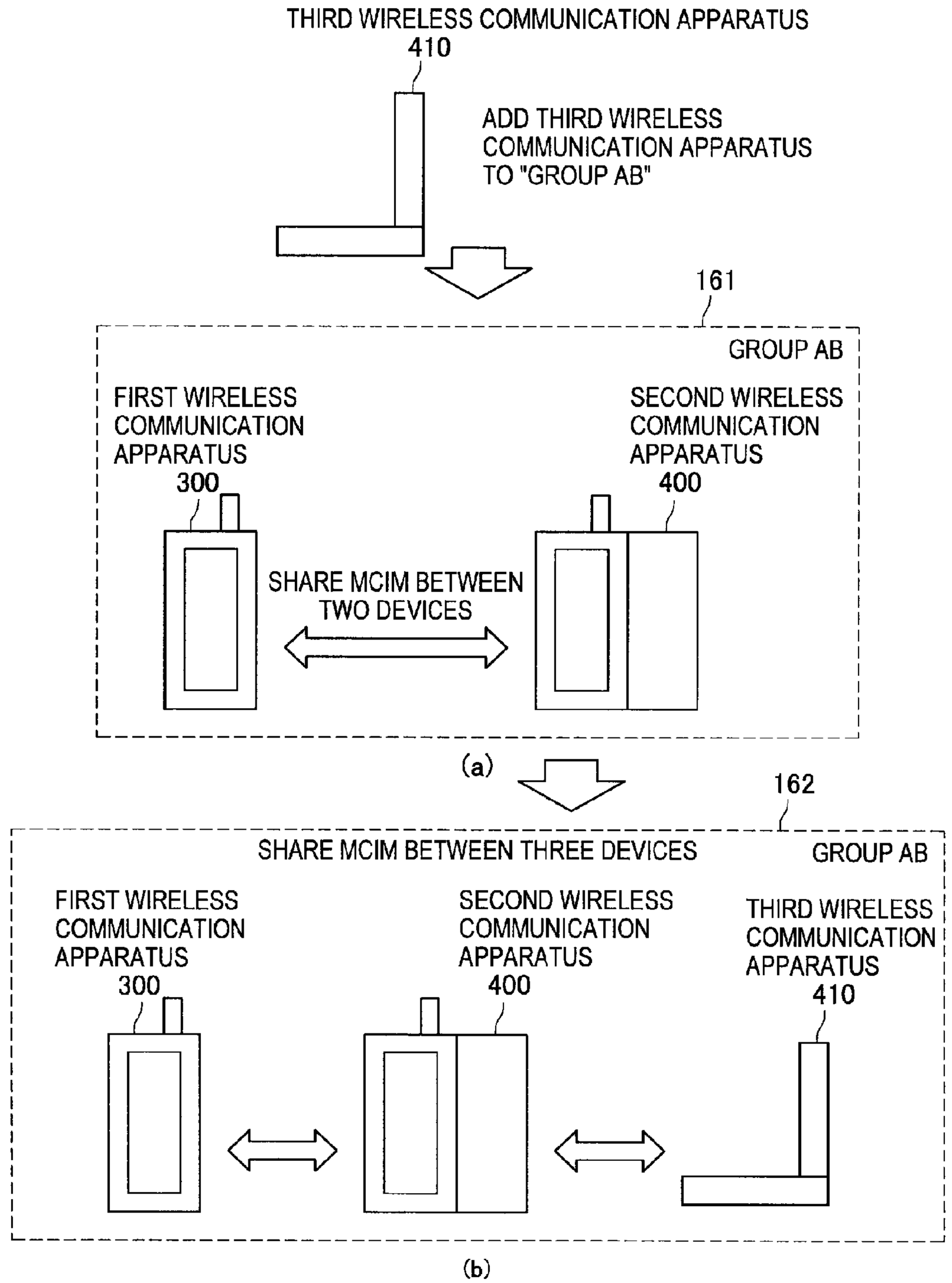

THIRD WIRELESS COMMUNICATION APPARATUS
410
ADD THIRD WIRELESS COMMUNICATION APPARATUS TO "GROUP AB"
161
GROUP AB
FIRST WIRELESS COMMUNICATION APPARATUS
300
SECOND WIRELESS COMMUNICATION APPARATUS
400
SHARE MCIM BETWEEN TWO DEVICES
(a)
162
SHARE MCIM BETWEEN THREE DEVICES
GROUP AB
FIRST WIRELESS COMMUNICATION APPARATUS
300
SECOND WIRELESS COMMUNICATION APPARATUS
400
THIRD WIRELESS COMMUNICATION APPARATUS
410
(b)

Fig. 3

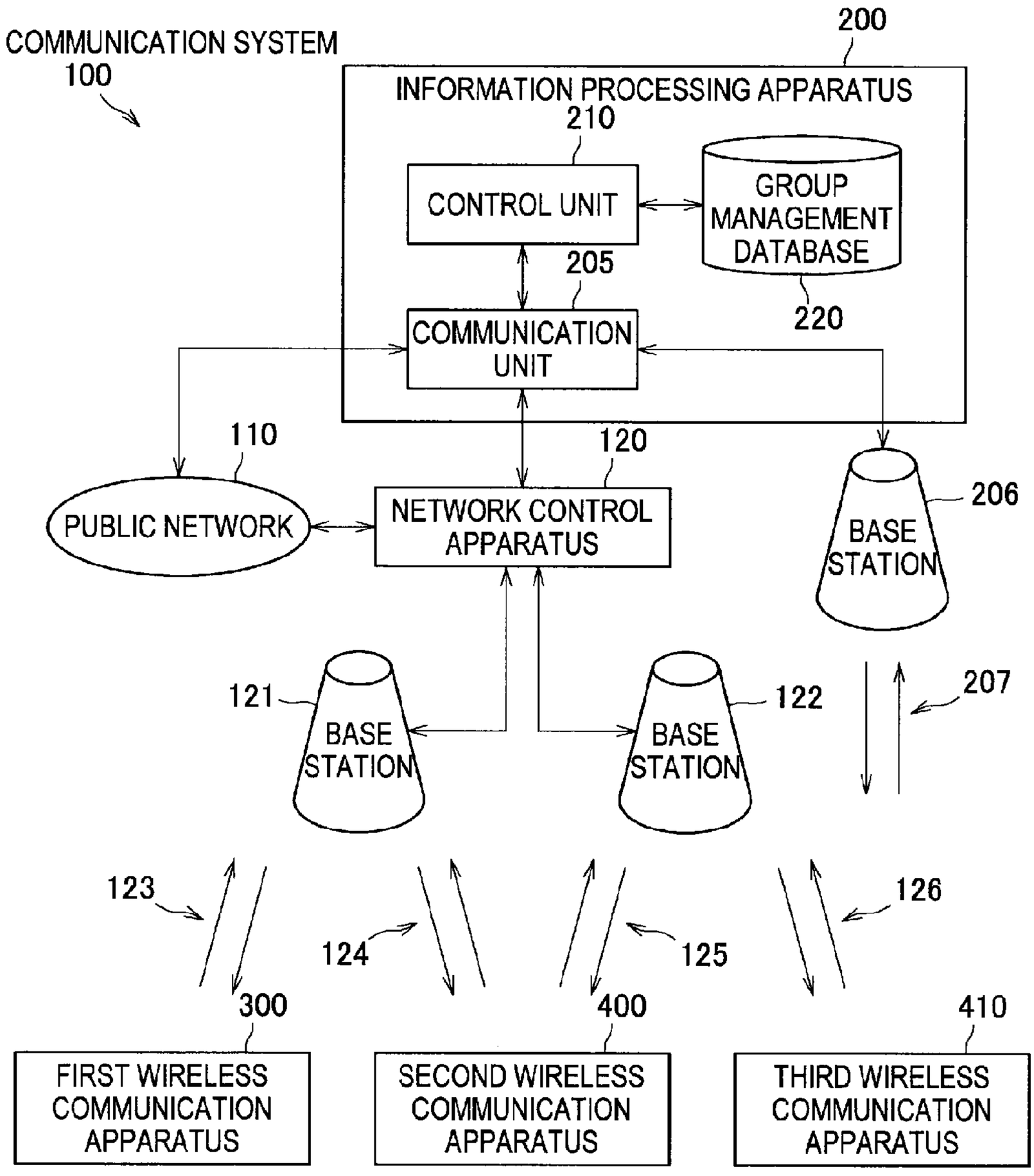

COMMUNICATION SYSTEM
100
200
INFORMATION PROCESSING APPARATUS
210
CONTROL UNIT
GROUP MANAGEMENT DATABASE
220
205
COMMUNICATION UNIT
110
120
PUBLIC NETWORK
NETWORK CONTROL APPARATUS
206
BASE STATION
121
BASE STATION
122
BASE STATION
207
123
124
125
126
300
400
410
FIRST WIRELESS COMMUNICATION APPARATUS
SECOND WIRELESS COMMUNICATION APPARATUS
THIRD WIRELESS COMMUNICATION APPARATUS

Fig. 4

GROUP MANAGEMENT DATABASE
220

	221 GROUP NAME	222 GROUP ID	223 GROUP PASSWORD	224 DEVICE NAME	225 TERMINAL IDENTIFICATION INFORMATION	226 VALID/INVALID INFORMATION
1	GROUP AB	123456789	poiuytr	MY MOBILE	PCID#1	VALID
				MY E-BOOK READER	PCID#2	INVALID
2	...	...	...	...	...	...
⋮	⋮	⋮	⋮	⋮	⋮	⋮
M	...	...	...	...	...	...

(a) ADD THIRD WIRELESS COMMUNICATION APPARATUS (PCID#3) TO "GROUP AB"

GROUP MANAGEMENT DATABASE
220

	221 GROUP NAME	222 GROUP ID	223 GROUP PASSWORD	224 DEVICE NAME	225 TERMINAL IDENTIFICATION INFORMATION	226 VALID/INVALID INFORMATION
1	GROUP AB	123456789	poiuytr	MY MOBILE	PCID#1	VALID
				MY E-BOOK READER	PCID#2	INVALID
				MY COMPUTER	PCID#3	INVALID
2	...	...	...	...	...	...
⋮	⋮	⋮	⋮	⋮	⋮	⋮
M	...	...	...	...	...	...

(b) 227

Fig. 5

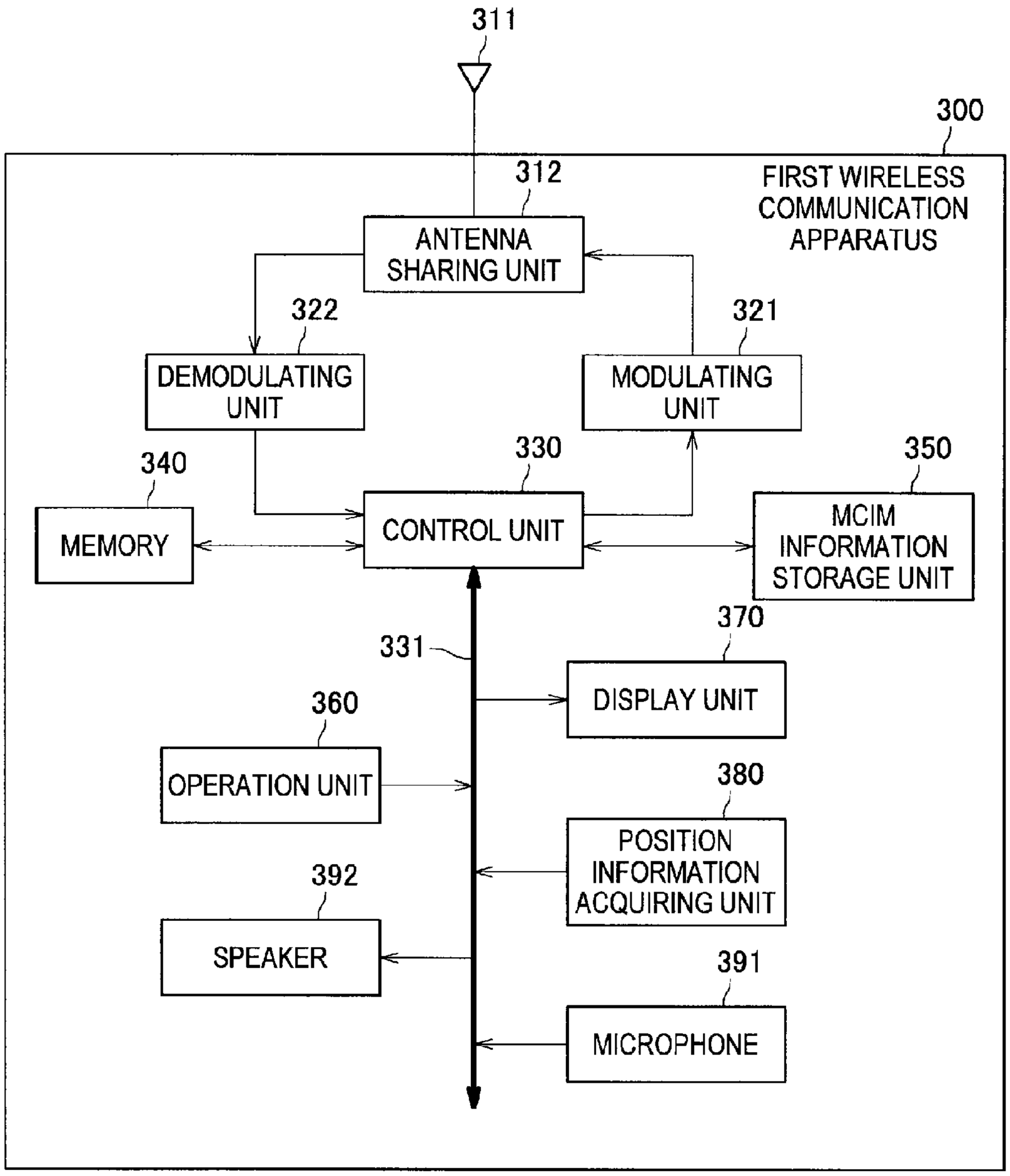

311
300
FIRST WIRELESS COMMUNICATION APPARATUS
312
ANTENNA SHARING UNIT
322
DEMODULATING UNIT
321
MODULATING UNIT
340
MEMORY
330
CONTROL UNIT
350
MCIM INFORMATION STORAGE UNIT
370
DISPLAY UNIT
331
360
OPERATION UNIT
380
POSITION INFORMATION ACQUIRING UNIT
392
SPEAKER
391
MICROPHONE

Fig. 6

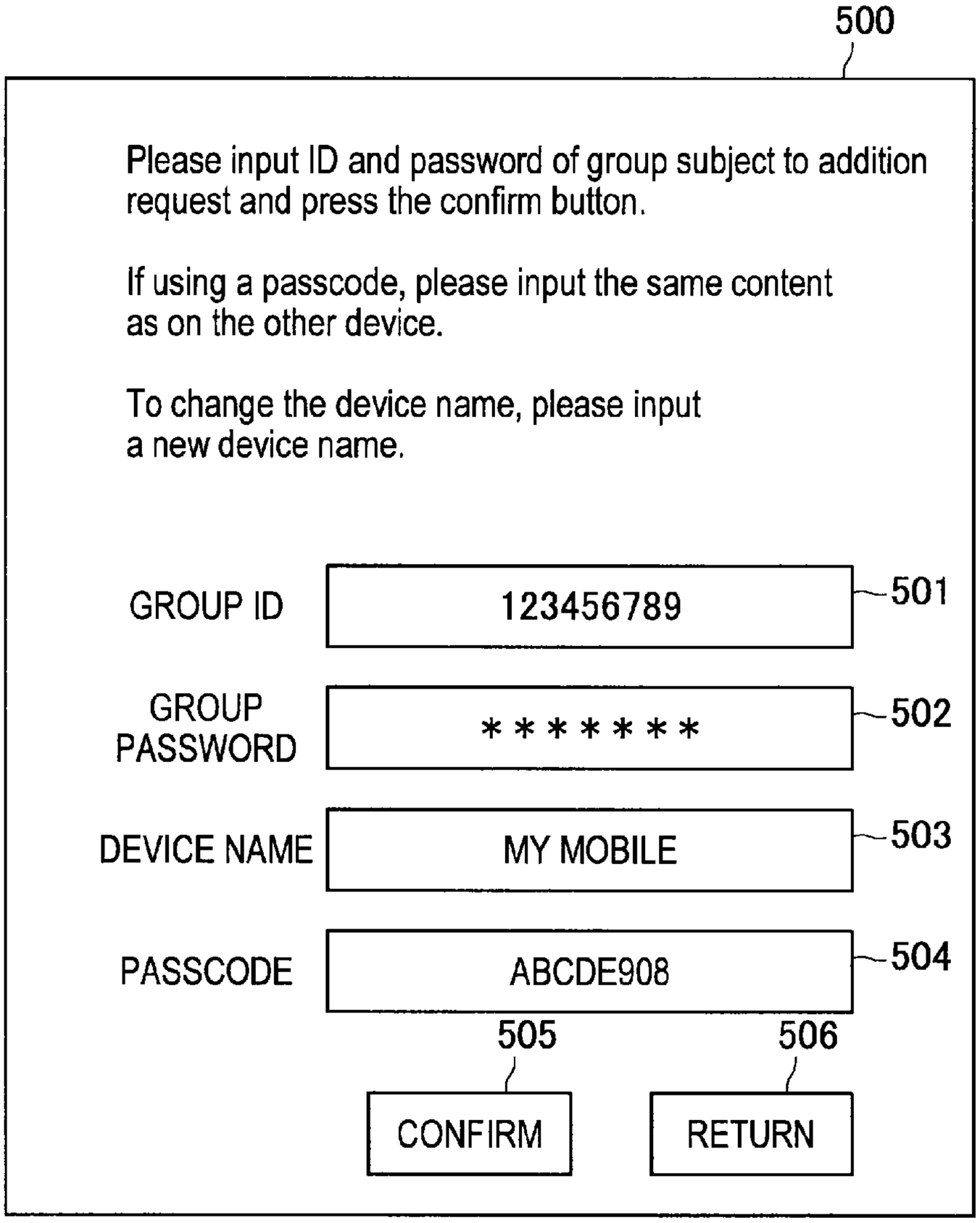
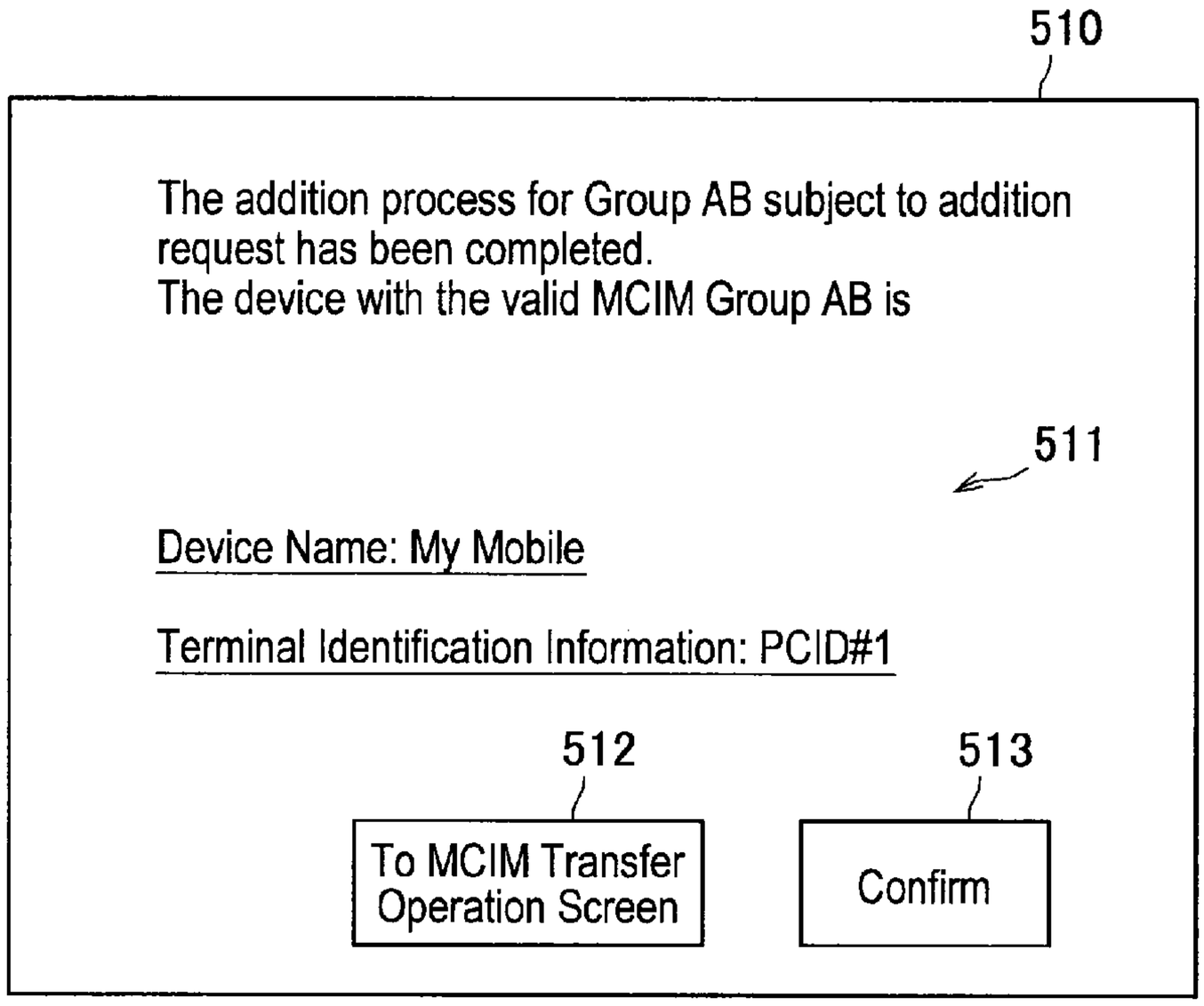
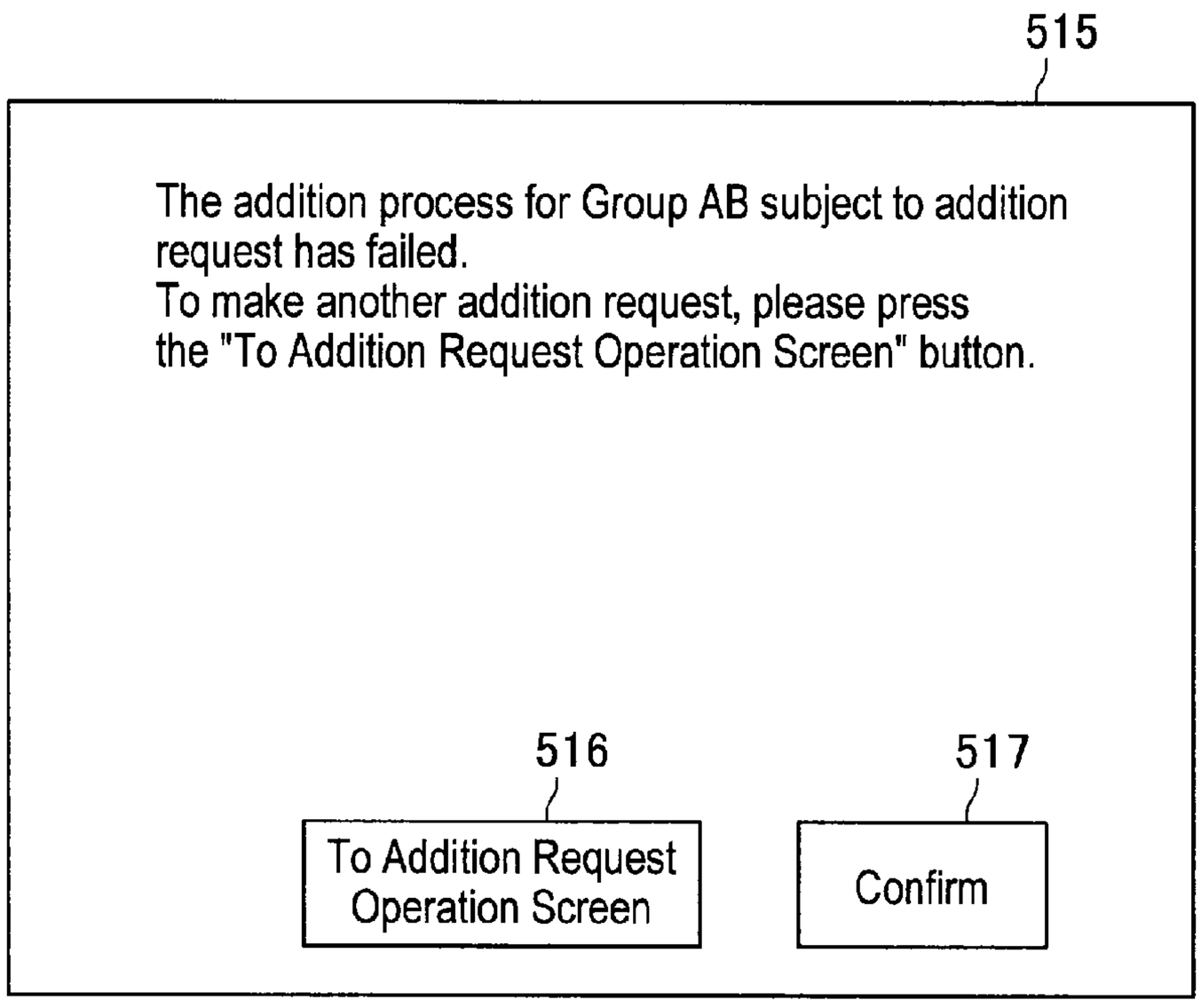

500
Please input ID and password of group subject to addition request and press the confirm button.
If using a passcode, please input the same content as on the other device.
To change the device name, please input a new device name.
GROUP ID
123456789
501
GROUP PASSWORD
* * * * * * *
502
DEVICE NAME
MY MOBILE
503
PASSCODE
ABCDE908
504
505
CONFIRM
506
RETURN

Fig. 7


510
The addition process for Group AB subject to addition request has been completed.
The device with the valid MCIM Group AB is
511
Device Name: My Mobile
Terminal Identification Information: PCID#1
512
To MCIM Transfer Operation Screen
513
Confirm

(a)


515
The addition process for Group AB subject to addition request has failed.
To make another addition request, please press the "To Addition Request Operation Screen" button.
516
To Addition Request Operation Screen
517
Confirm

(b)

Fig. 8

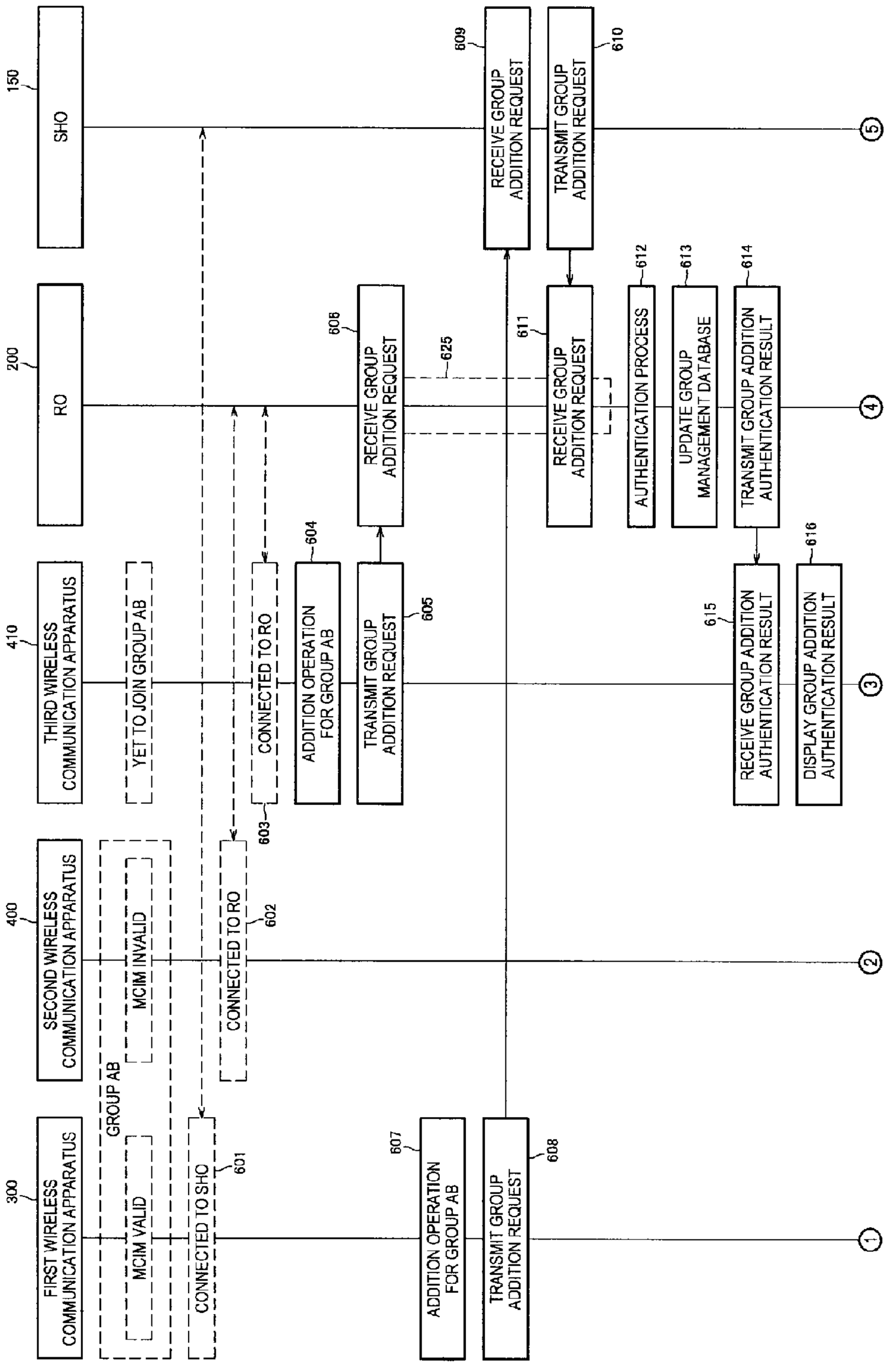

300
FIRST WIRELESS COMMUNICATION APPARATUS
400
SECOND WIRELESS COMMUNICATION APPARATUS
410
THIRD WIRELESS COMMUNICATION APPARATUS
200
RO
150
SHO
GROUP AB
MCIM VALID
MCIM INVALID
YET TO JOIN GROUP AB
CONNECTED TO SHO
601
CONNECTED TO RO
602
603
CONNECTED TO RO
604
ADDITION OPERATION FOR GROUP AB
605
TRANSMIT GROUP ADDITION REQUEST
606
RECEIVE GROUP ADDITION REQUEST
607
ADDITION OPERATION FOR GROUP AB
608
TRANSMIT GROUP ADDITION REQUEST
609
RECEIVE GROUP ADDITION REQUEST
610
TRANSMIT GROUP ADDITION REQUEST
611
RECEIVE GROUP ADDITION REQUEST
612
AUTHENTICATION PROCESS
613
UPDATE GROUP MANAGEMENT DATABASE
614
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT
615
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
616
DISPLAY GROUP ADDITION AUTHENTICATION RESULT
625
1
2
3
4
5

Fig. 9

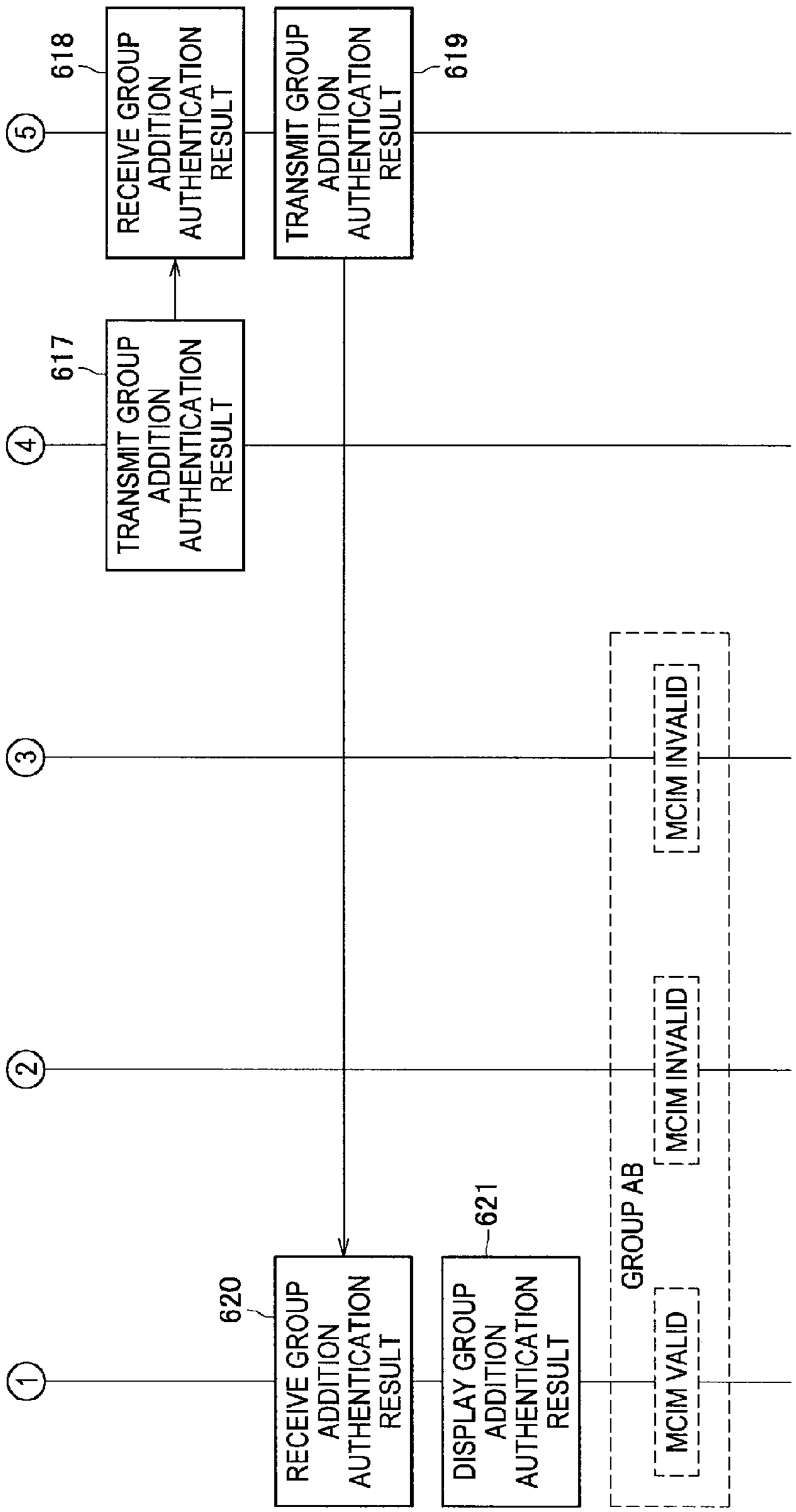

618
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
619
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT
617
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT
MCIM INVALID
620
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
621
DISPLAY GROUP ADDITION AUTHENTICATION RESULT
GROUP AB
MCIM INVALID
MCIM VALID
5
4
3
2
1

Fig. 10

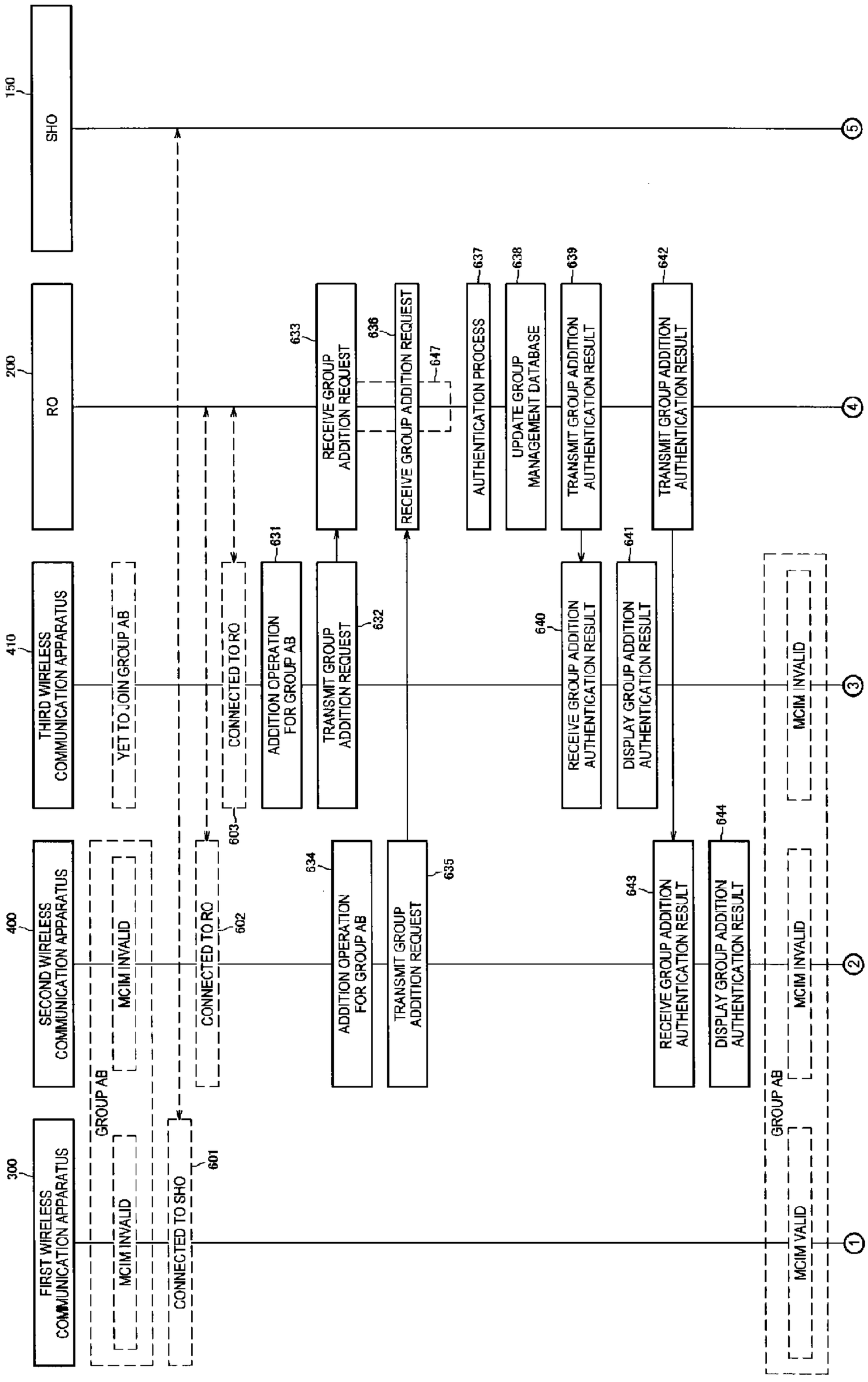

150
SHO
5
637
638
639
642
200
RO
633
636
647
RECEIVE GROUP ADDITION REQUEST
RECEIVE GROUP ADDITION REQUEST
AUTHENTICATION PROCESS
UPDATE GROUP MANAGEMENT DATABASE
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT
4
410
THIRD WIRELESS COMMUNICATION APPARATUS
YET TO JOIN GROUP AB
CONNECTED TO RO
631
ADDITION OPERATION FOR GROUP AB
TRANSMIT GROUP ADDITION REQUEST
632
640
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
641
DISPLAY GROUP ADDITION AUTHENTICATION RESULT
MCIM INVALID
3
603
634
635
644
643
400
SECOND WIRELESS COMMUNICATION APPARATUS
MCIM INVALID
CONNECTED TO RO
602
ADDITION OPERATION FOR GROUP AB
TRANSMIT GROUP ADDITION REQUEST
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
DISPLAY GROUP ADDITION AUTHENTICATION RESULT
MCIM INVALID
2
GROUP AB
300
FIRST WIRELESS COMMUNICATION APPARATUS
GROUP AB
MCIM INVALID
CONNECTED TO SHO
601
MCIM VALID
1

Fig. 11

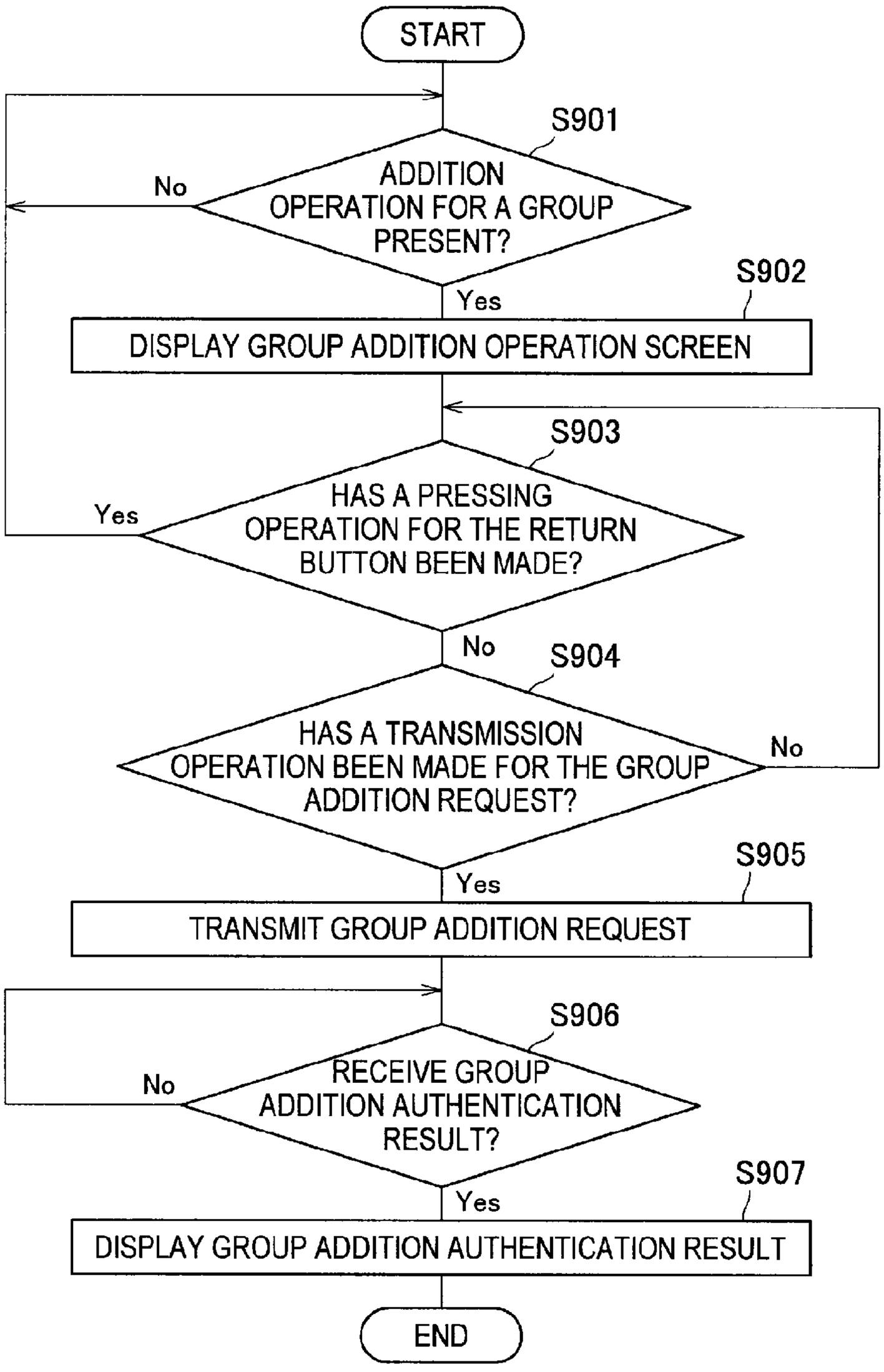

START
S901
ADDITION OPERATION FOR A GROUP PRESENT?
No
Yes
S902
DISPLAY GROUP ADDITION OPERATION SCREEN
S903
HAS A PRESSING OPERATION FOR THE RETURN BUTTON BEEN MADE?
Yes
No
S904
HAS A TRANSMISSION OPERATION BEEN MADE FOR THE GROUP ADDITION REQUEST?
No
Yes
S905
TRANSMIT GROUP ADDITION REQUEST
S906
RECEIVE GROUP ADDITION AUTHENTICATION RESULT?
No
Yes
S907
DISPLAY GROUP ADDITION AUTHENTICATION RESULT
END

Fig. 12

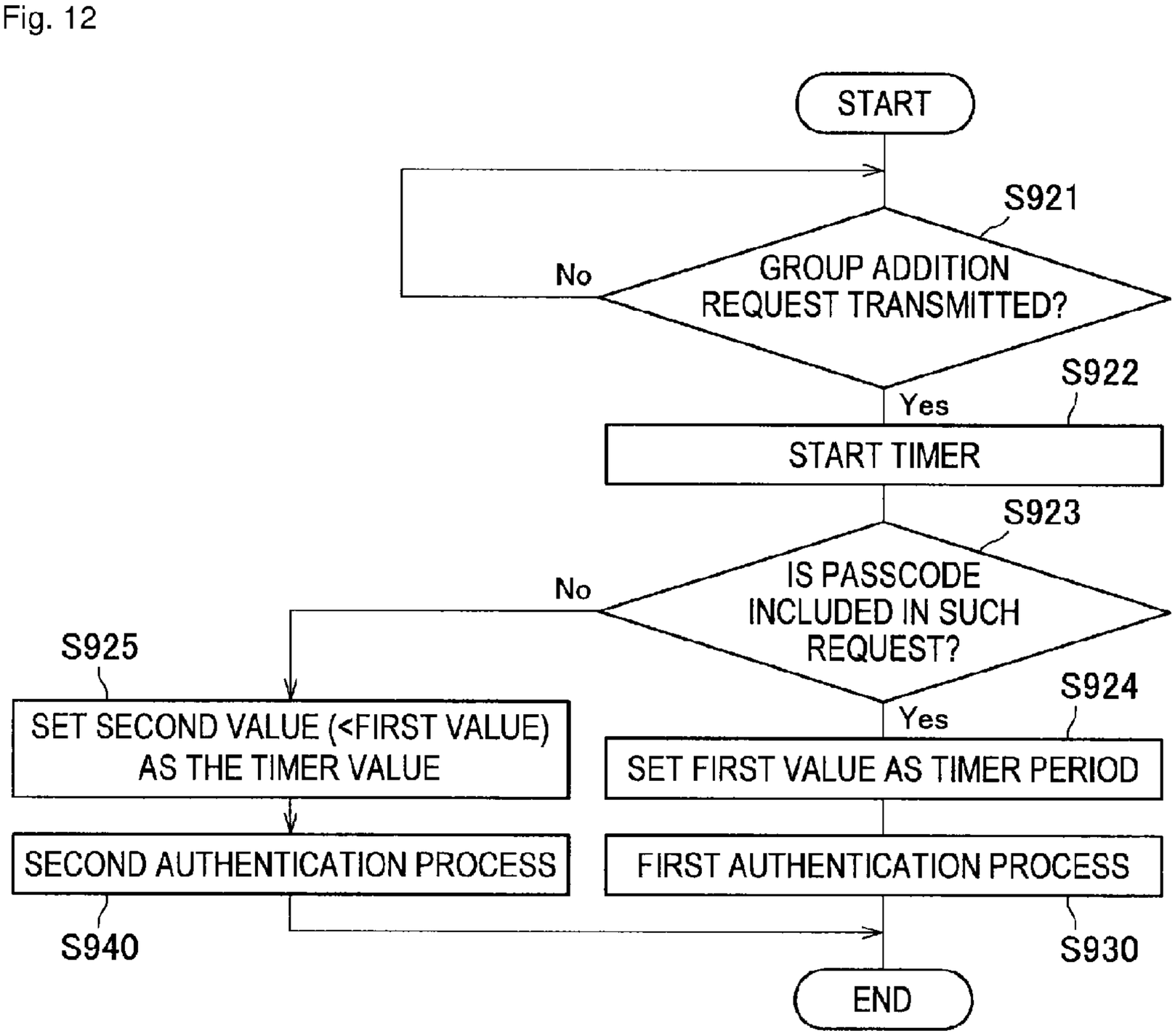

START
S921
GROUP ADDITION REQUEST TRANSMITTED?
No
Yes
S922
START TIMER
S923
IS PASSCODE INCLUDED IN SUCH REQUEST?
No
Yes
S924
SET FIRST VALUE AS TIMER PERIOD
S925
SET SECOND VALUE (<FIRST VALUE) AS THE TIMER VALUE
SECOND AUTHENTICATION PROCESS
FIRST AUTHENTICATION PROCESS
S940
S930
END

Fig. 13

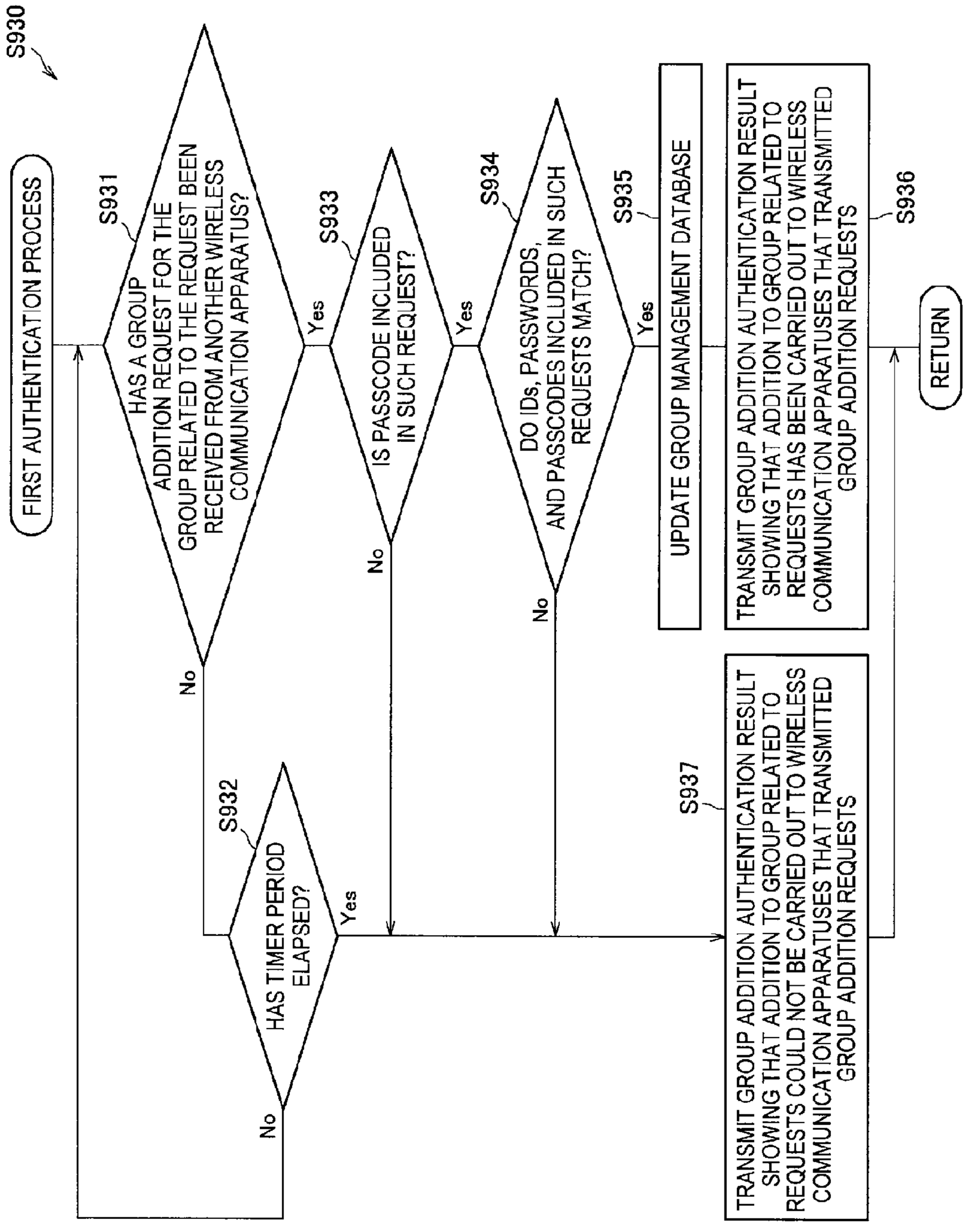

FIRST AUTHENTICATION PROCESS
S930
S931
HAS A GROUP ADDITION REQUEST FOR THE GROUP RELATED TO THE REQUEST BEEN RECEIVED FROM ANOTHER WIRELESS COMMUNICATION APPARATUS?
Yes
No
S932
HAS TIMER PERIOD ELAPSED?
Yes
No
S933
IS PASSCODE INCLUDED IN SUCH REQUEST?
Yes
No
S934
DO IDs, PASSWORDS, AND PASSCODES INCLUDED IN SUCH REQUESTS MATCH?
Yes
No
S935
UPDATE GROUP MANAGEMENT DATABASE
S936
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT SHOWING THAT ADDITION TO GROUP RELATED TO REQUESTS HAS BEEN CARRIED OUT TO WIRELESS COMMUNICATION APPARATUSES THAT TRANSMITTED GROUP ADDITION REQUESTS
S937
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT SHOWING THAT ADDITION TO GROUP RELATED TO REQUESTS COULD NOT BE CARRIED OUT TO WIRELESS COMMUNICATION APPARATUSES THAT TRANSMITTED GROUP ADDITION REQUESTS
RETURN

Fig. 14

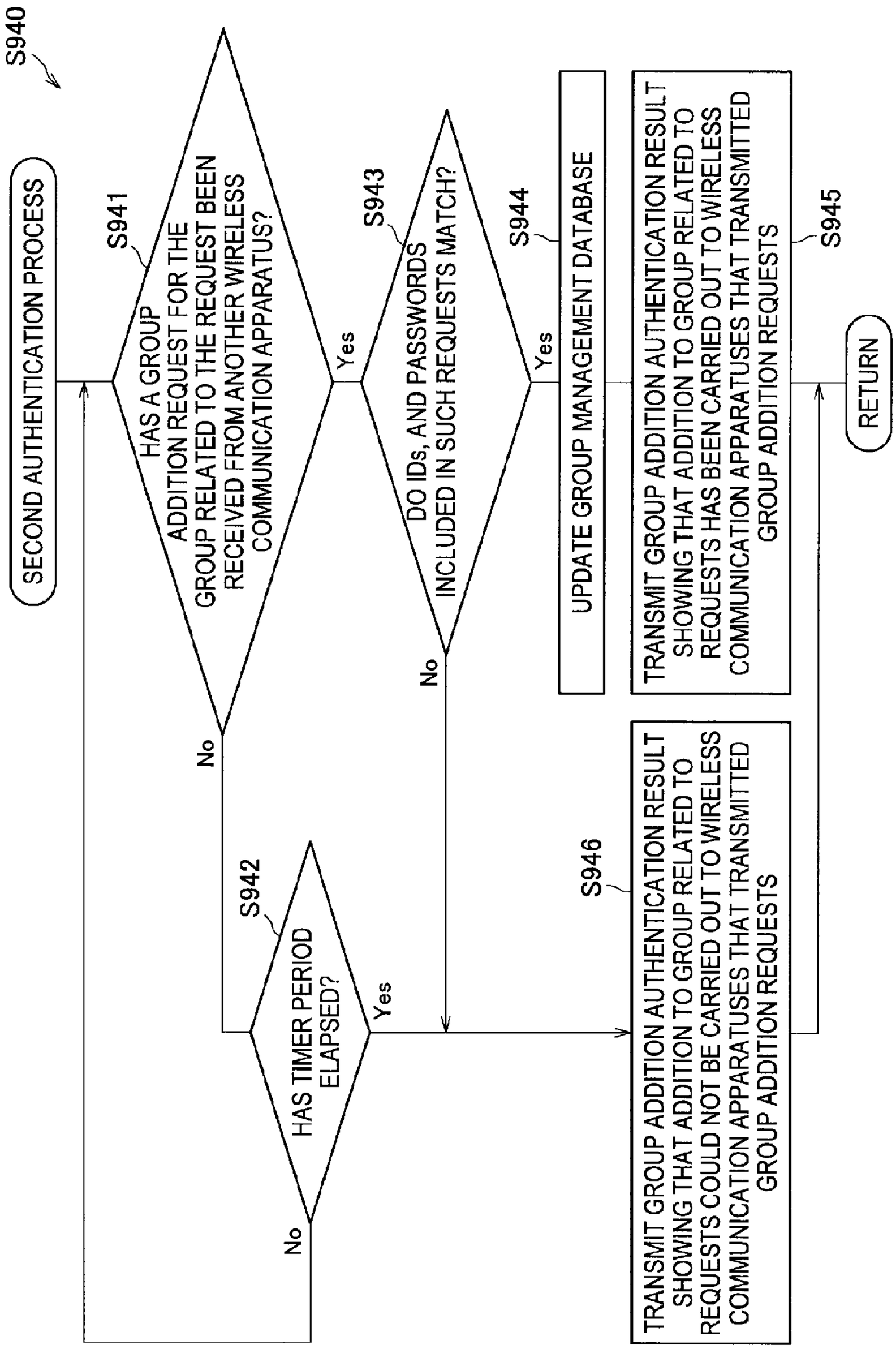

S940
SECOND AUTHENTICATION PROCESS
S941
HAS A GROUP ADDITION REQUEST FOR THE GROUP RELATED TO THE REQUEST BEEN RECEIVED FROM ANOTHER WIRELESS COMMUNICATION APPARATUS?
No
Yes
S942
HAS TIMER PERIOD ELAPSED?
No
Yes
S943
DO IDs, AND PASSWORDS INCLUDED IN SUCH REQUESTS MATCH?
No
Yes
S944
UPDATE GROUP MANAGEMENT DATABASE
S945
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT SHOWING THAT ADDITION TO GROUP RELATED TO REQUESTS HAS BEEN CARRIED OUT TO WIRELESS COMMUNICATION APPARATUSES THAT TRANSMITTED GROUP ADDITION REQUESTS
S946
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT SHOWING THAT ADDITION TO GROUP RELATED TO REQUESTS COULD NOT BE CARRIED OUT TO WIRELESS COMMUNICATION APPARATUSES THAT TRANSMITTED GROUP ADDITION REQUESTS
RETURN

Fig. 15

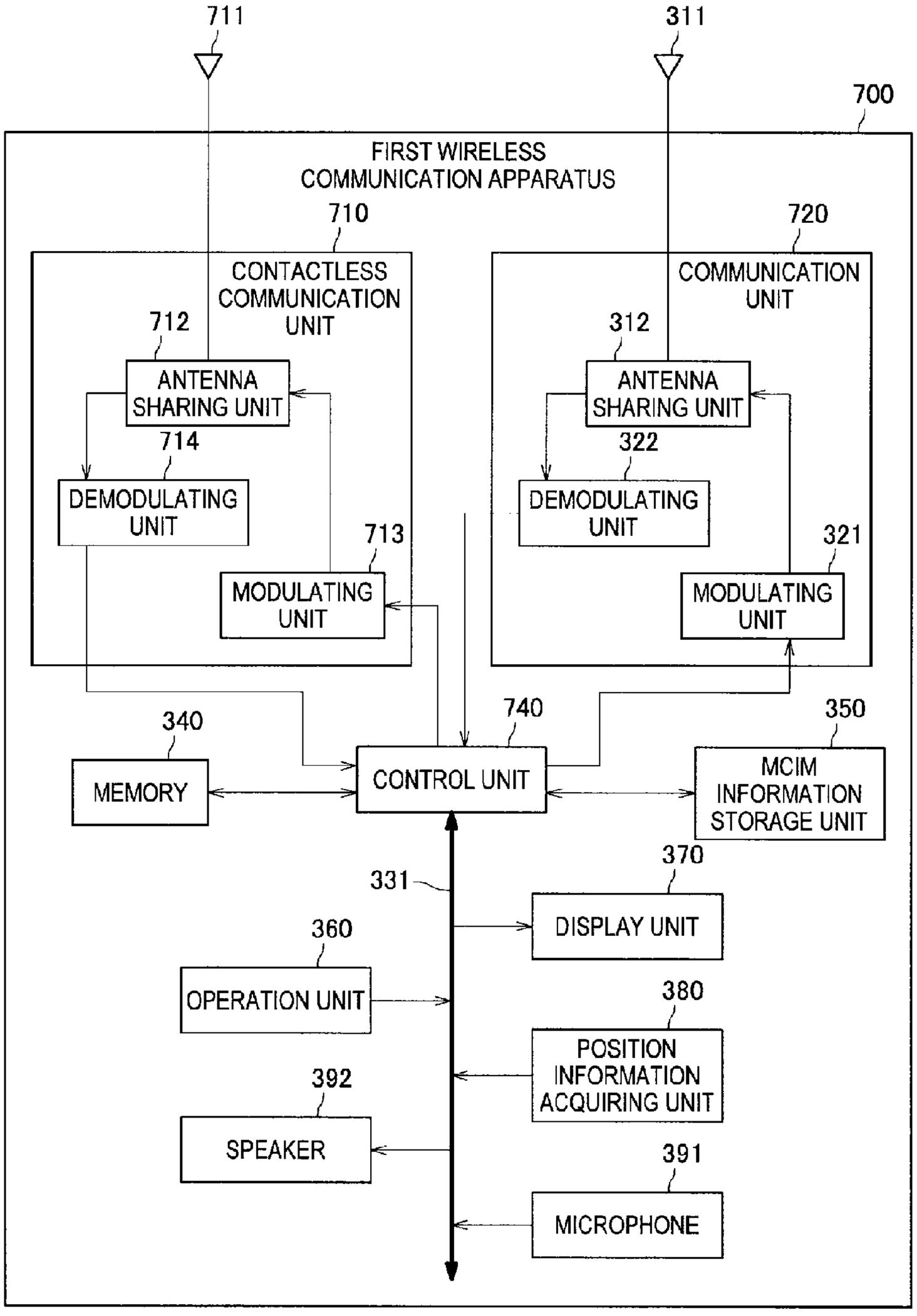
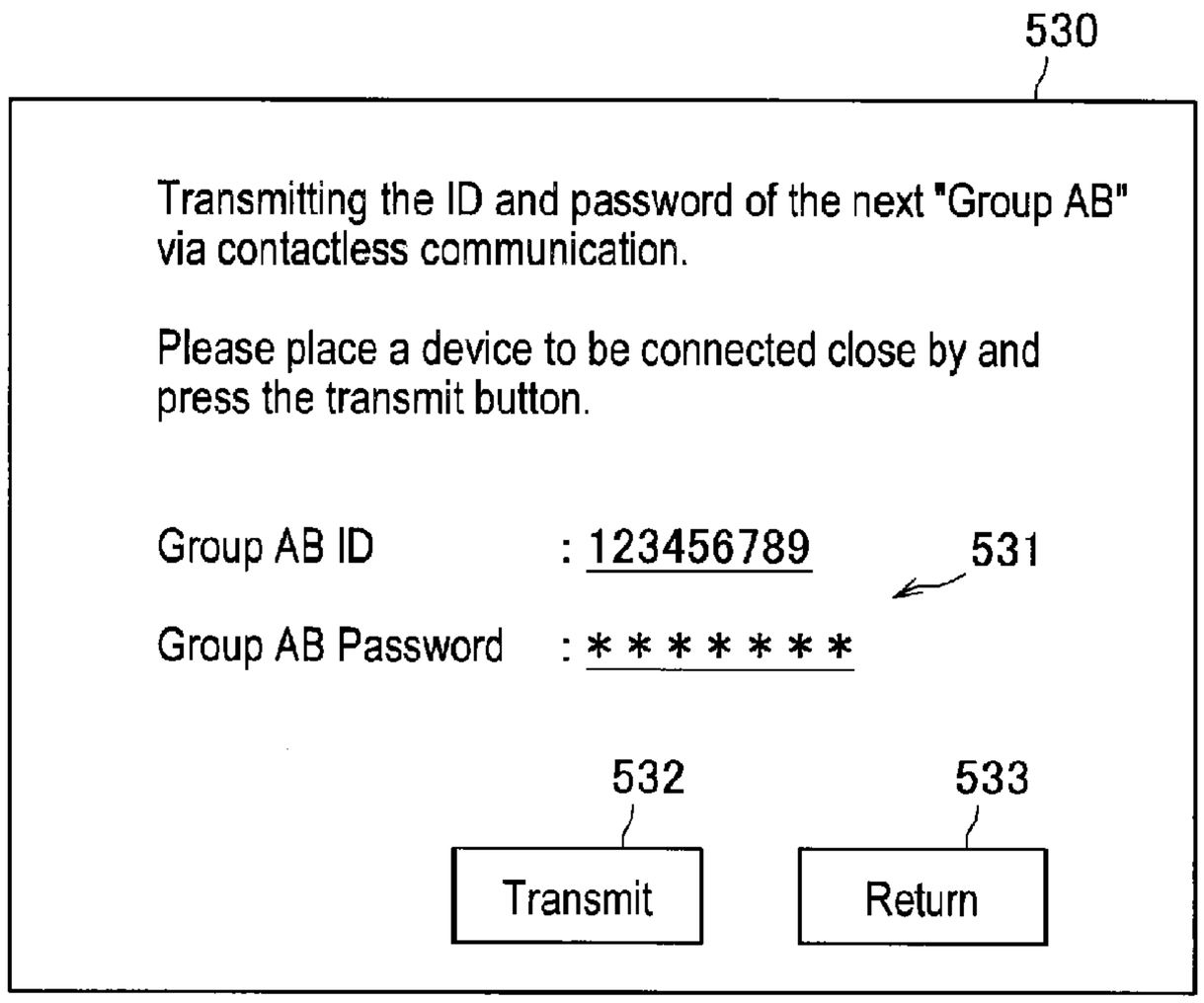
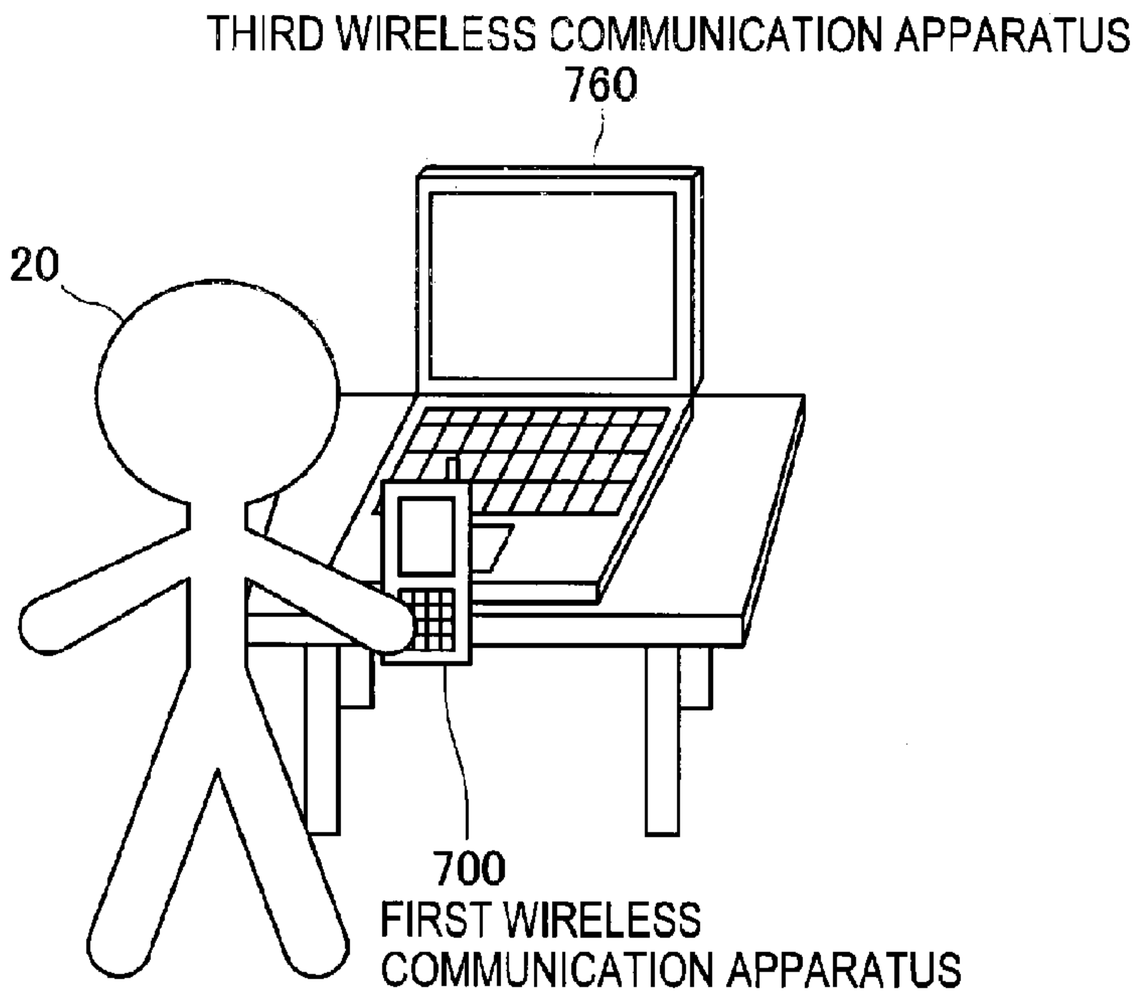

711
311
700
FIRST WIRELESS COMMUNICATION APPARATUS
710
CONTACTLESS COMMUNICATION UNIT
712
ANTENNA SHARING UNIT
714
DEMODULATING UNIT
713
MODULATING UNIT
720
COMMUNICATION UNIT
312
ANTENNA SHARING UNIT
322
DEMODULATING UNIT
321
MODULATING UNIT
340
MEMORY
740
CONTROL UNIT
350
MCIM INFORMATION STORAGE UNIT
331
370
DISPLAY UNIT
360
OPERATION UNIT
380
POSITION INFORMATION ACQUIRING UNIT
392
SPEAKER
391
MICROPHONE

Fig. 16


530
Transmitting the ID and password of the next "Group AB" via contactless communication.
Please place a device to be connected close by and press the transmit button.
Group AB ID : 123456789
531
Group AB Password : * * * * * * * *
532
533
Transmit
Return

(a)


THIRD WIRELESS COMMUNICATION APPARATUS
760
20
700
FIRST WIRELESS COMMUNICATION APPARATUS

(b)

Fig. 17

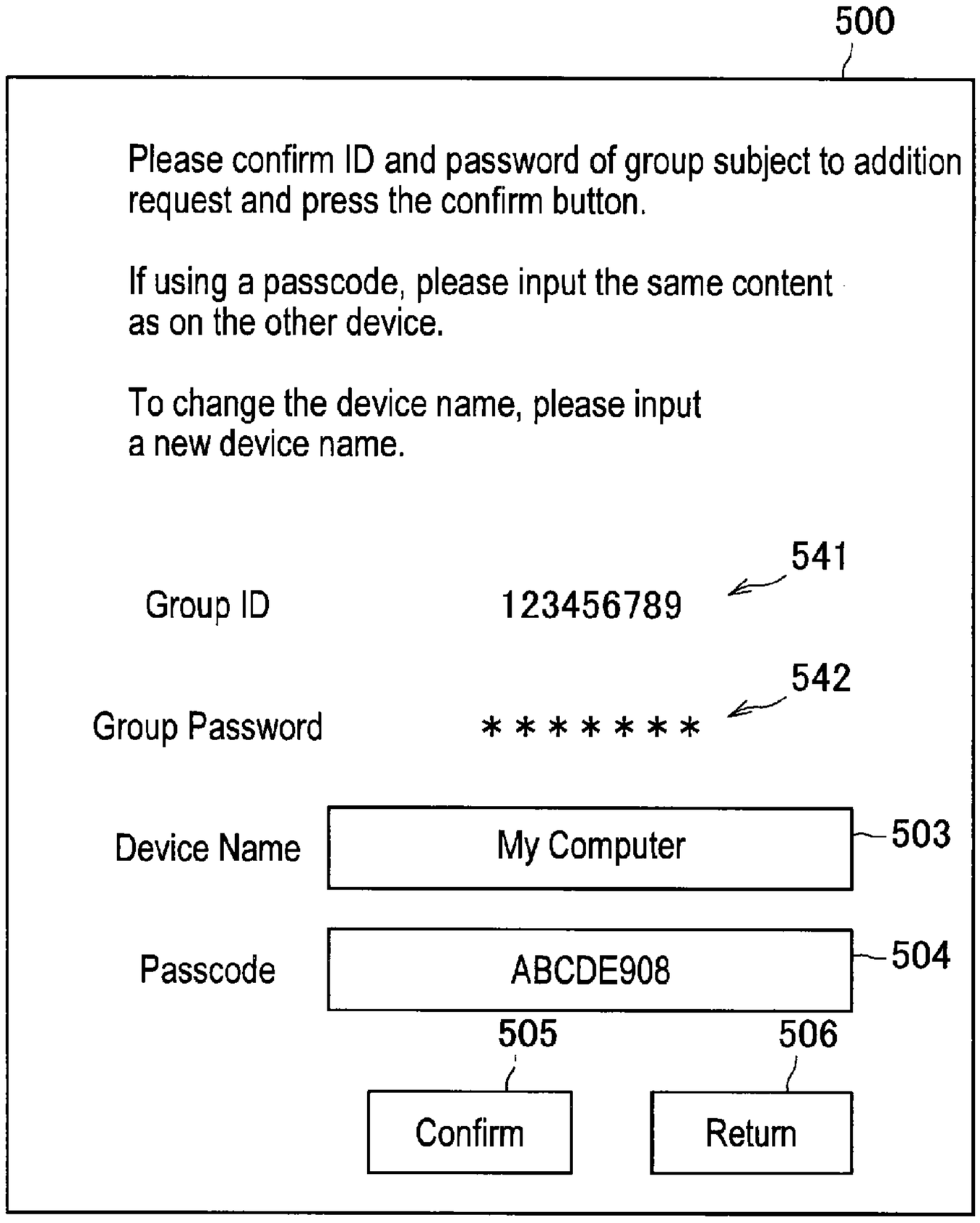

500
Please confirm ID and password of group subject to addition request and press the confirm button.
If using a passcode, please input the same content as on the other device.
To change the device name, please input a new device name.
541
Group ID
123456789
542
Group Password
* * * * * * *
Device Name
My Computer
503
Passcode
ABCDE908
504
505
506
Confirm
Return

Fig. 18

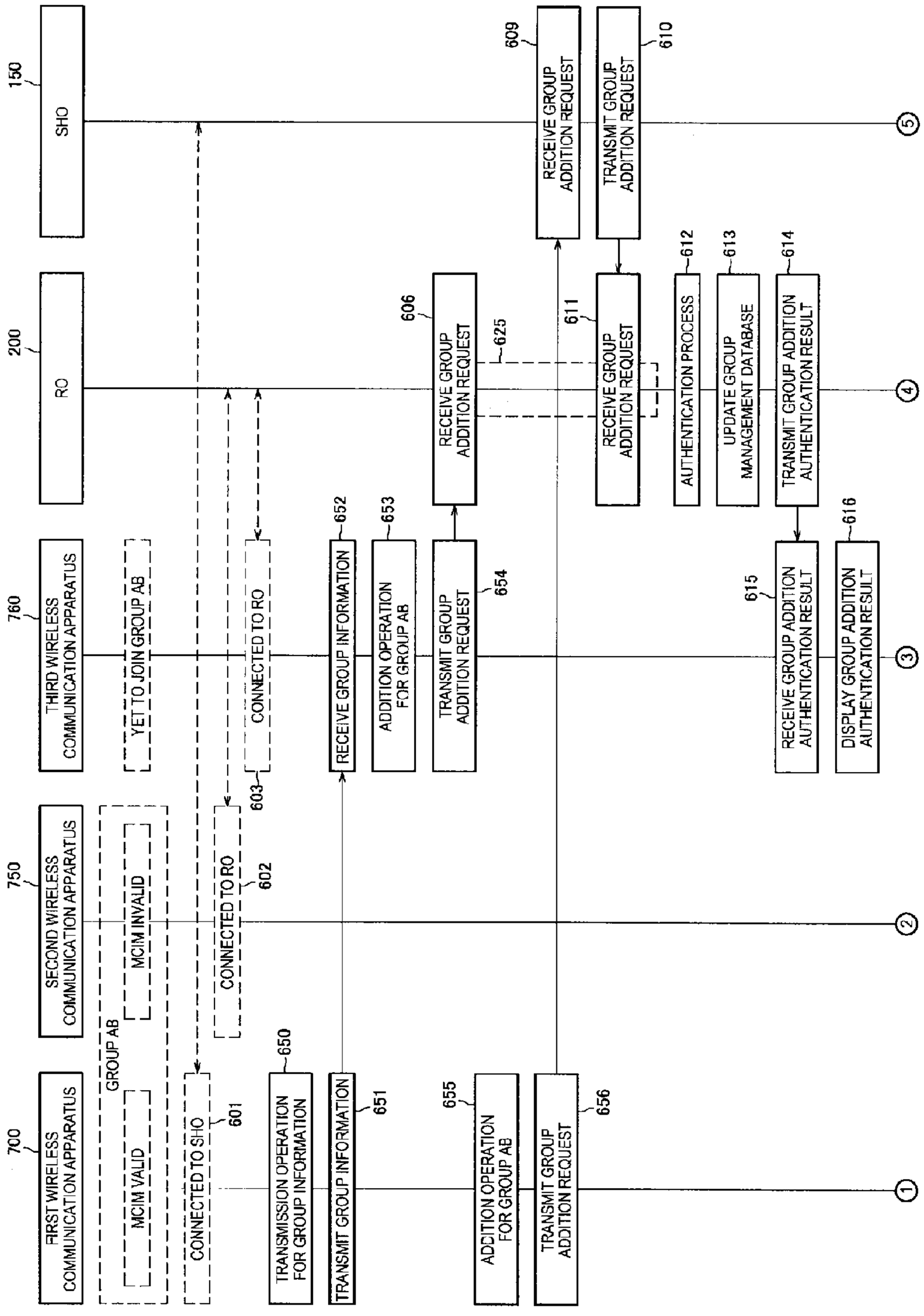

700
FIRST WIRELESS COMMUNICATION APPARATUS
750
SECOND WIRELESS COMMUNICATION APPARATUS
760
THIRD WIRELESS COMMUNICATION APPARATUS
200
RO
150
SHO
GROUP AB
MCIM VALID
MCIM INVALID
YET TO JOIN GROUP AB
CONNECTED TO SHO
601
CONNECTED TO RO
602
603
CONNECTED TO RO
TRANSMISSION OPERATION FOR GROUP INFORMATION
650
TRANSMIT GROUP INFORMATION
651
RECEIVE GROUP INFORMATION
652
ADDITION OPERATION FOR GROUP AB
653
TRANSMIT GROUP ADDITION REQUEST
654
ADDITION OPERATION FOR GROUP AB
655
TRANSMIT GROUP ADDITION REQUEST
656
RECEIVE GROUP ADDITION REQUEST
606
625
RECEIVE GROUP ADDITION REQUEST
609
611
RECEIVE GROUP ADDITION REQUEST
TRANSMIT GROUP ADDITION REQUEST
610
AUTHENTICATION PROCESS
612
UPDATE GROUP MANAGEMENT DATABASE
613
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT
614
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
615
DISPLAY GROUP ADDITION AUTHENTICATION RESULT
616
1
2
3
4
5

Fig. 19

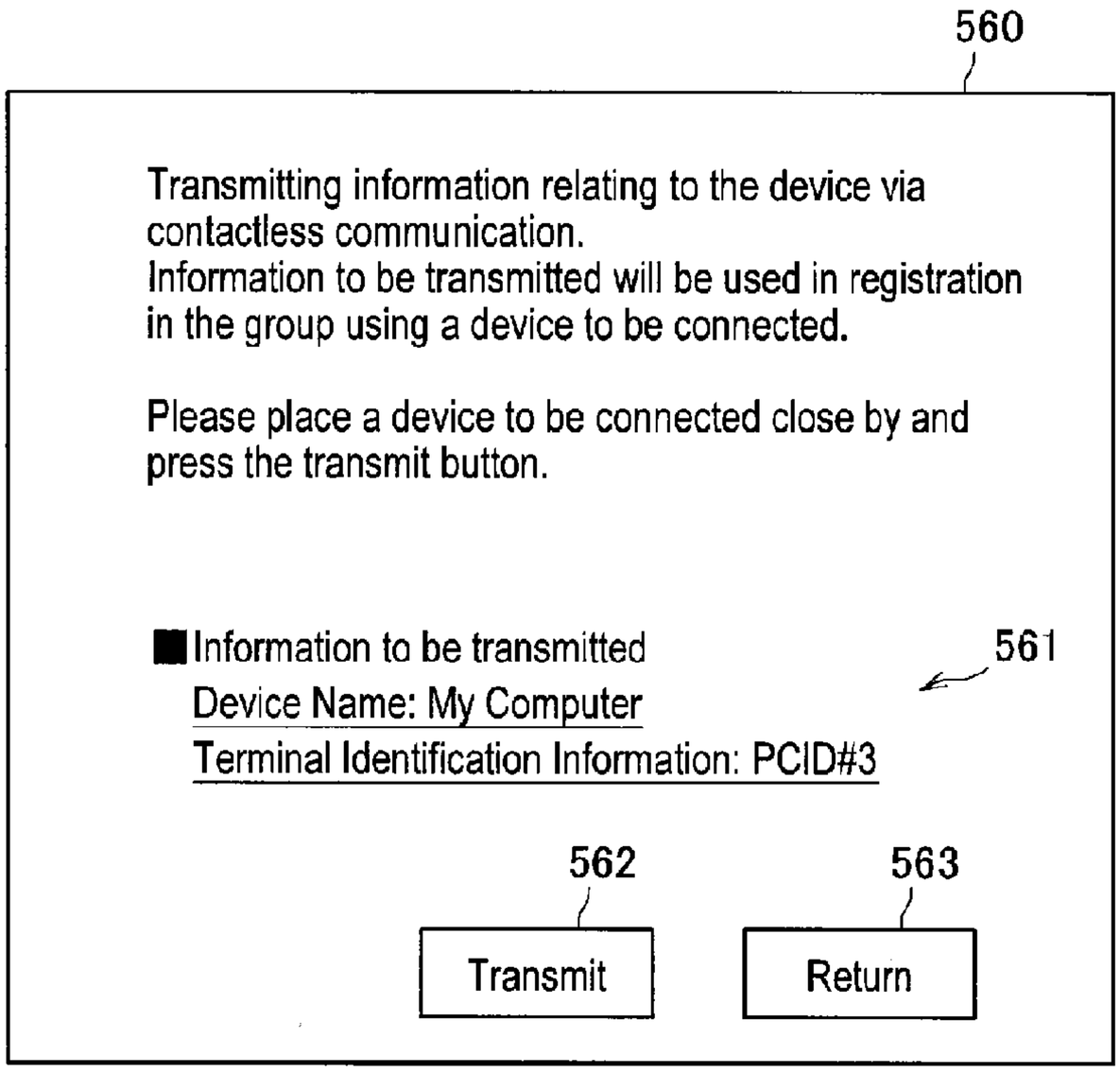

560
Transmitting information relating to the device via contactless communication.
Information to be transmitted will be used in registration in the group using a device to be connected.
Please place a device to be connected close by and press the transmit button.
Information to be transmitted
Device Name: My Computer
Terminal Identification Information: PCID#3
561
562
563
Transmit
Return

Fig. 20

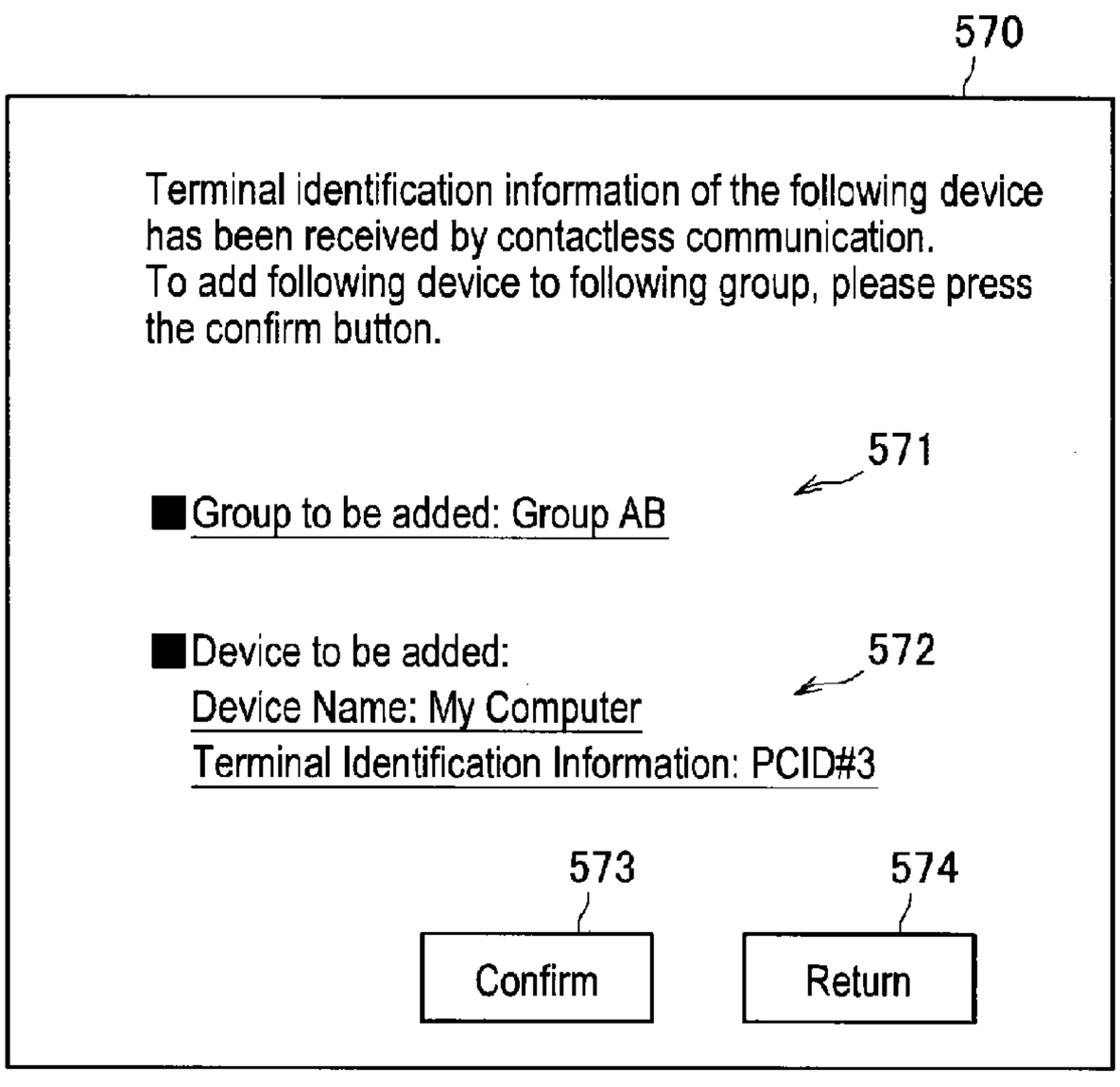

570
Terminal identification information of the following device has been received by contactless communication.
To add following device to following group, please press the confirm button.
571
Group to be added: Group AB
Device to be added:
Device Name: My Computer
Terminal Identification Information: PCID#3
572
573
574
Confirm
Return

Fig. 21

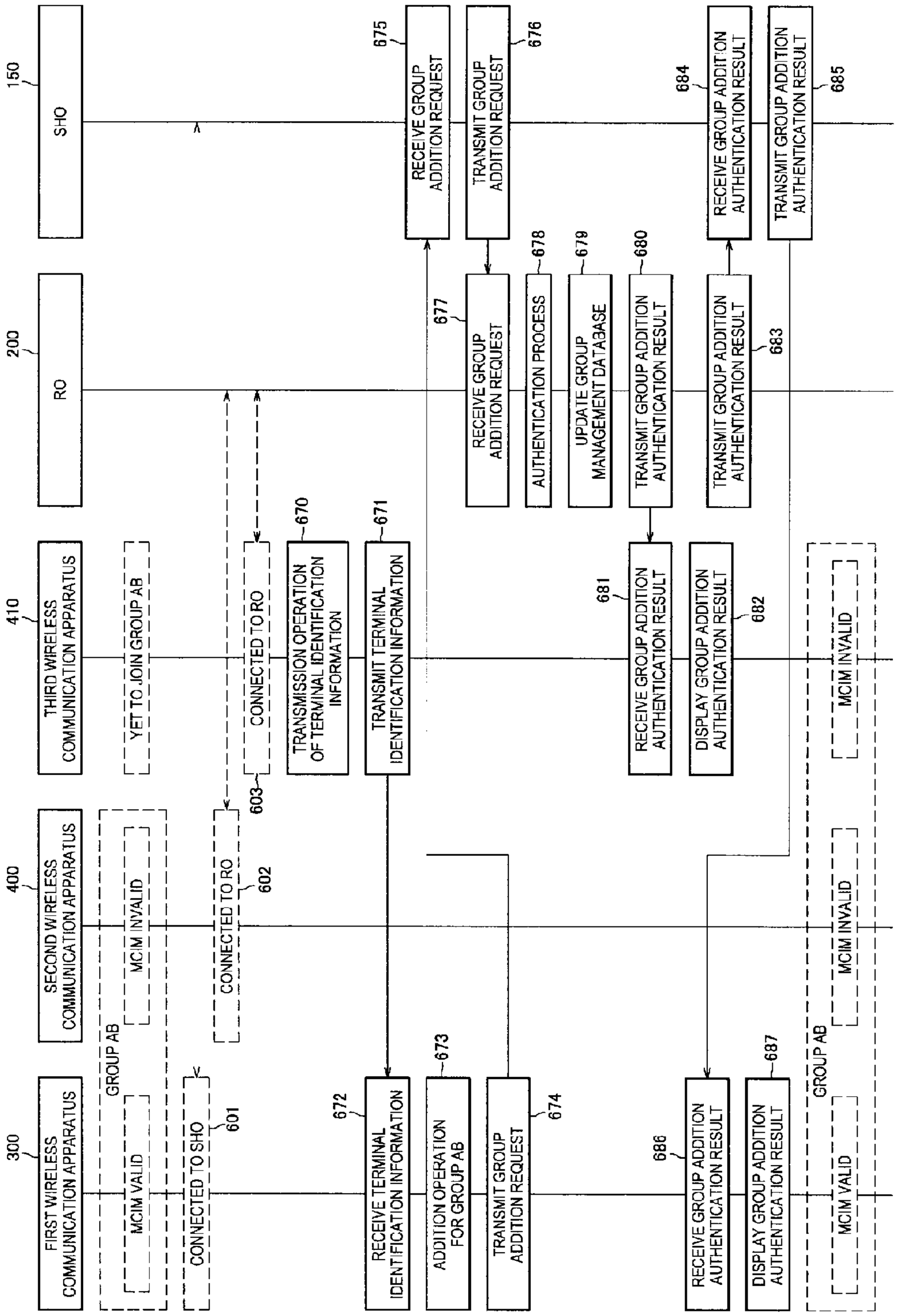
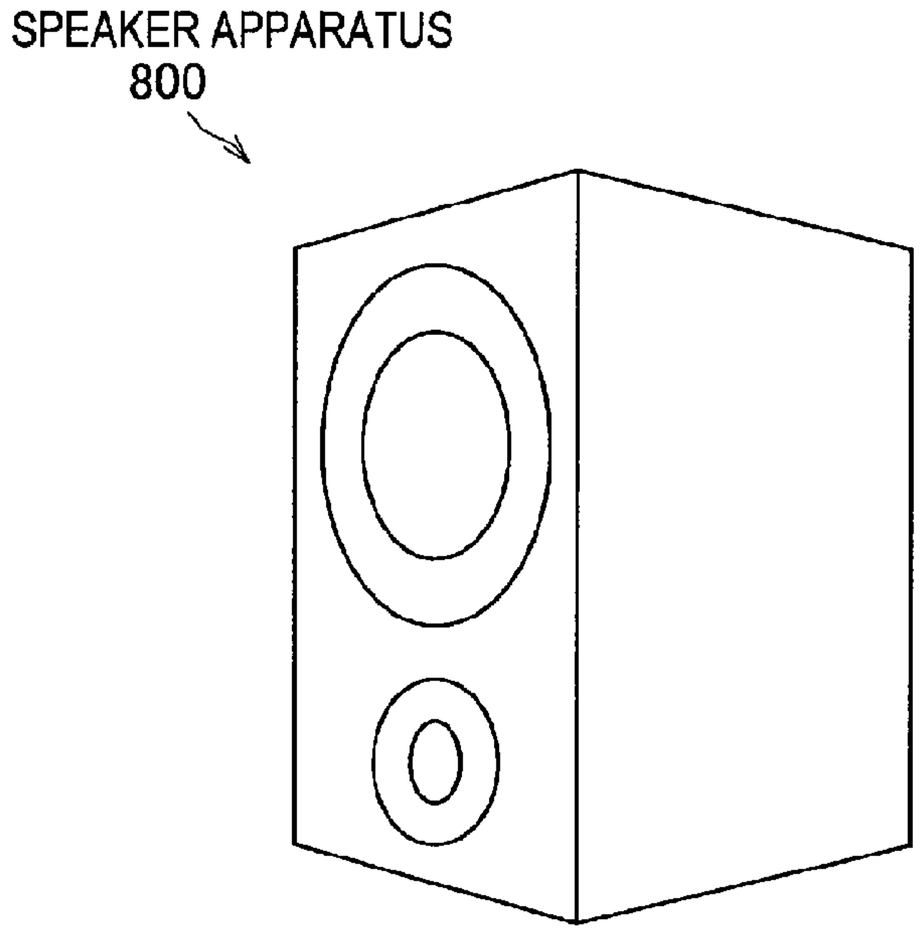
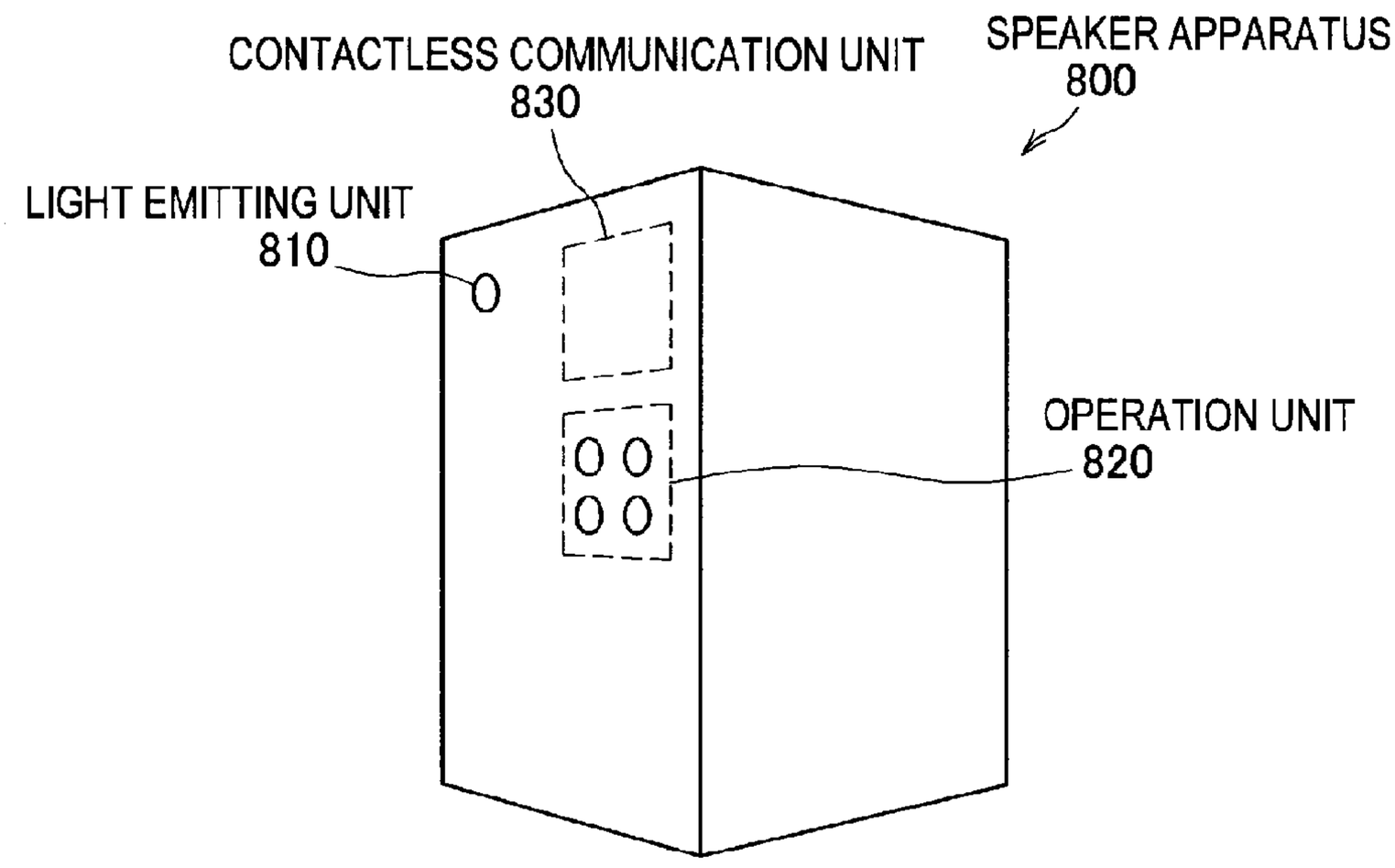

150
SHO
675
RECEIVE GROUP ADDITION REQUEST
676
TRANSMIT GROUP ADDITION REQUEST
684
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
685
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT
678
679
680
200
RO
677
RECEIVE GROUP ADDITION REQUEST
AUTHENTICATION PROCESS
UPDATE GROUP MANAGEMENT DATABASE
TRANSMIT GROUP ADDITION AUTHENTICATION RESULT
683
410
THIRD WIRELESS COMMUNICATION APPARATUS
YET TO JOIN GROUP AB
603
CONNECTED TO RO
670
TRANSMISSION OPERATION OF TERMINAL IDENTIFICATION INFORMATION
671
TRANSMIT TERMINAL IDENTIFICATION INFORMATION
681
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
682
DISPLAY GROUP ADDITION AUTHENTICATION RESULT
MCIM INVALID
400
SECOND WIRELESS COMMUNICATION APPARATUS
GROUP AB
MCIM VALID
CONNECTED TO RO
602
300
FIRST WIRELESS COMMUNICATION APPARATUS
CONNECTED TO SHO
601
672
RECEIVE TERMINAL IDENTIFICATION INFORMATION
673
ADDITION OPERATION FOR GROUP AB
TRANSMIT GROUP ADDITION REQUEST
674
686
RECEIVE GROUP ADDITION AUTHENTICATION RESULT
687
DISPLAY GROUP ADDITION AUTHENTICATION RESULT
GROUP AB
MCIM INVALID
MCIM VALID

Fig. 22


SPEAKER APPARATUS
800

(a)


CONTACTLESS COMMUNICATION UNIT
830
SPEAKER APPARATUS
800
LIGHT EMITTING UNIT
810
OPERATION UNIT
820

(b)

INFORMATION PROCESSING APPARATUS, WIRELESS COMMUNICATION APPARATUS, COMMUNICATION SYSTEM, AND INFORMATION PROCESSING METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the benefit of priority from Japanese Patent Application JP 2011-092956, filed on Apr. 19, 2011, the entire contents of which are hereby incorporated by reference.

TECHNICAL FIELD

The present disclosure relates to an information processing apparatus, a communications device, a communications system, and corresponding methods for securely associating communications devices with groups of device having a corresponding connection right.

BACKGROUND ART

An expanded functionality is being considered for the 3rd Generation Partnership Project (i.e., 3GPP) that decides the technical specification of public wireless communication networks (see, for example, 3GPP TR 33.812 V9.2.0 (2010-06)).

Using such an expanded functionality, known as "Machine to Machine Equipment," it will become possible to flexibly use information showing what services can be utilized. Such information may be referred to as a Machine Communication Identity Module (MCIM), which is one example of contact authentication information. As an example, it may possible to download an MCIM from a network, and additionally or alternatively, to temporarily invalidate and then revalidate an MCIM within a network.

At present, information corresponding to an MCIM needs to be stored in a physical device called a SIM (Subscriber Identity Module) card. However, if an MCIM could be handled as software, the method of storage could be made more flexible.

SUMMARY

Technical Problem

By using the expanded functionality described above, it is possible to conceive new methods of using an MCIM that differ to the past. For example, it would be conceivably possible for an MCIM to be shared by a plurality of wireless communication apparatuses. In such case, it is important for the operations relating to sharing to be easy to carry out and for security to be maintained when sharing the MCIM.

Exemplary embodiments of the present disclosure were conceived in view of the above and aims to share the right to connect to a network between a plurality of wireless communication apparatuses and to maintain security for such sharing.

Solution to Problem

Consistent with an exemplary embodiment, an information processing apparatus includes a receiving unit configured to receive, from a first communications device, a first request to join a group of second communications devices. The first request includes first information identifying the group, and the group is associated with at least one connection right. The information processing device also includes a control unit configured to associate the first communications device with the group, based at least the received information.

Consistent with a further exemplary embodiment, a computer-implemented method receives, from a first communications device, a first request to join a group of second communications devices. The first request includes first information identifying the group, and the group is associated with at least one connection right. The method associates, using at least one processor, the first communications device with the group, based at least the received information.

Consistent with another exemplary embodiment, a tangible, non-transitory computer-readable medium stores instructions that, when executed by at least one processor, cause the processor to perform a method that includes receiving, from a first communications device, a first request to join a group of second communications devices. The first request includes first information identifying the group, and the group is associated with at least one connection right. The method includes associating the first communications device with the group, based at least the received information.

Consistent with yet another exemplary embodiment, an information processing apparatus includes a transmission control unit configured to generate a first instruction to transmit a request to join a group of communications devices to an information processing apparatus. The request includes information identifying the group, and the group us associated with at least one connection right The communications device includes a display control unit configured to generate a second instruction to display information associated with an outcome of the request.

Consistent with an additional exemplary embodiment, a communications system includes a terminal device comprising a transmission control unit configured to generate a first instruction to transmit a request to join a group of communications devices to an information processing apparatus, and an information processing apparatus in communications with the terminal device. The information processing apparatus includes a receiving unit configured to receive, from the terminal device, a request to join a group of communications devices. The request includes information identifying the group, and the group is associated with at least one connection right. The information processing apparatus also includes a control unit configured to associate the first communications device with the group, based at least the received information.

Advantageous Effects of Invention

According to the disclosed exemplary embodiments, a notable effect whereby the right to connect to a network is shared between a plurality of wireless communication apparatuses and security is maintained for such sharing may be achieved.

BRIEF DESCRIPTION OF DRAWINGS

FIGS. **1**(*a*) to **1**(*c*) are simplified diagrams showing one example usage of a plurality of wireless communication devices according to a first exemplary embodiment;

FIGS. **2**(*a*) and **2**(*b*) are simplified diagrams showing an example of a group in a case where an MCIM is shared by a plurality of wireless communication devices according to the first exemplary embodiment;

FIG. **3** is a block diagram showing an exemplary system configuration of a communication system, according to the first exemplary embodiment;

FIGS. **4**(*a*) and **4**(*b*) are schematically diagrams of a group management database, according to the first exemplary embodiment;

FIG. **5** is a block diagram showing an example of an internal configuration of a wireless communication apparatus, according to the first exemplary embodiment;

FIG. **6** is a diagram showing an example of an addition operation screen displayed by a display unit of a wireless communication apparatus, according to the first exemplary embodiment;

FIGS. **7**(*a*) and **7**(*b*) are examples of display screens showing additional authentication results to be displayed on a display unit of a wireless communication apparatus, according to the first exemplary embodiment

FIG. **8** is a flowchart of an exemplary communication process performed by apparatuses of a communication system, according to the first exemplary embodiment;

FIG. **9** is flowchart of an exemplary communication process performed by apparatuses of a communication system, according to the first exemplary embodiment;

FIG. **10** is a flowchart of an exemplary communication process performed by various apparatuses of a communication system, according to the first exemplary embodiment;

FIG. **11** is a flowchart of an exemplary communication process performed by a wireless communication apparatus, according to the first exemplary embodiment;

FIG. **12** is a flowchart of an exemplary communication process performed by an information processing apparatus, according to the first exemplary embodiment;

FIG. **13** is a flowchart of a first authentication process performed by an information processing apparatus, according to the first exemplary embodiment;

FIG. **14** is a flowchart of a second authentication process performed by an information processing apparatus, according to the first exemplary embodiment;

FIG. **15** is a block diagram showing a functional configuration of a wireless communication apparatus, according to a second exemplary embodiment;

FIGS. **16**(*a*) and **16**(*b*) are diagrams of a display screen for carrying out contactless communication that is displayed on a display unit of a wireless communication apparatus, and states of respective wireless communication apparatuses when contactless communication is carried out, according to the second exemplary embodiment;

FIG. **17** is a diagram showing an example of an addition operation screen displayed on a display unit of a wireless communication apparatus, according to the second exemplary embodiment;

FIG. **18** is a flowchart of an exemplary communication process performed by apparatuses of a communication system, according to the second exemplary embodiment;

FIG. **19** is a diagram of an exemplary contactless communication operation screen displayed on a display unit of a wireless communication apparatus, according to a third exemplary embodiment;

FIG. **20** is a diagram showing an exemplary addition operation screen displayed on a display unit of a wireless communication apparatus, according to the third exemplary embodiment;

FIG. **21** is a flowchart of an exemplary communication process performed by various apparatuses of a communication system, according to the third exemplary embodiment; and

FIGS. **22**(*a*) and **22**(*b*) are perspective views of a speaker apparatus according to a modification to the exemplary embodiments.

DESCRIPTION OF EMBODIMENTS

Below, exemplary embodiments will be described in detail with reference to the appended drawings. Note that, in this specification and the appended drawings, structural elements that have substantially the same function and structure are denoted with the same reference numerals, and repeated explanation of these structural elements is omitted. The exemplary embodiments will be described in the order stated below.

1. First Exemplary Embodiment (Group Addition Control: Example of Adding a New Device to a Group Sharing an MCIM);

2. Second Exemplary Embodiment (Group Addition Control: Example of Transmission of Group Information to a New Device Using Contactless Communication);

3. Third Exemplary Embodiment (Group Addition Control: Example of Transmitting Information Relating to a New Device to a Registered Device Using Contactless Communication); and

4. Modifications to the Exemplary Embodiments.

1. First Embodiment

a. Example Usage of Wireless Communication Apparatuses

FIG. **1**(*a*) to **1**(*c*) are simplified diagrams showing one exemplary usage of a plurality of wireless communication apparatuses (or devices), according to a first exemplary embodiment.

FIG. **1**(*a*) shows a state where a plurality of wireless communication apparatuses (a first wireless communication apparatus **300** and a second wireless communication apparatus **400**) are used by a user **10**. As examples, the first wireless communication apparatus **300** is a mobile telephone apparatus (for example, a "smartphone") and the second wireless communication apparatus **400** is an electronic book display apparatus equipped with a wireless communication function.

FIGS. **1**(*b*) and **1**(*c*) show an example of how use rights for an MCIM (Machine Communication Identity Module) are transferred when the MCIM is shared between a plurality of wireless communication apparatuses. In the first exemplary embodiment, an example network configuration composed of an SHO (Selected Home Operator) **150** and an RO (Registration Operator) **200** is shown.

The SHO **150** provides Internet services and the like, and as one example corresponds to a wireless communication provider (for example, a mobile telephone provider) that provides a wireless connection service. The RO **200** also provides services such as initial connection and registration and as one example corresponds to a wireless communication provider (for example, a mobile telephone provider) that provides a wireless connection service. The SHO **150** and the RO **200** are also connected and are capable of communicating with one another.

Note that RO and SHO represent logical roles and although a case where such devices are operated by different businesses is imagined, it would also be possible for the same business to operate both devices. It is also possible for multiple RO and SHO to be present. Also, RO and SHO may be configured as a single information processing apparatus or may be constructed of a plurality of apparatuses. Here, RO and SHO refer to relative roles with respect to a particular wireless communication apparatus in possession of a valid MCIM. This means that it is possible for a device that corresponds to an RO for one wireless communication apparatus to correspond to an SHO for a different wireless communication apparatus.

Here, in FIGS. **1**(*b*) and **1**(*c*), a wireless communication apparatus storing a valid MCIM is shown using a bold outline. That is, FIG. **1**(*b*) shows a case where the first wireless communication apparatus **300** stores a valid MCIM and FIG. **1**(*c*) shows a case where the second wireless communication apparatus **400** stores a valid MCIM. Also, as shown in FIGS. **1**(*b*) and **1**(*c*), it is possible for the first wireless communication apparatus **300** and the second wireless communication apparatus **400** to connect to the SHO **150** only when such apparatuses store a valid MCIM (**301** and **402**). Conversely, it is possible for a wireless communication apparatus that does not store a valid MCIM to connect to the RO **200** based on a PCID (Provisional Connectivity Identity) (**401** and **302**).

Here, an MCIM is one example of contract authentication information and such contract authentication information is information including telephone subscriber information and authentication key information. As one example, an MCIM is contract authentication information (a so-called "software downloadable SIM (Subscriber Identity Module)") that is not limited to a specified communication provider (for example, a mobile telephone provider) when a device is purchased and can be flexibly set by a communication provider after purchase. Also, as an example, the expression "when a valid MCIM is not stored" refers to when an MCIM itself is not stored or when only MCIM that have been invalidated by an MCIM invalidation process are stored.

Also, PCID is an identifier (for example, the terminal identification information **225** on a network shown in FIG. **4**) for connecting to the RO and is assigned to every wireless communication apparatus (device).

In this way, when use rights over an MCIM are shared by a plurality of wireless communication apparatuses, it is possible to set the plurality of wireless communication apparatuses that participate in such sharing as a single group. An example of a group is shown in FIGS. **2**(*a*) and **2**(*b*).

b. Example of a Group Sharing an MCIM

FIGS. **2**(*a*) and **2**(*b*) are simplified diagrams showing an example of a group in a case where an MCIM is shared by a plurality of wireless communication apparatuses according to the first exemplary embodiment.

In FIG. **2**(*a*), an example is shown where a third wireless communication apparatus **410** is added to a group AB (shown by the dotted rectangle **161**) composed of the first wireless communication apparatus **300** and the second wireless communication apparatus **400**. Note that the expression "group AB" is the name assigned to the group (for example, the "group name **211**" shown in FIG. **4**). As one example, the third wireless communication apparatus **410** is an information processing apparatus (for example, a notebook personal computer) equipped with a wireless communication function.

FIG. **2**(*b*) shows a case where the third wireless communication apparatus **410** has been added to the group AB (shown by the dotted rectangle **161**) shown in FIG. **2**(*a*), so that the group AB becomes composed of three devices (shown by the dotted rectangle **162**).

The user **10** is also capable of deleting a desired device out of the three devices that compose the group AB (shown by the dotted rectangle **162**) shown in FIG. **2**(*b*) from the group AB.

Here, when a new device is additionally registered in a group, it is preferable for such addition operation to be carried out easily. In addition to facilitating such adding operation, it is also important to maintain security so that unintended devices are not added. It is therefore conceivable to carry out the addition operation using an ID and/or a password. However, if such ID and/or password were to become known by a third party, it would be difficult to maintain security for the addition operation. For this reason, in the first exemplary embodiment, in addition to carrying out authentication that uses a group ID and password, both a device that has already been registered in a group and a new device to be added are used to additionally register the new device in the group.

c. Example Configuration of Communication System

FIG. **3** is a block diagram showing an example system configuration of a communication system **100** according to the first exemplary embodiment.

The communication system **100** includes a public network **110**, base stations **121**, **122**, and **206**, a network control apparatus **120**, an information processing apparatus **200**, the first wireless communication apparatus **300**, the second wireless communication apparatus **400**, and the third wireless communication apparatus **410**.

The public network **110** is a public network such as a telephone network or the Internet. The public network **110** and the network control apparatus **120** are connected via a gateway (not shown). In the same way, the public network **110** and the information processing apparatus **200** are connected via a gateway (not shown).

The network control apparatus **120** is a communication control apparatus managed by a wireless communication provider that provides a wireless connection service and includes an authentication control unit (not shown). This authentication control unit carries out authentication control of wireless communication apparatuses connected via the base stations **121** and **122**. Here, aside from special cases, the authentication control unit of the network control apparatus **120** authenticates a wireless communication apparatus storing a valid MCIM (contract authentication information) out of the wireless communication apparatuses connected via the base stations **121** and **122**. The network control apparatus **120** also connects the authenticated wireless communication apparatus via the gateway (not shown) to the public network **110**.

The network control apparatus **120** is also connected to the information processing apparatus **200** so as to exchange various information with the information processing apparatus **200**. Here, a wireless communication apparatus that does not store a valid MCIM (contract authentication information) is capable of connecting (with a limited connection) via the network control apparatus **120** to the information processing apparatus **200** based on the PCID of the wireless communication apparatus.

The base stations **121**, **122** are mobile communication base stations (NodeB) that connect the first wireless communication apparatus **300**, the second wireless communication apparatus **400**, and the third wireless communication apparatus **410**, to the network control apparatus **120** via wireless connections **123** to **126**.

As one example, in the communication system **100**, the respective wireless communication apparatuses are connected via the wireless connections **123** to **126** to the base stations **121**, **122** and are connected via the base stations **121**, **122** to the network control apparatus **120**. The respective wireless communication apparatuses are also connected via the network control apparatus **120** to the information processing apparatus **200**. Note that the first wireless communication apparatus **300**, the second wireless communication apparatus **400**, and the third wireless communication apparatus **410** are respectively capable of connecting to any of the base stations **121**, **122** in accordance with the locations at which such apparatuses are being used. Also, in the communication system **100**, for a wireless communication apparatus storing a valid MCIM for a communication provider that operates the network control apparatus **120**, the network control apparatus **120** and the base stations **121**, **122** correspond to an SHO.

Also, a wireless communication apparatus that does not store a valid MCIM (contract authentication information) can connect (with a limited connection) via the wireless connection **207** and the base station **206** to the information processing apparatus **200** based on the PCID of the wireless communication apparatus. Also, in the communication system **100**, for a wireless communication apparatus storing a valid MCIM of the communication provider that operates the network control apparatus **120**, the information processing apparatus **200** and the base station **206** correspond to an RO. For this reason, in the embodiments of the present disclosure, the information processing apparatus **200** is sometimes referred to as the "RO **200**".

The information processing apparatus **200** provides services such as initial connection and registration, and includes a communication unit **205**, a control unit **210**, and a group management database **220**.

The communication unit **205** transmits and receives various information based on control by the control unit **210**. The communication unit **205** is connected to the network control apparatus **120**, for example, and transmits and receives various information to and from the respective wireless communication apparatuses connected via the network control apparatus **120**. For example, the communication unit **205** receives a group addition request (including group information relating to that group), which requests additional registration of a new wireless communication apparatus in a group composed of a plurality of wireless communication apparatuses that share an MCIM, from one or a plurality of wireless communication apparatuses. The communication unit **205** then outputs various information received from wireless communication apparatuses and the like to the control unit **210**. Note that the communication unit **205** is an example of a receiving unit.

The control unit **210** carries out various control relating to the wireless communication apparatuses connected via the communication unit **205** and the network control apparatus **120**. For example, the control unit **210** receives a group addition request from one or a plurality of the wireless communication apparatuses via the communication unit **205**. In this way, when a group addition request has been received, the control unit **210** controls the additional registration in a group of a new wireless communication apparatus based on the group information included in such group addition request. Here, if group addition requests have been received from both a wireless communication apparatus that has already been registered in the group and a new wireless communication apparatus, the control unit **210** carries out additional registration based on the group information included in the respective group addition requests.

As one example, the control unit **210** extracts a group that matches the group information included in the group addition request from the group management database **220** and registers the new wireless communication apparatus so as to be associated with the matching group in the group management database **220**. That is, the control unit **210** determines whether the group information included in such group addition requests matches and carries out additional registration of the new wireless communication apparatus only when the group information matches.

Also, when a new wireless communication apparatus has been additionally registered in accordance with a group addition request, the control unit **210** carries out control to transmit, via wireless connections, notification of this to the respective wireless communication apparatuses that transmitted the group addition requests and has such notification displayed.

The group described above can be understood as a group that shares one or more comment network connection rights. Such network connection rights are the right to connect to a specified network (for example, the public network **110**) via a wireless connection and as one example correspond to use rights over an MCIM. That is, the network connection rights are rights for connecting to base stations operated by a communication provider based on an MCIM (contract authentication information) for connecting to such base stations. For example, the presence or absence of such network connection rights can be decided according to the presence or absence of use rights over an MCIM.

The group management database **220** is a database for managing groups which are each composed of a plurality of wireless communication apparatuses sharing an MCIM. Note that the group management database **220** will be described in detail with reference to FIGS. **4**(*a*) and **4**(*b*). The group management database **220** is one example of a "storage unit" referred to in the patent claims.

Here, an example will be described where use rights over the MCIM are transferred (i.e., where the network connection rights are transferred) in the communication system **100**. For example, the MCIM is stored in advance in the respective wireless communication apparatuses. Based on an instruction from the control unit **210**, the network control apparatus **120** is capable of transferring the use rights over the MCIM by validating or invalidating the MCIM of the respective wireless communication apparatuses.

Instead of storing the MCIM in the respective wireless communication apparatuses, it is also possible to transfer use rights over the MCIM by transferring the MCIM itself. As one example, a case where use rights over the MCIM are transferred from the first wireless communication apparatus **300** to the second wireless communication apparatus **400** is imagined. For example, an MCIM transfer request is transmitted from the first wireless communication apparatus **300** to the control unit **210**. In this case, based on an instruction from the control unit **210**, the MCIM stored in the first wireless communication apparatus **300** is invalidated (deleted) by the network control apparatus **120**. In addition, transfer information (setting information including the MCIM) is transmitted via the control unit **210** from the network control apparatus **120** to the second wireless communication apparatus **400**. By storing the MCIM included in the transfer information in the second wireless communication apparatus **400**, a valid MCIM is set in the second wireless communication apparatus **400**.

d. Example Configuration of Group Management Database

FIGS. **4**(*a*) and **4**(*b*) are tables schematically showing the group management database **220** according to the first exemplary embodiment. Note that in FIG. **4**(*a*), a case where the first wireless communication apparatus **300** and the second wireless communication apparatus **400** are registered in the group AB is shown. Also, in FIG. **4**(*b*), a case where the third wireless communication apparatus **410** is additionally registered in the group AB shown in FIG. **4**(*a*) is shown.

In the group management database **220**, a group name **221**, a group ID **222**, a group password **223**, a device name **224**, terminal identification information **225**, and valid/invalid information **226** are stored so as to be associated with one another in group units. Such information is successively updated by the control unit **210** based on requests (group addition requests, group deletion requests) from the respective wireless communication apparatuses, for example.

A name assigned to a group is stored in the group name **221**. Such name is stored for example when a group is generated.

A group ID assigned to a group is stored in the group ID **222**. A password assigned to a group is stored in the group password **223**. A group addition request is made using such ID and password. The respective wireless communication apparatuses belonging to a group may store in advance the ID and password assigned to such group (for example, storage in a memory **340** shown in FIG. **5**). Alternatively, an arrangement may be used where the ID and password are not stored in a wireless communication apparatus and are inputted each time by the user.

Names assigned to devices are stored in the device name **224**. As one example, such names are stored when devices are newly added to a group.

Terminal identification numbers of wireless communication apparatuses (devices) are stored in the terminal identification information **225**. Terminal identification information is identification information for identifying a wireless communication apparatus, and as one example a PCID is stored. In FIGS. **4**(*a*) and **4**(*b*), "PCID#**1**" in the terminal identification information **225** corresponds to the first wireless communication apparatus **300**. In the same way, "PCID#**2**" in the terminal identification information **225** corresponds to the second wireless communication apparatus **400** and "PCID#**3**" in the terminal identification information **225** corresponds to the third wireless communication apparatus **410**.

Information showing whether the MCIM at the wireless communication apparatus is valid or invalid (or an MCIM is yet to be stored) is stored in the valid/invalid information **226**. Note that in FIG. **4**(*a*), for ease of explanation, a wireless communication apparatus where the MCIM is valid is shown as "valid" and a wireless communication apparatus where the MCIM is invalid is shown as "invalid".

e. Example Configuration of Wireless Communication Apparatus

FIG. **5** is a block diagram showing an example of the internal configuration of the first wireless communication apparatus **300** according to the first exemplary embodiment. Note that since the internal configurations of the second wireless communication apparatus **400** and the third wireless communication apparatus **410** are the same as that of the first wireless communication apparatus **300**, description thereof is omitted here. Also, in FIG. **6** onwards, when describing the second wireless communication apparatus **400** or the third wireless communication apparatus **410**, names and reference numerals corresponding to the first wireless communication apparatus **300** are used.

The first wireless communication apparatus **300** includes an antenna **311**, an antenna sharing unit **312**, a modulating unit **321**, a demodulating unit **322**, a control unit **330**, a tangible, non-transitory computer-readable storage medium, an example of which is memory **340**, and the MCIM information storage unit **350**. The first wireless communication apparatus **300** also includes an operation unit **360**, a display unit **370**, a location information acquiring unit **380**, a microphone **391**, and a speaker **392**. Such components are connected by a bus **331**. As one example, the first wireless communication apparatus **300** is realized by a mobile telephone apparatus capable of telephone calls and data communication.

For example, when a reception process is carried out, radio waves received by the antenna **311** are demodulated via the antenna sharing unit **312** by the demodulating unit **322** and demodulated reception data is supplied to the control unit **330**. When the reception process is an incoming call process, the demodulated reception data (audio data) is outputted via the control unit **330** from the speaker **392** as sound.

When, for example, a transmission process is carried out, the transmission data outputted by the control unit **330** is modulated by the modulating unit **321** and the modulated transmission data is transmitted via the antenna sharing unit **312** from the antenna **311**. When the transmission process is an outgoing call process, audio data inputted from the microphone **391** is modulated via the control unit **330** by the modulating unit **321** and modulated transmission data (audio data) is transmitted via the antenna sharing unit **312** from the antenna **311**.

The control unit **330** carries out various control based on instructions (e.g., a control program) stored in the memory **340**. As one example, the control unit **330** is constructed of a microprocessor. For example, the control unit **330** is connected to the modulating unit **321** and the demodulating unit **322** and transmits and receives various data to and from the network control apparatus **120** connected via the base stations **121**, **122**. The control unit **330** also carries out a connection process that connects to the RO **200** (with a limited connection) via a wireless connection based on the PCID, for example, without using the MCIM. Note that the control unit **330** is one example of a "transmission control unit" and a "display control unit."

The memory **340** is a memory storing instructions (e.g., a control program) that may be executed by the microprocessor to enable the control unit **330** to carry out various control, in addition to transmission data, reception data, and the like. As examples, the memory **340** is constructed of ROM (Read Only Memory) and/or RAM (Random Access Memory). Terminal identification information (PCID#**1**) for specifying the first wireless communication apparatus **300** and a device name (for example, the device name **224** shown in FIG. **4**(*a*)) of the first wireless communication apparatus **300** are also stored in the memory **340**. Such device name is registered for example by a user operation. The ID and password assigned to the group AB to which the first wireless communication apparatus **300** belongs (as one example, the group ID **222** and the group password **223** shown in FIG. **4**(*a*)) are also stored in the memory **340**. As one example, such group ID and password are included in a group addition authentication result given in response to a group addition request, transmitted from the information processing apparatus **200**, and stored in the memory **340**.

The MCIM information storage unit **350** is a memory storing an MCIM (contract authentication information). As the MCIM information storage unit **350**, as examples it is possible to use a UICC (Universal Integrated Circuit) card or a dedicated memory for securely storing an MCIM. Note that when a UICC card is used as the MCIM information storage unit **350**, instead of the MCIM being permanently written, a card capable of a validation process and an invalidation process for the MCIM is used. That is, a device that enables the control unit **330** to carry out a validation process and an invalidation process for an MCIM based on transfer information that has been received from the antenna **311** and demodulated is used. Also, a device that allows the MCIM to be rewritten is used. Note that the validation process and invalidation process for the MCIM can be carried out according to the validation process and invalidation process defined by 3GPP (Third Generation Partnership Project). Also, by providing a secure region in the memory **340**, the MCIM information storage unit **350** may be provided inside the memory **340**.

Here, when an operation input for additional registration in a group has been received by the operation unit **360**, the

control unit **330** carries out control to transmit a group addition request via a wireless connection to the RO **200**. As one example, such group addition request requests additional registration in the group of a wireless communication apparatus aside from the wireless communication apparatuses that compose such group and includes group information (for example, an ID and password of a group) stored in the memory **340**.

When a group addition request has been received, the RO **200** additionally registers a new wireless communication apparatus in the group based on the group information included in such group addition request.

Also, when notification of additional registration of the new wireless communication apparatus in a group in accordance with the group addition request has been received from the RO **200** via the wireless connection, the control unit **330** carries out control to display such notification. Example displays of such a notification are shown in FIGS. **7**(*a*) and **7**(*b*).

Also, when for example an operation input for deleting any of the wireless communication apparatuses that compose a group from such group has been received, the control unit **330** transmits a group deletion request for deletion of the wireless communication apparatus to be deleted from the group to the RO **200**. The RO **200** then carries out a deletion process for deleting the wireless communication apparatus to be deleted from the group.

The operation unit **360** is an operation receiving unit receiving an operation input made by the user and outputs a signal in accordance with the received operation input to the control unit **330**. The operation unit **360** includes various keys such as numeric keys and/or alphabet keys and receives an instruction operation (or "specified operation") made by the user who designates a group addition request.

The display unit **370** is a display unit that displays various information (text information, time information, and the like) based on control by the control unit **330**. As one example, the display unit **370** displays various information (for example, the display screens shown in FIGS. **6**, **7**(*a*), and **7**(*b*)) relating to a group addition request. Note that as examples, it is possible to use a display panel such as an organic EL (Electro Luminescence) panel or an LCD (Liquid Crystal Display) panel. It is also possible to integrally construct the operation unit **360** and the display unit **370** using a touch panel that enables the user to make an operation input by touching or placing his/her finger close to a display screen.

The location information acquiring unit **380** acquires location information showing the location where the first wireless communication apparatus **300** is present and outputs the acquired location information to the control unit **330**. As one example, the location information acquiring unit **380** can be realized by a GPS (Global Positioning System) unit that calculates the location information using GPS signals received by a GPS signal reception antenna (not shown). The calculated location information includes various data relating to location, such as latitude, longitude, and altitude, at the time the GPS signals were received. It is also possible to use a location information acquiring apparatus acquiring location information according to a different method of acquiring location information. For example, it is possible to derive location information using access point information according to a wireless LAN (Local Area Network) present in the periphery and to use a location information acquiring apparatus that acquires such location information.

f. Example Display of Addition Operation Screen

FIG. **6** is a diagram showing one example of an addition operation screen display by the display unit **370** of the first wireless communication apparatus **300** according to the first exemplary embodiment. The addition operation screen **500** shown in FIG. **6** is a display screen for carrying out an addition operation for adding a wireless communication apparatus aside from the first wireless communication apparatus **300** to the group AB.

The addition operation screen **500** includes a group ID input region **501**, a group password input region **502**, a device name display region **503**, a passcode input region **504**, a confirm button **505**, and a return button **506**.

The group ID input region **501** is a region for inputting the ID of the group to which the other wireless communication apparatus is to be added.

The group password input region **502** is a region for inputting a password of the group to which the other wireless communication apparatus is to be added. That is, the ID of the group AB to which the first wireless communication apparatus **300** belongs is inputted into the group ID input region **501** and the password of the group AB to which the first wireless communication apparatus **300** belongs is inputted into the group password input region **502**. Note that since the password is not displayed on the actual screen for security purposes, the password is shown as "*******" in FIG. **6**. Passwords are also shown as "*******" or the like in other display screens.

The device name display region **503** is a region in which the device name registered in the first wireless communication apparatus **300** is displayed. As one example, it is assumed here that "My Mobile" is stored in the memory **340** as the device name of the first wireless communication apparatus **300**. In this case, the device name "My Mobile" registered in the first wireless communication apparatus **300** is stored in the device name **224** of the group management database **220**. To change the device name "My Mobile" stored in the device name **224**, a new device name can be inputted into the device name display region **503**.

The passcode input region **504** is a region for inputting information associated with a user, for example, a passcode used in an authentication process when adding another wireless communication apparatus. Note that the passcode is a shared code (in other words, a temporary password) used only in a special authentication process (for example, an authentication process relating to a group addition request) and that by using a passcode together with a password, it is possible to further improve the security of group registration. As one example, it is still possible to maintain security for group registration even when the ID and password of a group have leaked out

Note that it is possible to input a passcode as necessary into the addition operation screen **500**. However, in cases where a passcode is not inputted, the time (acceptance period) set for the authentication process will be set shorter. Such change to the acceptance period will be described in detail with reference to FIGS. **8** and **9**.

The confirm button **505** is a button that is pressed after the various operations described above (input operation, selection operation) have been carried out and is used to confirm the content of such operations.

The return button **506** is a button pressed when returning to a display screen that was displayed immediately before the addition operation screen **500**, for example. Note that since the return buttons **533**, **563** and the like shown in drawings such as FIGS. **16** and **19** are substantially the same, description of such buttons is omitted for such drawings.

Note that although only the addition operation screen **500** displayed on the first wireless communication apparatus **300** is shown in FIG. **6**, it is assumed that the addition operation screen displayed on the wireless communication apparatus to

be added is substantially the same. However, in the addition operation screen displayed on the wireless communication apparatus to be added, the device name of the wireless communication apparatus to be added is displayed in the device name display region **503**.

g. Example Display of Addition Authentication Result

FIGS. **7**(*a*) and **7**(*b*) are diagrams showing examples of a display screen for the addition authentication result that is displayed by the display unit **370** of the first wireless communication apparatus **300** according to the first exemplary embodiment. The display screens **510** and **515** shown in FIGS. **7**(*a*) and **7**(*b*) are screens displaying addition authentication results in response to an addition operation for adding a wireless communication apparatus to the group AB. More specifically, FIG. **7**(*a*) shows the display screen **510** showing a message that addition to the group was successfully authenticated for such addition operation and FIG. **7**(*b*) shows the display screen **515** showing a message that authentication of the group addition failed for such addition operation.

The display screen **510** shown in FIG. **7**(*a*) displays a message showing that group addition was successfully authenticated and is additionally provided with a device display region **511** showing the device with a valid MCIM, a button **512** for switching to an MCIM transfer operation screen, and a confirm button **513**.

The device display region **511** showing the device with a valid MCIM is a region displaying information (device information) relating to a device with a valid MCIM out of the devices that belong to the group subjected to additional registration. For example, the content of the group management database **220** is included in the group addition authentication result and the device information is displayed based on such content.

The button **512** for switching to an MCIM transfer operation screen is a button which is pressed when switching to a display screen for carrying out an operation for transferring the MCIM between devices that belong to the group subjected to the additional registration.

The confirm button **513** is a button pressed by the user after confirming the additional registration in the group and confirming the device with the valid MCIM. When the confirm button **513** has been pressed, a specified display screen (for example, an initial screen) is displayed.

The display screen **515** shown in FIG. **7**(*b*) displays a message showing that authentication of the group addition failed and is additionally provided with a button **516** for switching to an addition request operation screen and a confirm button **517**.

The button **516** for switching to an addition request operation screen is a button pressed when switching to a display screen (for example, the addition operation screen **500** shown in FIG. **6**) for repeating an addition operation for adding the wireless communication apparatus, for which authentication of the group addition failed, to the group AB.

The confirm button **517** is a button pressed by the user after confirming that authentication of the group addition failed. When the confirm button **513** has been pressed, a specified display screen (for example, an initial screen) is displayed.

Note that although only the display screens **510** and **515** displayed on the first wireless communication apparatus **300** are shown in FIGS. **7**(*a*) and **7**(*b*), it is assume that the display screens displayed on the wireless communication apparatus to be added are substantially the same.

h. Example of Communication when Carrying out Additional Registration Using a Plurality of Devices

FIGS. **8** and **9** are sequence charts showing an example of the communication process carried out between the apparatuses that compose the communication system **100** according to the first exemplary embodiment.

In FIGS. **8** and **9**, an imaginary case is explained where the group AB is composed of the first wireless communication apparatus **300** and the second wireless communication apparatus **400** and the first wireless communication apparatus **300** is storing a valid MCIM. Also, in FIGS. **8** and **9**, an example of a communication process when additionally registering the third wireless communication apparatus **410** in the group AB by operating the first wireless communication apparatus **300** and the third wireless communication apparatus **410** that is yet to subscribe to the group AB is shown. Here, an example is described where group addition requests are made by first operating the third wireless communication apparatus **410** and then operating the first wireless communication apparatus **300**. Note that in FIGS. **8** and **9**, it is assumed that the first wireless communication apparatus **300** is connected to the SHO **150** (**601**) and that the second wireless communication apparatus **400** and the third wireless communication apparatus **410** are connected to the RO **200** (**602**, and **603**).

First, according to a user operation, a display screen for carrying out an addition operation for the group AB is displayed on the display units **370** of the first wireless communication apparatus **300** and the third wireless communication apparatus **410**. As one example, the addition operation screen **500** shown in FIG. **6** (except that the respective input regions are blank) is displayed by the display unit **370** of the first wireless communication apparatus **300**. The addition operation screen **500** shown in FIG. **6** (except that "My Computer" is displayed in the device name display region **503** and the respective input regions are blank) is also displayed by the display unit **370** of the third wireless communication apparatus **410**.

Here, in the addition operation screen **500** shown in FIG. **6**, the ID and the password of the group AB are inputted into the group ID input region **501** and the group password input region **502** (**604** and **607**). Also, when an authentication process using a passcode is desired, the passcode desired by the user is inputted into the passcode input region **504** (**604** and **607**). Note that the ID and password of the group AB and the passcode are examples of "group information" relating to the group AB. The passcode is also one example of "specified information" included in the group information. After such input operations have been carried out, the confirm button **505** is pressed (**604** and **607**).

Note that the ID and password of the group AB are stored in the memory **340** of the first wireless communication apparatus **300**. This means that by using the ID and password of the group AB stored in the memory **340**, it is possible to omit the operation inputs into the group ID input region **501** and the group password input region **502**. That is, the content (the ID and password assigned to the group AB) stored in the memory **340** of the first wireless communication apparatus **300** are displayed in the group ID input region **501** and the group password input region **502** of the addition operation screen **500**. By doing so, it becomes unnecessary for the user to input the ID and password of the group AB and the user can instead simply confirm the displayed content for such information.

As described above, when an addition operation for the group AB has been received at the third wireless communication apparatus **410** (**604**), a group addition request corresponding to such addition operation is transmitted from the third wireless communication apparatus **410** to the RO **200** (**605** and **606**). In this case, since the third wireless communication apparatus **410** is connected to the RO **200** (**603**), the

group addition request is transmitted directly from the third wireless communication apparatus **410** to the RO **200** (**605** and **606**).

When an addition operation for the group AB has been received at the first wireless communication apparatus **300** (**607**), a group addition request corresponding to such addition operation is transmitted from the first wireless communication apparatus **300** to the RO **200** (**608** to **611**). In this case, since the first wireless communication apparatus **300** is connected to the SHO **150** (**601**), the group addition request is transmitted from the information processing apparatus **200** via the SHO **150** to the R**200** (**608** to **611**).

A group addition request includes various information inputted into the addition operation screen **500** and identification information (the terminal identification information stored in the memory **340**) of the device that made the group addition request. As examples, the various information inputted into the addition operation screen **500** is the ID and password of the group and, if a passcode has been inputted by a user operation, such passcode. Also, as the identification information of the device that made the group addition request, the terminal identification information (PCID#**1**) is included in the group addition request from the first wireless communication apparatus **300** and the terminal identification information (PCID#**3**) is included in the group addition request from the third wireless communication apparatus **410**.

When the RO **200** first receives the group addition request (**606**), the control unit **210** starts to monitor whether another group addition request is received before an acceptance period has elapsed (e.g., a range in a vertical direction shown by the dotted line **625** in FIG. **8**).

Here, it is assumed that the length of the acceptance period (the range shown by the dotted line **625**) changes in accordance with whether a passcode is included in the group addition request received first. For example, if a passcode is included in the group addition request received first, a first value is set as the acceptance period. Meanwhile, if a passcode is not included in the group addition request received first, a second value is set as the acceptance period. Here, it is assumed that the second value is smaller than the first value. As one example, it is possible to set ten seconds to two minutes as the first value. In such case, as one example it is possible to set a value that is half of the first value (e.g., five seconds to one minute) as the second value.

If the RO **200** receives another group addition request before the acceptance period set in this way has elapsed (**611**), the control unit **210** carries out the authentication process for the received group addition requests based on the content of the group management database **220** (**612**).

More specifically, it is determined whether the ID and password of the group included in the received group addition requests match the ID and password of a group stored in the group management database **220**. If a group whose ID and password respectively match is present, the control unit **210** authenticates the additional registration of the third wireless communication apparatus **410** related to the received group addition requests.

Meanwhile, if a passcode is included in the group addition request received first, it is determined whether the passcodes included in the respective group addition requests that have been received match. In such case, if a group whose ID and password respectively v match is present and the passcodes included in the respective group addition requests also match, the control unit **210** authenticates the additional registration of the third wireless communication apparatus **410** related to the received group addition requests.

If the authentication according to the authentication process relating to the received group addition requests succeeds (**612**), the control unit **210** updates the content of the group management database **220** (**613**). That is, in the group management database **220**, the third wireless communication apparatus **410** is additionally registered in the group AB (i.e., updating from the state shown in FIG. **4**(*a*) to the state shown in FIG. **4**(*b*) (the dotted rectangle **227**).

Here, a case is imagined where the RO **200** does not receive another group addition request before the acceptance period (the range shown by the dotted line **625**) elapses or the authentication according to the authentication process relating to the received group addition requests has failed (**612**). In such a case, the content of the group management database **220** is not updated and a group addition authentication result showing that addition to the group related to the group addition request was not possible is transmitted to the first wireless communication apparatus **300** and the second wireless communication apparatus **400**. Such group addition authentication result is then displayed by the first wireless communication apparatus **300** and the third wireless communication apparatus **410**. Here, one example of when authentication fails is when at least one of the ID and password of the group included in the respective group addition requests that have been received does not match the content of the group management database **220**. When a passcode is included in the first group addition request, there are also cases where the two passcodes do not match or where a passcode is not included in the next group addition request.

Next, the RO **200** transmits the group addition authentication result showing addition to the group to the third wireless communication apparatus **410** (**614** and **615**). When a group addition authentication result showing addition to the group has been received (**615**), a message showing the result is displayed on the display unit **370** of the third wireless communication apparatus **410** (**616**). One example display is shown in FIG. **7**(*a*). Here, as described above, the third wireless communication apparatus **410** is connected to the RO **200** (**603**). For this reason, the group addition authentication result is directly transmitted from the RO **200** to the third wireless communication apparatus **410** (**614** to **616**).

The RO **200** also transmits the group addition authentication result showing addition to the group to the first wireless communication apparatus **300** (**617** to **620**). When a group addition authentication result showing addition to the group has been received (**620**), a message showing the result is displayed on the display unit **370** of the first wireless communication apparatus **300** (**621**). One example display is shown in FIG. **7**(*b*). Here, as described above, the first wireless communication apparatus **300** is connected to the SHO **150** (**601**). For this reason, the group addition authentication result is transmitted from the RO **200** via the SHO **150** to the first wireless communication apparatus **300** (**617** to **620**).

Note that although an example where the third wireless communication apparatus **410** transmits a group addition request first is shown in FIG. **8**, the first wireless communication apparatus **300** may transmit a group addition request first. In such case, monitoring for the reception of a group addition request from the third wireless communication apparatus **410** is carried out from reception by the RO **200** of the group addition request from the first wireless communication apparatus **300** until the acceptance period (the range shown by the dotted line **625**) elapses.

In this way, the control unit **210** additionally registers the third wireless communication apparatus **410** in the group AB on the condition that the next group addition request is received before the acceptance period from the reception of

the first group addition request elapses. The control unit **210** is also capable of changing the length of the acceptance period based on whether passcodes are included in the two group addition requests. For example, the acceptance period when at least one out of the two group addition requests does not include a passcode can be set shorter than the acceptance period when the two group addition requests both include a passcode.

i. Example of Communication when Additional Registration is Carried out Using a Plurality of Devices not Storing a Valid MCIM

FIG. **10** is a sequence chart showing an example of a communication process between the various apparatuses that compose the communication system **100** according to the first exemplary embodiment. Note that since the sequence chart shown in FIG. **10** is a modification of FIGS. **8** and **9**, parts that are the same as FIGS. **8** and **9** have been assigned the same reference numerals and the description thereof is partially omitted. Also, FIG. **10** shows an example of a communication process for a case where the third wireless communication apparatus **410** is additionally registered in the group AB by operating two devices (the second wireless communication apparatus **400** and the third wireless communication apparatus **410**) that do not store a valid MCIM. Here, the two devices that do not store a valid MCIM are capable of connecting to the RO **200** with only a limited connection based on the PCIDs. For this reason, in the example shown in FIG. **10**, the group addition requests are directly transmitted from the respective devices to the RO **200** and the group addition authentication result is directly transmitted from the RO **200** to the respective devices.

The processes (**631** to **633**) shown in FIG. **10** correspond to the processes (**604** to **606**) shown in FIG. **8**. Similarly, the processes (**634** to **636**) shown in FIG. **10** correspond to the processes (**607** to **611**) shown in FIG. **8**. However, the example in FIG. **10** differs in that the addition operation for the group AB is carried out at the second wireless communication apparatus **400** and the group addition request is directly transmitted from the second wireless communication apparatus **400** to the RO **200**. The acceptance period (the range shown by the dotted line **647**) shown in FIG. **10** corresponds to the acceptance period (the range shown by the dotted line **625**) shown in FIG. **8**.

The processes (**637** to **641**) shown in FIG. **10** correspond to the processes (**612** to **616**) shown in FIG. **8**. The processes (**642** to **644**) shown in FIG. **10** correspond to the processes (**617** to **621**) shown in FIG. **9**. However, the example in FIG. **10** differs in that the group addition authentication result is transmitted directly from the RO **200** to the second wireless communication apparatus **400** (**642** and **643**) without passing via the SHO **150**.

In this way, according to the first exemplary embodiment, as one example the contact authentication information (MCIM) of the public network **110** can be easily shared by a plurality of devices in a group. In such case, when a new device is additionally registered in a group, it is possible to reliably add the device while maintaining security. However, additional registration of a device to be added is performed by carrying out authentication using the ID and password of the group and with the condition that specified operations are carried out within a set time using both a device registered in the group and the device to be added. By doing so, it is possible to increase security and reliably add a device. For example, by carrying out specified operations in a set time using the first wireless communication apparatus **300** and the third wireless communication apparatus **410**, it is possible to add the third wireless communication apparatus **410** to the group AB. By doing so, even in a case where the TD and/or password of the group AB has been lost or the ID and/or password has leaked out to a third party, it will still be possible to prevent unexpected additions to the group AB by a third party. That is, according to the first exemplary embodiment, it is possible to easily share the right to connect to a network between a plurality of wireless communication apparatuses. In such case, it is possible to maintain security over the sharing.

j. Example Operation of Communication System

Next, the operation of the communication system **100** according to the first exemplary embodiment will be described with reference to the drawings.

k. Example Operation of Wireless Communication Apparatus

FIG. **11** is a flowchart showing one example of the processing procedure of the communication process carried out by the first wireless communication apparatus **300** according to the first exemplary embodiment. In FIG. **11**, the case where the first wireless communication apparatus **300** makes a group addition request will be described as one example. Note that although only the example operation of the first wireless communication apparatus **300** is shown in FIG. **11**, it is also possible to apply such operation to other wireless communication apparatuses.

First, the control unit **330** judges whether an addition operation for a group sharing an MCIM has been carried out (step **5901**) and when such addition operation has not been carried out, such monitoring is continued. When such addition operation has been carried out (step S**901**), the control unit **330** displays a display screen (for example, the addition operation screen **500** shown in FIG. **6**) for carrying out an addition operation for the group sharing the MCIM on the display unit **370** (step S**902**).

Next, the control unit **330** determines whether a pressing operation has been carried out for the return button in such display screen (for example, a pressing operation for the return button **506** in the addition operation screen **500** shown in FIG. **6**) (step S**903**). If such button operation has been carried out (step S**903**), the processing returns to step S**901**.

When such pressing operation has not been carried out (step S**903**), the control unit **330** determines whether a transmission operation for a group addition request has been carried out in the display screen (step S**904**). This transmission operation is for example a pressing operation of the confirm button **505** after operating the items in the addition operation screen **500** shown in FIG. **6**. When such transmission operation has not been carried out (step S**904**), the processing returns to step S**903**.

When a transmission operation for a group addition request (i.e., an addition operation) has been carried out (step S**904**), the control unit **330** transmits a group addition request corresponding to the addition operation to the RO **200** (step S**905**). In this case, if the first wireless communication apparatus **300** is storing a valid MCIM, the group addition request is transmitted from the first wireless communication apparatus **300** via the SHO **150** to the RO **200**. Meanwhile, if the first wireless communication apparatus **300** is not storing a valid MCIM, the group addition request is directly transmitted from the first wireless communication apparatus **300** to the RO **200**.

Next, it is determined whether a group addition authentication result has been received (step S**906**) and when the group addition authentication result has not been received, such monitoring is continued. Meanwhile, if a group addition authentication result has been received (step S**906**), the control unit **330** displays the group addition authentication result

on the display unit **370** (step S**907**). Here, when a group addition authentication result showing that authentication succeeded for group addition has been received (step S**906**), the control unit **330** displays a message showing that authentication succeeded on the display unit **370** (for example, the display screen **510** shown in FIG. **7**(*a*)). Meanwhile, when a group addition authentication result showing that authentication for the group addition failed has been received (step S**906**), the control unit **330** displays a message showing that authentication failed on the display unit **370** (for example, the display screen **515** shown in FIG. **7**(*b*)).

1. Example Operation of Information Processing Apparatus (RO)

FIG. **12** is a flowchart showing one example of the processing procedure of the communication process carried out by the information processing apparatus **200** according to the first exemplary embodiment.

First, the control unit **210** judges whether a group addition request has been received (step S**921**) and when a group addition request has not been received, such monitoring is continued. Meanwhile, when a group addition request has been received (step S**921**), a timer for determining whether the acceptance period has elapsed is started (step S**922**).

Next, it is determined whether a passcode is included in the received group addition request (step S**923**) and when a passcode is included in the received group addition request, the control unit **210** sets the first value as the timer period (acceptance period) (step S**923**). Next, a first authentication process is carried out (step S**930**). The first authentication process will be described in detail with reference to FIG. **13**.

Meanwhile, when a passcode is not included in the received group addition request (step S**923**), the control unit **210** sets the second value as the timer period (acceptance period) (step S**925**). As described earlier, it is assumed that the second value is smaller than the first value.

Next, a second authentication process is carried out (step S**940**). The second authentication process will be described in detail with reference to FIG. **14**.

FIG. **13** is a flowchart showing the first authentication process procedure (the processing procedure in step S**930** shown in FIG. **12**) out of the processing procedure in the communication process carried out by the information processing apparatus **200** according to the first exemplary embodiment.

First, the control unit **210** determines whether a group addition request for a group to which a received group addition request relates has been received from another wireless communication apparatus (step S**931**). When a group addition request for such group has not been received from another wireless communication apparatus (step S**931**), the control unit **210** determines whether the timer period (acceptance period) from the reception of the first group addition request has elapsed (step S**932**).

If the timer period (acceptance period) has not elapsed from transmission of the first group addition request (step S**932**), the processing returns to step S**931**. Meanwhile, if the timer period (acceptance period) has elapsed from the transmission of the first group addition request (step S**932**), the processing proceeds to step S**937**. That is, the control unit **210** transmits a group addition authentication result showing that addition to the group related to the group addition request is not possible to the respective wireless communication apparatuses that transmitted the group addition requests (step S**937**). In such case, if the wireless communication apparatus to which the group addition authentication result is to be transmitted stores a valid MCIM, the group addition authentication result is transmitted from the RO **200** via the SHO **150**. Meanwhile, if the wireless communication apparatus to which the group addition authentication result is to be transmitted does not store a valid MCIM, the group addition authentication result is directly transmitted from the RO **200**. This also applies to the transmission in step S**936**.

If a group addition request relating to the group has been received from another wireless communication apparatus (step S**931**), the control unit **210** determines whether a passcode is included in the newly received group addition request (step S**933**). If a passcode is included in the newly received group addition request (step S**933**), the control unit **210** compares the received group addition requests with the content of the group management database **220** (step S**934**).

More specifically, the ID and password of the group respectively included in the received group addition requests and the ID and password of the group stored in the group management database **220** are compared and it is determined whether such TDs and passwords match (step S**934**). Note that the expression "received group addition requests" here refers to the group addition request received first and the next group addition request to be received. When a group whose ID and password match is present, it is determined whether the passcodes included in the respective group addition requests that have been received match (step S**934**).

When the IDs and passwords of the group and the passcodes included in the respective group addition requests all match (step S**934**), the control unit **210** updates the content of the group management database **220** (step S**935**). Next, the control unit **210** transmits a group addition authentication result showing that addition was carried out to the respective wireless communication apparatuses that transmitted the group addition requests (step S**936**). Note that step S**933** and S**934** are examples of the "determining" referred to in the patent claims. Also, step S**935** is one example of the "additionally registering" referred to in the patent claims.

Also, if a passcode is not included in the group addition request that has been newly received (step S**933**), or if at least one of the IDs and passwords of the group and the passcodes included in the group addition requests do not match (step S**934**), the processing proceeds to step S**937**. In addition, since a mismatch has occurred in the authentication process, the control unit **210** transmits a group addition authentication result showing that addition to the group related to the group addition requests is not possible to the respective wireless communication apparatuses that transmitted the group addition requests (step S**937**).

FIG. **14** is a flowchart showing a second authentication process procedure (the processing procedure of step S**940** shown in FIG. **12**) out of the processing procedure of the communication process of the information processing apparatus **200** according to the first exemplary embodiment.

First, the control unit **210** determines whether a group addition request related to the group to which a received group addition request relates has been received from another wireless communication apparatus (step S**941**). If a group addition request related to the group has not been received from another wireless communication apparatus (step S**941**), the control unit **210** determines whether the timer period (acceptance period) from the transmission of the first group addition request has elapsed (step S**942**).

If the timer period (acceptance period) has not elapsed from transmission of the first group addition request (step S**942**), the processing returns to step S**941**. Meanwhile, when the timer period (acceptance period) has elapsed from the transmission of the first group addition request (step S**942**), the processing proceeds to step S**946**. That is, the control unit **210** transmits a group addition authentication result showing

that addition to the group related to the group addition request is not possible to the respective wireless communication apparatuses that transmitted the group addition requests (step S**946**). In such case, if the wireless communication apparatus to which the group addition authentication result is to be transmitted stores a valid MCIM, the group addition authentication result is transmitted from the RO **200** via the SHO **150**. Meanwhile, if the wireless communication apparatus to which the group addition authentication result is to be transmitted does not store a valid MCIM, the group addition authentication result is directly transmitted from the RO **200**. This also applies to the transmission in step S**945**.

If a group addition request relating to the group has been received from another wireless communication apparatus (step S**941**), the control unit **210** compares the received group addition requests with the content of the group management database **220** (step S**943**).

More specifically, the ID and password of the group respectively included in the received group addition requests and the ID and password of the group stored in the group management database **220** are compared and it is determined whether such IDs and passwords match (step S**943**). Note that the expression "received group addition requests" here refers to the group addition request received first and the next group addition request to be received.

When the IDs and passwords of the group included in the respective group addition requests match (step S**943**), the control unit **210** updates the content of the group management database **220** (step S**944**). Next, the control unit **210** transmits a group addition authentication result showing that addition was carried out to the respective wireless communication apparatuses that transmitted the group addition requests (step S**945**). Note that step **5943** is one example of the "determining" referred to in the patent claims. Also, step **5944** is one example of the "additionally registering" referred to in the patent claims.

Also, if at least one of the IDs and passwords of the group included in the group addition requests do not match (step S**943**), the processing proceeds to step **5946**.

Note that in the first exemplary embodiment, an example has been described where security is increased by carrying out authentication using a passcode and/or by reducing the timer period (acceptance period) instead of simply using the ID and password of the group. However, as one example, it is also possible to increase security using location information relating to the respective wireless communication apparatuses. For example, the authentication process may be carried out on condition that the two wireless communication apparatuses that transmitted the group addition requests are within a specified range (for example, a circle with a radius of 1 to 5 km). In such case, it is possible to include location information acquired by the location information acquiring unit **380** in the group addition request and to specify the locations of the wireless communication apparatuses based on such location information. That is, the information processing apparatus **200** is capable of specifying the locations of respective wireless communication apparatuses based on the location information included in the group addition requests received from the two wireless communication apparatuses. The information processing apparatus **200** is also capable of acquiring the IDs or location information (longitude and latitude) of the base stations to which the respective wireless communication apparatuses are connected and specifying the position of each wireless communication apparatus based on such information. As another example, it is also possible to carry out the authentication process with the condition that the two wireless communication apparatuses that transmitted the group addition requests are connected to the same base station (or base stations that are close (for example, one to five km apart)). It is also possible for example to change the timer period (acceptance period) in accordance with the distance between the two wireless communication apparatuses that transmitted the group addition requests. As one example, it is possible to change the timer period (acceptance period) so as to become shorter the greater the distance between the two wireless communication apparatuses.

That is, the control unit **210** is capable of carrying out the authentication process on condition that the two wireless communication apparatuses are present within a specified range at the time of transmission of the group addition requests. Based on such result, it is possible to additionally register the wireless communication apparatus to be added in a group.

In the first exemplary embodiment, an example is described where additional registration in a group is carried out by inputting items such as an ID and password of the group according to a manual operation by the user. However, a case can be imagined where the user operates the device to be registered and the device that makes the group addition request for carrying out such registration at substantially the same time. In such a case, since it may be necessary to input the same information into two devices, it would be preferable to facilitate such input operations while maintaining security. As one example, it would be conceivable to carry out such input operations automatically using near field communication, contactless communication, or the like. For this reason, in the second exemplary embodiment, an example is described where the input operation for the ID, password, and the like of a group is carried out automatically using contactless communication. Note that the configuration of the communication system according to the second exemplary embodiment is substantially the same as the example shown in drawings such as FIG. **3**. For this reason, parts that are the same as in the first exemplary embodiment have been assigned the same reference numerals and the description thereof is partially omitted.

a. Example Configuration of Wireless Communication Apparatus

FIG. **15** is a block diagram showing one example of the functional configuration of a first wireless communication apparatus **700** according to the second exemplary embodiment. Note that the first wireless communication apparatus **700** is a modification of the first wireless communication apparatus **300** shown in FIG. **5**. For this reason, parts that are the same as in the first wireless communication apparatus **300** have been assigned the same reference numerals and the description thereof is partially omitted.

The first wireless communication apparatus **700** includes a contactless communication unit **710**, a communication unit **720**, and a control unit **740**. Note that the communication unit **720** corresponds to the antenna **311**, the antenna sharing unit **312**, the modulating unit **321**, and the demodulating unit **322** shown in FIG. **5**.

Based on control by the control unit **740**, the contactless communication unit **710** carries out communication (contactless communication) according to a contactless communication method with another appliance (an appliance equipped with a contactless communication unit, not shown) and/or a reader/writer apparatus (not shown). As one example, the contactless communication unit **710** is a contactless communication unit equipped with an IC card function and is capable of carrying out transmission and reception of data in a contactless manner with an appliance or a reader/writer apparatus

when placed within a distance of several centimeters of the appliance or reader/writer apparatus.

The contactless communication unit **710** includes an antenna **711**, an antenna sharing unit **712**, a modulating unit **713**, and a demodulating unit **714**. Note that although a different communication method is used, the functions of the antenna **711**, the antenna sharing unit **712**, the modulating unit **713**, and the demodulating unit **714** correspond to the antenna **311**, the antenna sharing unit **312**, the modulating unit **321**, and the demodulating unit **322** shown in FIG. **5**. For this reason, detailed description of such functions is omitted here.

b. Example Display of Contactless Communication Operation Screen

FIGS. **16**(*a*) and (*b*) are diagrams showing an example of a contactless communication operation screen displayed on the display unit **370** of the first wireless communication apparatus **700** according to the second exemplary embodiment and the state of the wireless communication apparatuses when contactless communication is carried out.

The contactless communication operation screen **530** shown in FIG. **16**(*a*) is a display screen for carrying out a transmission operation for transmitting the ID and password of the group AB from the first wireless communication apparatus **700** to a third wireless communication apparatus **760** according to contactless communication.

The contactless communication operation screen **530** is provided with a group ID and password display region **531**, a transmit button **532**, and a return button **533**.

The group ID and password display region **531** is a region showing the ID and password of a group (the group AB) to which the first wireless communication apparatus **700** belongs.

The transmit button **532** is a button which is pressed when transmitting the group ID and password displayed in the group ID and password display region **531** to another wireless communication apparatus.

FIG. **16**(*b*) schematically shows the states of the respective wireless communication apparatuses when the ID and password of the group AB are transmitted by contactless communication from the first wireless communication apparatus **700** to the third wireless communication apparatus **760**.

As one example, the user **20** places the first wireless communication apparatus **700** near the third wireless communication apparatus **760** so that the respective contactless communication units **710** of the first wireless communication apparatus **700** and the third wireless communication apparatus **760** are close (for example, so that the distance between the devices is several centimeters or less) or are touching. In this state, the user **20** carries out a pressing operation of the transmit button **532** in the contactless communication operation screen **530** displayed on the first wireless communication apparatus **700**. Due to this pressing operation, the ID and password of the group AB are transmitted by contactless communication from the first wireless communication apparatus **700** to the third wireless communication apparatus **760**. When this transmission process has been completed, a message showing this is displayed on the respective display units **370** of the first wireless communication apparatus **700** and the third wireless communication apparatus **760** and an addition operation screen is displayed. An example display of this addition operation screen is shown in FIG. **17**.

c. Example Display of Addition Operation Screen

FIG. **17** is a diagram showing an example of the addition operation screen displayed on the display unit **370** of the third wireless communication apparatus **760** according to the second exemplary embodiment.

The addition operation screen **540** shown in FIG. **17** is a display screen that is a partial modification of the addition operation screen **500** shown in FIG. **6** and is a display screen for carrying out an addition operation that adds the third wireless communication apparatus **760** to the group AB. For this reason, parts that are the same as the addition operation screen **500** have been assigned the same names and description thereof is partially omitted.

The addition operation screen **540** includes a group ID display region **541**, a group password display region **542**, the device name display region **503**, the passcode input region **504**, the confirm button **505**, and the return button **506**.

The group ID display region **541** is a region displaying the ID of the group (the group AB) transmitted from the first wireless communication apparatus **700**.

The group password display region **542** is a region displaying the password of the group (the group AB) transmitted from the first wireless communication apparatus **700**.

Note that although only the addition operation screen **540** displayed on the third wireless communication apparatus **760** is shown in FIG. **17**, the addition operation screen displayed on the first wireless communication apparatus **700** is substantially the same except that the device name of the first wireless communication apparatus **700** is displayed in the device name display region **503**.

d. Communication Example for Case where Group Addition Registration is Carried out Using Contactless Communication

FIG. **18** is a sequence chart showing an example of the communication process carried out between the apparatuses that compose the communication system **100** according to the second exemplary embodiment.

FIG. **18** is a modification of the communication process shown in FIGS. **8** and **9** and differs in that input of the ID and password of the group is omitted by transmitting the ID and password of the group by contactless communication. Aside from this, since the process is substantially the same as the communication process shown in FIGS. **8** and **9**, parts that are the same as the communication process shown in FIGS. **8** and **9** have been assigned the same reference numerals and description thereof is partially omitted.

First, according to a user operation, a display screen for carrying out a transmission operation for transmitting group information (the group ID and password) relating to the group AB is displayed on the display unit **370** of the first wireless communication apparatus **700**. As one example, the contactless communication operation screen **530** shown in FIG. **16**(*a*) is displayed on the display unit **370** of the first wireless communication apparatus **700**.

After this, in the contactless communication operation screen **530**, the user confirms the ID and password of the group AB displayed in the group ID and password display region **531**. Note that since the password is not displayed, as one example the user may confirm the number of characters. After such confirmation a transmission operation is carried out for the group information (**650**). That is, in the contactless communication operation screen **530**, after the ID and password of the group AB have been confirmed, a pressing operation for the transmit button **532** (i.e., a transmission operation) is carried out (**650**).

In this way, when a transmission operation has been received for the group information by the first wireless communication apparatus **700** (**650**), the group information (the ID and password of the group AB) in the contactless communication operation screen **530** is transmitted (**651**, **652**). That is, the group information is transmitted by contactless communication from the first wireless communication apparatus

700 to the third wireless communication apparatus 760 (651, 652). However, when the respective contactless communication units 710 of the first wireless communication apparatus 700 and the third wireless communication apparatus 760 are not close, it is not possible to transmit the group information by contactless communication. In such case where it is not possible to transmit the group information, as one example an error screen is displayed on the first wireless communication apparatus 700 and the third wireless communication apparatus 760 respectively to instruct the user to place the devices in a state where contactless communication is possible.

Next, a display screen for carrying out an addition operation for the group AB is displayed on the respective display units 370 of the first wireless communication apparatus 700 and the third wireless communication apparatus 760. As one example, the contactless communication operation screen 530 shown in FIG. 17 (except that "My Mobile" is displayed in the device name display region 503 and the passcode input region 504 is blank) is displayed on the display unit 370 of the first wireless communication apparatus 700. The contactless communication operation screen 540 shown in FIG. 17 (except that the passcode input region 504 is blank) is displayed on the display unit 370 of the third wireless communication apparatus 760.

In this way, group information stored in the memory 340 is displayed by the first wireless communication apparatus 700 and group information transmitted from the first wireless communication apparatus 700 is displayed by the third wireless communication apparatus 760. This means that the user only needs to input a passcode as necessary (653, 655). After such input operations have been carried out, the confirm button 505 is pressed (654, 656). When an addition operation for the group AB has been accepted in this way (654, 656), a group addition request corresponding to the addition operation is transmitted to the RO 200 (654 and 606, 656 and 609).

Note that since the communication process is thereafter the same as in FIGS. 8 and 9, further description thereof is omitted.

In this way, according to the second exemplary embodiment, the ID and password of the group are transmitted by contactless communication from a device that has already been registered to a device that is to be added. By doing so, it is possible to omit an input operation for the group ID and password when carrying out operations for a group addition request. In such case, since contactless communication of the group ID and password is carried out based on a transmission operation by the user, it is possible to prevent the group ID and password from leaking to another appliance. That is, according to the second exemplary embodiment, it is possible to easily share the rights for connecting to a network between a plurality of wireless communication apparatuses. In this case, it is possible to maintain security for such sharing.

3. Third Embodiment

In the first and second embodiments according to the present disclosure, examples are described where additional registration is carried out by transmitting group addition requests from two devices. However, as another example it would also be conceivably possible to maintain a certain level of security by having the same user operate a device to be registered and a device that makes a group addition request in order to carry out such registration. For this reason, the third exemplary embodiment describes an example where information or the like relating to a device that is to be registered is transmitted to a device that has already been registered in a group using contactless communication and then a group addition request is made from only such registered device. Note that the configuration of the communication system according to the third exemplary embodiment is substantially the same as the examples shown in drawings such as FIGS. 3 and 15. For this reason, parts that are the same as in the second exemplary embodiment have been assigned the same reference numerals and the description thereof is partially omitted.

a. Example Display of Contactless Communication Operation Screen

FIG. 19 is a diagram showing an example of the contactless communication operation screen displayed on the display unit 370 of the third wireless communication apparatus 760 according to the third exemplary embodiment.

The contactless communication operation screen 560 shown in FIG. 19 is a display screen for carrying out a transmission operation that transmits information (for example, terminal identification information) relating to the third wireless communication apparatus 760 from the third wireless communication apparatus 760 to the first wireless communication apparatus 700 using contactless communication.

The contactless communication operation screen 560 is provided with a transmission information display region 561, a transmit button 562, and a return button 563.

The transmission information display region 561 is a region displaying information to be transmitted to the first wireless communication apparatus 700 out of the various information stored in the third wireless communication apparatus 760. Here, this third embodiment of the present disclosure describes an example where out of the various information stored in the third wireless communication apparatus 760, the device name and terminal identification information is the information to be transmitted.

The transmit button 562 is a button that is pressed when transmitting the various information displayed in the transmission information display region 561 to another wireless communication apparatus.

Note that the state of the respective wireless communication apparatuses when contactless communication is carried out between the third wireless communication apparatus 760 and the first wireless communication apparatus 700 is substantially the same as the state shown in FIG. 16(*b*) except that the device being operated is the third wireless communication apparatus 760.

b. Example Display of Addition Operation Screen

FIG. 20 is a diagram showing one example of the addition operation screen displayed on the display unit 370 of the first wireless communication apparatus 700 according to the third exemplary embodiment.

The addition operation screen 570 shown in FIG. 20 is a display screen for carrying out an addition operation for adding the third wireless communication apparatus 760 to the group AB.

The addition operation screen 570 is provided with an added group display region 571, an added device display region 572, a confirm button 573, and a return button 574.

The added group display region 571 is a region displaying the name of the group to which the first wireless communication apparatus 700 belongs.

The added device display region 572 is a region displaying information transmitted from the third wireless communication apparatus 760. Note that part of the information transmitted from the third wireless communication apparatus 760 may be in a non-displayed state.

The confirm button 573 is a button which is pressed after confirming the various items described above to make a group addition request for the confirmed content. That is, when the confirm button 573 is pressed, a group addition request for

adding the device displayed in the added device display region **572** to the group displayed in the group display region **571** is transmitted.

c. Example of Communication when Carrying out Group Additional Registration Using Contactless Communication

FIG. **21** is a sequence chart showing an example of the communication process carried out by the various apparatuses that compose the communication system **100** according to the third exemplary embodiment.

The example shown in FIG. **21** is a modification to the communication process shown in FIG. **18** and by transmitting information relating to the device to be added via contactless communication to another device, transmission of a group addition request from the device to be added is omitted. Also, in the example shown in FIG. **21**, in the authentication process for a group addition request, authentication is carried out using only the group information included in the group addition request transmitted from one device. Note that aside from the above, the processing is substantially the same as in the communication process shown in FIG. **18** and therefore parts that are the same as in the communication process shown in FIG. **18** have been assigned the same reference numerals and the description thereof is partially omitted.

First, according to a user operation, a display screen for carrying out a transmission operation that transmits information relating to the third wireless communication apparatus **760** (as examples, the terminal identification information and/or device name) is displayed on the display unit **370** of the third wireless communication apparatus **760**. As one example, the contactless communication operation screen **560** shown in FIG. **19** is displayed on the display unit **370** of the third wireless communication apparatus **760**.

Next, the user confirms the information (as examples, the terminal identification information and/or device name) displayed in the transmission information display region **561** of the contactless communication operation screen **560**. After such confirmation, a transmission operation for such information is carried out (**670**). That is, in the contactless communication operation screen **560**, a pressing operation (transmission operation) for the confirm button **532** is carried out after confirming the information to be transmitted (**670**).

In this way, if a transmission operation has been received by the third wireless communication apparatus **760** (**670**), the information in the contactless communication operation screen **560** for such transmission operation (as examples, the terminal identification information and/or device name) is transmitted (**671**, **672**). That is, the information is transmitted by contactless communication from the third wireless communication apparatus **760** to the first wireless communication apparatus **700**. However, when the contactless communication units **710** of the first wireless communication apparatus **700** and the third wireless communication apparatus **760** are not close, it is not possible to transmit the information by contactless communication. In such case where it is not possible to transmit the information, as one example an error screen is displayed on the first wireless communication apparatus **700** and the third wireless communication apparatus **760** respectively to instruct the user to place the devices in a state where contactless communication is possible.

Next, a display screen for carrying out an addition operation for the group AB is displayed on the display unit **370** of the first wireless communication apparatus **700**. For example, an addition operation screen **570** shown in FIG. **20** is displayed on the display unit **370** of the first wireless communication apparatus **700**.

In this way, the information transmitted from the third wireless communication apparatus **760** is displayed by the first wireless communication apparatus **700**. This means that the user does not need to input a group ID, password, or various information (as examples, the terminal identification information and/or device name) relating to the device to be added. After confirming such information, the confirm button **573** is pressed (**673**). In this way, when an addition operation for the group AB has been received (**673**), a group addition request corresponding to such addition operation is transmitted to the RO **200** (**674** to **677**). Here, in the example shown in FIG. **21**, since only one wireless communication apparatus transmits a group addition request, there is no passcode to be compared. For this reason, a passcode is not included in the group addition request.

After this, an authentication process is carried out for the received group addition request (**678**). Here, in the example shown in FIG. **21**, since there is only one wireless communication apparatus that transmits a group addition request, a determination of whether a timer period (acceptance period) has passed is not carried out. Also, since a passcode is not included in the received group addition request, a process determining whether a passcode is included is not carried out. Also, since only one group addition request is received, only a comparison of the content of the received group addition request with the content of the group management database **220** is carried out. If a group with a matching ID and password is present, the control unit **210** then updates the content of the group management database **220** (**613**).

The various processes (**679** to **682**) shown in FIG. **21** correspond to the various processes (**613** to **616**) shown in FIG. **8**. Similarly, the various processes (**683** to **687**) shown in FIG. **21** correspond to the various processes (**617** to **621**) shown in FIG. **9**. However, the processing differs in that when a group addition authentication result is transmitted from the RO **200** to the third wireless communication apparatus **760** (**680**, **681**), the terminal identification information of the third wireless communication apparatus **760** included in the group addition request transmitted from the first wireless communication apparatus **700** is used.

In this way, the control unit **210** is capable of additionally registering the third wireless communication apparatus **760** in the group AB using the wireless communication apparatus information (the terminal identification information or the like of the third wireless communication apparatus **760**) included in the group addition request.

In this way, according to the third exemplary embodiment, information (wireless communication apparatus information) relating to the device to be added is transmitted from the device to be added to a device that has already been registered. Since this makes it possible for the registered device to acquire the wireless communication apparatus information, it is possible to carry out an addition operation for the group using only the registered device. In such case, since the wireless communication apparatus information is transmitted by contactless communication based on a transmission operation made by the user, it is possible to prevent the wireless communication apparatus from leaking to another appliance. That is, according to the third exemplary embodiment, it is possible to easily share the right to connect to a network between a plurality of wireless communication apparatuses. In such case, it is possible to maintain security for the sharing.

Note that the second and third exemplary embodiments describe examples where contactless communication units are provided in the wireless communication apparatuses and information (as examples, the ID and password of a group) is exchanged between the wireless communication apparatuses using the contactless communication units. However, it is also possible for the wireless communication apparatuses to

be provided with near field communication units and for the information to be exchanged between the wireless communication apparatuses using the near field communication units. The near field communication units are capable of communicating with other devices (appliances equipped with near field communication units using the same method) present within a range of several meters to several tens of meters and are realized as one example using Bluetooth. It is also possible for the wireless communication apparatuses to be provided with infrared communication units and for the information to be exchanged between the wireless communication apparatuses using the infrared communication units. It is also possible to exchange information between the wireless communication apparatuses by carrying out wired communication using an interface such as a cable.

4. Modifications

In the first to third embodiments of the present disclosure, examples are described where a group addition operation is carried out using wireless communication apparatuses equipped with display units. Here, when carrying out additional registration in a group on a wireless communication apparatus equipped with a user interface (display unit) with comparatively high display performance, it is possible to display the respective display screens on such display unit and to carry out the addition operation for the group using such display screens. However, a case can also be imagined where additional registration in a group is carried out using a wireless communication apparatus equipped with only a user interface of limited display performance and it is not possible to display the respective display screens. For this reason, as a modification, an example is described where an addition operation for a group is carried out using a wireless communication apparatus equipped with only a user interface of limited display performance.

a. Example of a Wireless Communication Apparatus Equipped with a User Interface Aside from a Display Unit

FIGS. **22**(*a*) and **22**(*b*) are perspective views showing an example of the external construction of a speaker apparatus **800** according to a modification to the embodiments of the present disclosure. That is, in FIG. **22**, the speaker apparatus **800** is shown as one example of a wireless communication apparatus equipped with only a user interface of limited display performance. Also, in FIG. **22**, in the speaker apparatus **800** equipped with only a user interface of limited display performance, one example of operation elements used when carrying out an addition operation for a group (i.e., a light emitting unit **810** and an operation unit **820**) are shown.

FIG. **22**(*a*) is a perspective view from the front side of the speaker apparatus **800** and FIG. **22**(*b*) is a perspective view from the rear side of the speaker apparatus **800**. Also, the speaker apparatus **800** includes the light emitting unit **810**, the operation unit **820**, and a contactless communication unit **830**. The internal configuration relating to communication in the speaker apparatus **800** is assumed to be substantially the same as in the first wireless communication apparatus **700** shown in FIG. **15**. As one example, the light emitting unit **810** corresponds to the display unit **370**, the operation unit **820** corresponds to the operation unit **360**, and the contactless communication unit **830** corresponds to the contactless communication unit **710**.

The light emitting unit **810** is a light emitting unit provided on an exterior surface of the speaker apparatus **800** and is constructed of a LED, for example. The light emitting unit **810** is lit up and extinguished based on a control signal from the control unit **740**.

The operation unit **820** is constructed of one or a plurality of operation elements provided on the exterior surface of the speaker apparatus **800**.

For example, when additionally registering the speaker apparatus **800** in the group AB, it is possible to apply the third exemplary embodiment. As one example, by carrying out a specified operation of the operation elements (for example pressing a confirm button five times consecutively), the user transmits various information relating to the speaker apparatus **800** via the contactless communication unit **830** to the first wireless communication apparatus **700** (**670** to **672** shown in FIG. **21**). After this transmission operation, the user carries out an addition operation for additionally registering the speaker apparatus **800** in the group AB using the first wireless communication apparatus **700** (**673** in FIG. **21**).

Also, as one example, when the group addition authentication result is received by the speaker apparatus **800** (**681** shown in FIG. **21**), by having the light emitting unit **810** carry out a specified flashing operation (for example, flashing five times with a fixed interval), it is possible to notify the user of the authentication result (**682** shown in FIG. **21**). As another example, it is also possible to use a plurality of LEDs as the light emitting unit **810** and to notify the user that a group addition authentication result has been received by way of a lighting pattern that uses a combination of such LEDs.

As another example, a case where the speaker apparatus **800** belongs to the group AB is also imagined. In such case, when additionally registering another wireless communication apparatus (for example, the third wireless communication apparatus **760**) using the speaker apparatus **800**, it is possible to apply the second exemplary embodiment. For example, by having the user carry out a specified operation of the operation elements (for example pressing a confirm button three times consecutively), the speaker apparatus **800** transmits group information relating to the group AB via the contactless communication unit **830** to the third wireless communication apparatus **760** (**650** to **652** shown in FIG. **21**). After this transmission operation, the user carries out an addition operation for additionally registering the third wireless communication apparatus **760** in the group AB using the speaker apparatus **800** and the third wireless communication apparatus **760** (**653**, **655** in FIG. **18**). Note that this addition operation (**655** shown in FIG. **18**) for the group AB at the speaker apparatus **800** is realized by the user carrying out a specified operation of the operation elements (for example pressing a decide button three times consecutively while pressing a specified button).

In this way, according to the embodiments of the present disclosure, it is possible for a device with a simple UI (user interface) to carry out a registration operation for a group. This means that it is possible to carry out a registration operation for a group using various types of wireless communication apparatus.

Note that in the embodiments of the present disclosure, examples where the information processing apparatus **200** is constructed of a single device have been described. However, it is also possible to apply the embodiments of the present disclosure to an information processing system where the various components of the information processing apparatuses (for example, the control unit **210** and the group management database **220**) are configured using a plurality of apparatuses. Also, although examples where the group AB is composed of two or three wireless communication apparatuses have been described in the embodiments of the present disclosure, it is also possible to apply the embodiments of the present disclosure to a group composed of four or more wireless communication apparatuses. It is also possible to apply

the embodiments of the present disclosure to mobile wireless communication apparatuses (for example a dedicated data communication terminal apparatus) or fixed-type wireless communication apparatuses (for example, a wireless communication apparatus for data collection at a vending machine).

Examples where use rights over an MCIM are used as network connection rights are described above in the embodiments of the present disclosure. However, it is also possible to apply the embodiments of the present disclosure to other network connection rights for connecting to a specified network based on other information (for example, a USIM (Universal Subscriber Identity Module)).

Note that the embodiments given above describe examples used to embody the present disclosure and that elements in the embodiments correspond to elements in the patent claims. In the same way, elements in the patent claims correspond to elements in the embodiments of the present disclosure that have been given the same names. However, it should be understood by those skilled in the art that various modifications, combinations, sub-combinations and alterations may occur depending on design requirements and other factors insofar as they are within the scope of the appended claims or the equivalents thereof.

The processing procedures described in the embodiments given above may take the form of a method including a series of such procedures and may also take the form of a program for causing a computer to execute a series of such procedures or a recording medium storing such a program. As examples, it is possible to use a CD (Compact Disc), an MD (MiniDisc), a DVD (Digital Versatile Disc), a memory card, a Blu-ray Disc (registered trademark) or the like as the recording medium.

Additionally, the present technology may also be configured as below.

(1)

An information processing apparatus, comprising:

a receiving unit configured to receive, from a first communications device, a first request to join a group of second communications devices, the first request comprising first information identifying the group, and the group being associated with at least one connection right; and

a control unit configured to associate the first communications device with the group, based at least the received information.

(2)

The apparatus of (1), wherein the group is associated with a plurality of connection rights.

(3)

The apparatus of (1) or (2), wherein the first group information comprises at least one of an identifier of the group and a password associated with the group identifier.

(4)

The apparatus of any one of (1) to (3), wherein the control unit is further configured to: determine whether the first request comprises information associated with a first user of the first communications device; and

establish a first time period for associating the first communications device with the group, when the first request includes the first user information.

(5)

The apparatus of (4), wherein the first user information comprises a numerical passcode specified by the first user.

(6)

The apparatus of (4) or (5), wherein: the receiving unit is further configured to receive, from a corresponding one of the second communications devices, a second request to add the first communications device to the group; and

the control unit is further configured to determine whether the second request is received within the first time period.

(7)

The apparatus of (6), wherein:

the second request comprises information associated with a second user of the corresponding second communications device; and

the control unit is further configured to determine whether the first user information matches the second user information, when the second request is received within the first time period.

(8)

The apparatus of (7), wherein the second user information comprises a numerical passcode specified by the second user.

(9)

The apparatus of (8), wherein the control unit is further configured to generate information indicative of a failure to associate the first communications device with the group, when the first user information does not match the second user information.

(10)

The apparatus of any one of (7) to (9), wherein:

the second request comprises second information identifying the group; and

the control unit is further configured to determine whether at least a portion of the first group information matches a corresponding portion of the second group information, when the first user information matches the second user information.

(11)

The apparatus of (10), wherein the control unit is further configured to associate the first communications device with the group, when the first group information matches the second group information.

(12)

The apparatus of any one of (7) to (11), wherein the control unit is further configured to generate information indicative of a failure to associate the first communications device with the group, when the second request is not received within the first time period.

(13)

The apparatus of any one of (6) to (12), wherein the control unit is further configured to:

establish a second time period for associating the first communications device with the group, when the first request does not include the first user information, the first time period exceeding the second time period; and

determine whether the second request is received within the second time period

(14)

The apparatus of (13), wherein:

the second request comprises second information identifying the group; and

the control unit is further configured to determine whether at least a portion of the first group information matches a corresponding portion of the second group information, when the second request is received within the second time period.

(15)

The apparatus of (14), wherein the control unit is further configured to associate the first communications device with the group, when the first group information portion matches the second group information portion.

(16)

The apparatus of (10) or (11), wherein the control unit is further configured to generate information indicative of a failure to associate the first communications device with the

group, when the first group information does not correspond to the second group information.

(17)

The apparatus of any one of (1) to (16), wherein the control unit is further configured to:

generate a confirmation indicative of the association between the first communications device and the group; and

generate an instruction to transmit the confirmation to the first communications device and at least one of the second communications devices.

(18)

The apparatus of (17), further comprising a communications unit configured to transmit the confirmation to the first communications device and at least one of the second communications devices, in response to the generated instructions.

REFERENCE SIGNS LIST

100 Communication system
110 Public network
120 Network control apparatus
121, **122**, **206** Base station
123-126, **207** Wireless connection
200 Information processing apparatus (RO)
205, **720** Communication unit
210, **740** Control unit
220 Group management database
300, **700** First wireless communication apparatus
311, **711** Antenna
312, **712** Antenna sharing unit
321, **713** Modulating unit
322, **714** Demodulating unit
330 Control unit
331 Bus
340 Memory
350 MCIM information storage unit
360, **820** Operation unit
370 Display unit
380 Position information acquiring unit
391 Microphone
392 Speaker
400, **750** Second wireless communication apparatus
410, **760** Third wireless communication apparatus
710, **830** Contactless communication unit
800 Speaker apparatus
810 Light emitting unit

The invention claimed is:

1. An information processing apparatus, comprising:

circuitry configured to:

receive, from a first communications device, a first request to join a group of second communications devices, the first request comprising first group information identifying the group, and the group being associated with at least one connection right, and

receive, from a corresponding one of the second communications devices, a second request to add the first communications device to the group; and

a control unit configured to:

establish a first time period for associating the first communications device with the group,

determine whether the second request is received within the first time period, and

associate the first communications device with the group, based on the determination and the received first and second request.

2. The apparatus of claim **1**, wherein the group is associated with a plurality of connection rights.

3. The apparatus of claim **1**, wherein the first group information comprises at least one of an identifier of the group and a password associated with the identifier.

4. The apparatus of claim **1**, wherein the control unit is further configured to:

determine whether the first request comprises first user information associated with a first user of the first communications device; and

establish the first time period for associating the first communications device with the group, when the first request includes the first user information.

5. The apparatus of claim **4**, wherein:

the second request comprises second user information associated with a second user of the corresponding second communications device; and

the control unit is further configured to determine whether the first user information matches the second user information, when the second request is received within the first time period.

6. The apparatus of claim **5**, wherein the second user information comprises a numerical passcode specified by the second user.

7. The apparatus of claim **5**, wherein:

the second request comprises second group information identifying the group; and

the control unit is further configured to determine whether at least a portion of the first group information matches a corresponding portion of the second group information, when the first user information matches the second user information.

8. The apparatus of claim **7**, wherein the control unit is further configured to associate the first communications device with the group, when the first group information matches the second group information.

9. The apparatus of claim **5**, wherein the control unit is further configured to generate information indicative of a failure to associate the first communications device with the group, when the second request is not received within the first time period.

10. The apparatus of claim **4**, wherein the control unit is further configured to:

establish a second time period for associating the first communications device with the group, when the first request does not include the first user information, the first time period exceeding the second time period; and

determine whether the second request is received within the second time period.

11. The apparatus of claim **10**, wherein:

the second request comprises second group information identifying the group; and

the control unit is further configured to determine whether at least a portion of the first group information matches a corresponding portion of the second group information, when the second request is received within the second time period.

12. The apparatus of claim **11**, wherein the control unit is further configured to associate the first communications device with the group, when the first group information portion matches the second group information portion.

13. The apparatus of claim **7**, wherein the control unit is further configured to generate information indicative of a failure to associate the first communications device with the group, when the first group information does not correspond to the second group information.

14. The apparatus of claim **1**, wherein the control unit is further configured to:

generate a confirmation indicative of the association between the first communications device and the group; and

generate an instruction to transmit the confirmation to the first communications device and at least one of the second communications devices.

15. The apparatus of claim **14**, further comprising a communications unit configured to transmit the confirmation to the first communications device and at least one of the second communications devices, in response to the generated instruction.

16. A computer-implemented method, comprising:

receiving, from a first communications device, a first request to join a group of second communications devices, the first request comprising first group information identifying the group, and the group being associated with at least one connection right;

receiving, from a corresponding one of the second communications devices, a second request to add the first communications device to the group;

establishing a first time period for associating the first communications device with the group;

determining whether the second request is received within the first time period; and

associating, using at least one processor, the first communications device with the group, based on the determination and the received first and second request.

17. A first communications device, comprising

one or more processors configured to:

generate a first instruction to transmit a request to join a group of second communications devices to an information processing apparatus, the request comprising information identifying the group, and the group being associated with at least one connection right;

associate, with the group based on a second request received by the information processing apparatus from a corresponding one of the second communications devices, wherein

the second request is to add the first communications device to the group, and wherein

the second request is received within a first time period established by the information processing apparatus for associating the first communications device with the group; and generate a second instruction to display information associated with an outcome of the first request.

18. A communications system, comprising:

a terminal device configured to generate an instruction to transmit a first request to join a group of communications devices to an information processing apparatus; and

the information processing apparatus in communication with the terminal device, the information processing apparatus comprising:

circuitry configured to:

receive the first request from the terminal device, the request comprising information identifying the group, and the group being associated with at least one connection right,

receive, from a corresponding one of the communications devices, a second request to add the terminal device to the group; and

a control unit configured to:

establish a first time period for associating the terminal device with the group,

determine whether the second request is received within the first time period, and

associate the terminal device with the group, based on the determination and the received first and second request.

19. The communications system of claim **18**, wherein:

the information processing apparatus further comprises a communications unit configured to transmit, to the terminal device, an indication of an outcome of the received first request; and

the terminal device further comprises a display control unit configured to generate a second instruction to display, in response to the indication, information associated with the outcome of the first request.

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