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Li et al.

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(54) **METHOD AND TERMINAL FOR ESTABLISHING A COMMUNICATION CONNECTION**

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(73) Assignee: **HUAWEI DEVICE CO., LTD.**, Dongguan (CN)

(21) Appl. No.: **15/981,509**

(22) Filed: **May 16, 2018**

Related U.S. Patent Documents

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(51) **Int. Cl.**
H04B 5/00 (2006.01)
H04W 76/14 (2018.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H04W 76/14*** (2018.02); ***H04B 5/0031*** (2013.01); ***H04W 88/06*** (2013.01); ***H04W 92/18*** (2013.01); *H04W 8/005* (2013.01)

(58) **Field of Classification Search**
CPC H04W 76/14; H04W 8/005
(Continued)

(56) **References Cited**

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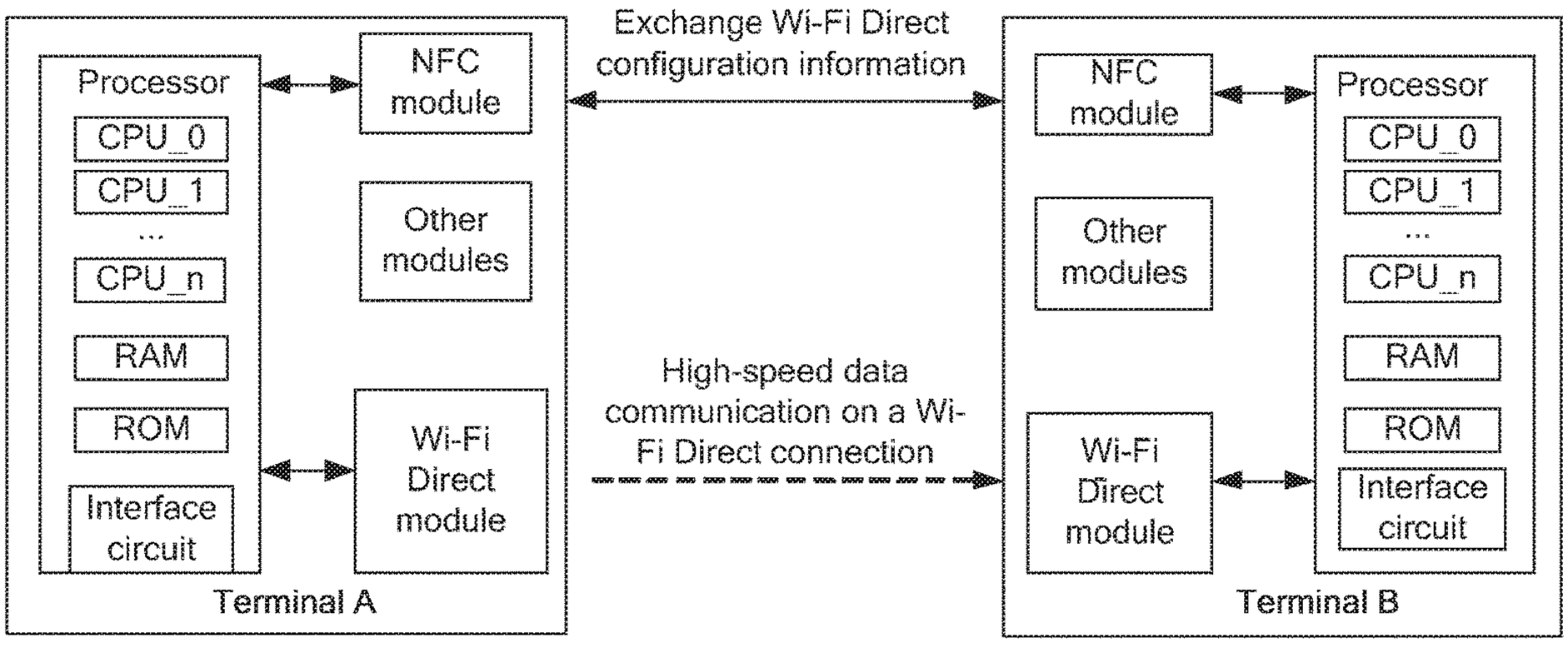
Primary Examiner — Nick Corsaro
(74) *Attorney, Agent, or Firm* — Conley Rose, P.C.

(57) **ABSTRACT**

A method and a terminal for establishing a communication connection. In an embodiment, the method for establishing a communication connection includes: exchanging, by a first terminal, Wi-Fi Direct configuration information with a second terminal through a near field communication connection between the first terminal and the second terminal, where the exchanged Wi-Fi Direct configuration information includes group information of the first terminal or second terminal; and establishing a Wi-Fi Direct connection between the first terminal and the second terminal according to the exchanged Wi-Fi Direct configuration information. The present invention can simplify a process of establishing a Wi-Fi Direct connection, so that both of two terminals can establish a Wi-Fi Direct connection within an NFC communication range.

28 Claims, 17 Drawing Sheets



(51) **Int. Cl.**
H04W 88/06 (2009.01)
H04W 92/18 (2009.01)
H04W 8/00 (2009.01)

(58) **Field of Classification Search**
USPC 455/41.2
See application file for complete search history.

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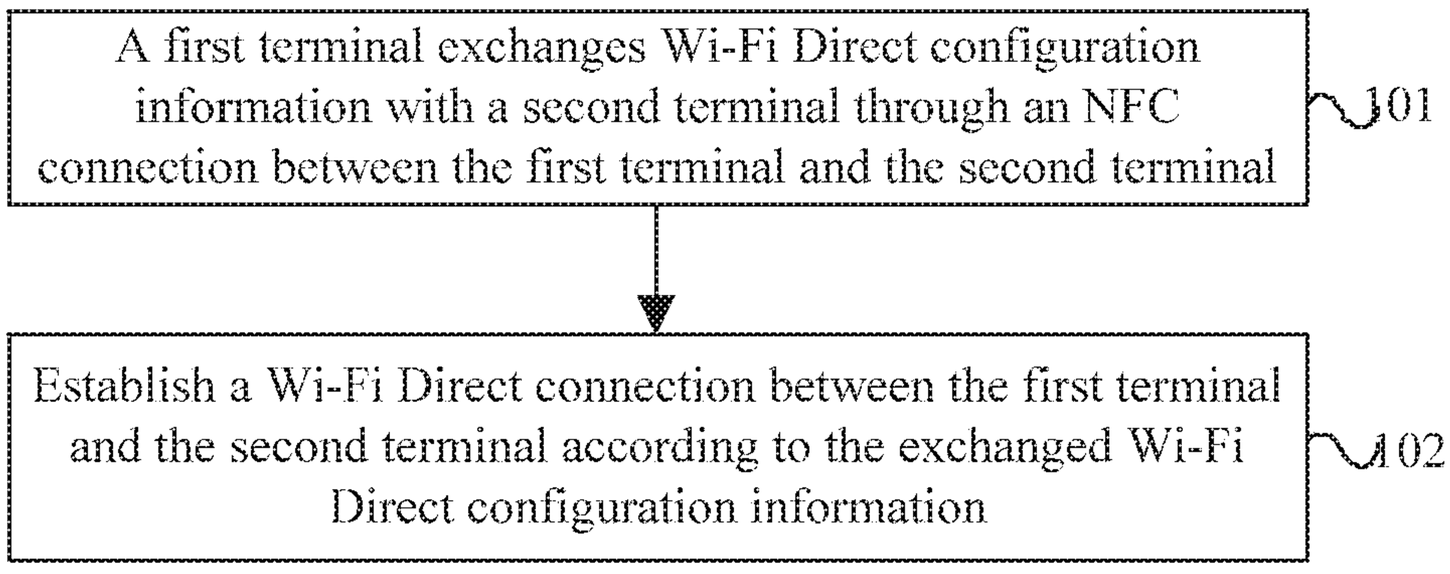
A first terminal exchanges Wi-Fi Direct configuration information with a second terminal through an NFC connection between the first terminal and the second terminal
101
Establish a Wi-Fi Direct connection between the first terminal and the second terminal according to the exchanged Wi-Fi Direct configuration information
102

FIG. 1

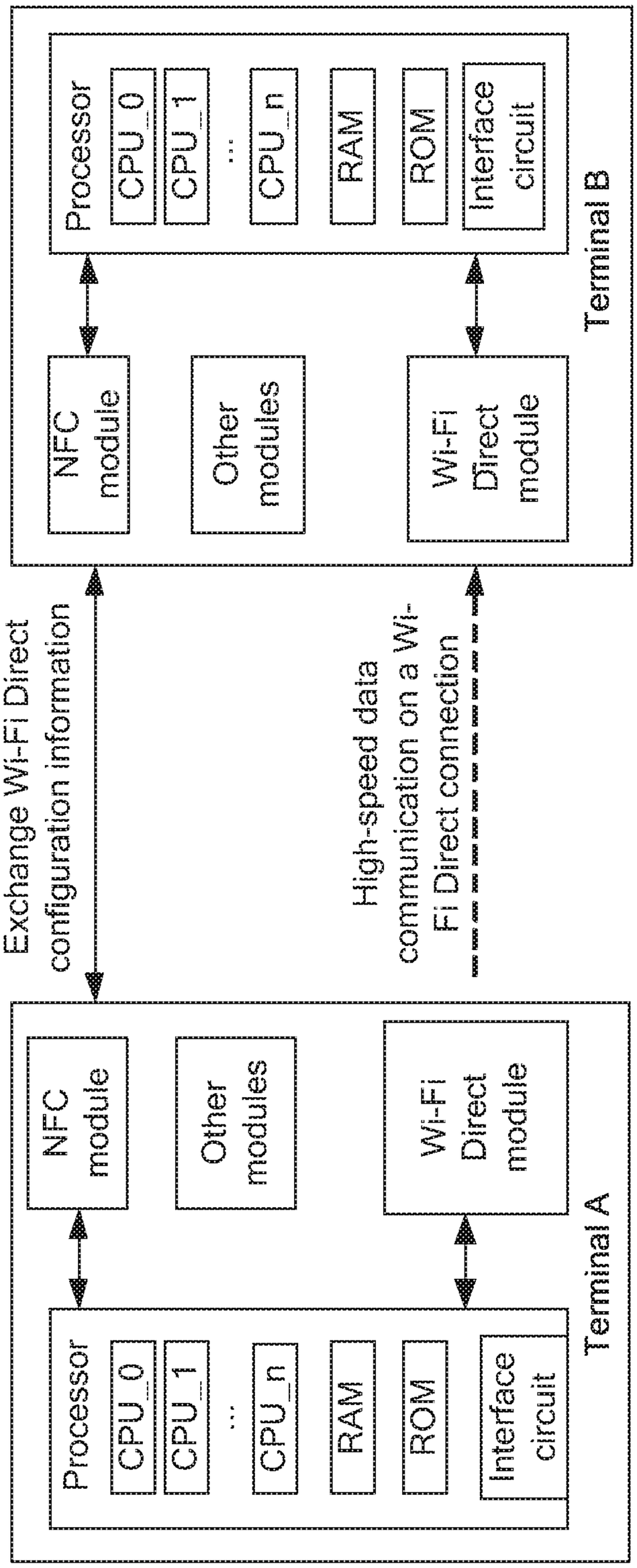
Terminal B
Processor
CPU_0
CPU_1
...
CPU_n
RAM
ROM
Interface circuit
NFC module
Other modules
Wi-Fi Direct module
Exchange Wi-Fi Direct configuration information
High-speed data communication on a Wi-Fi Direct connection
Terminal A
Processor
CPU_0
CPU_1
...
CPU_n
RAM
ROM
Interface circuit
NFC module
Other modules
Wi-Fi Direct module

FIG. 2

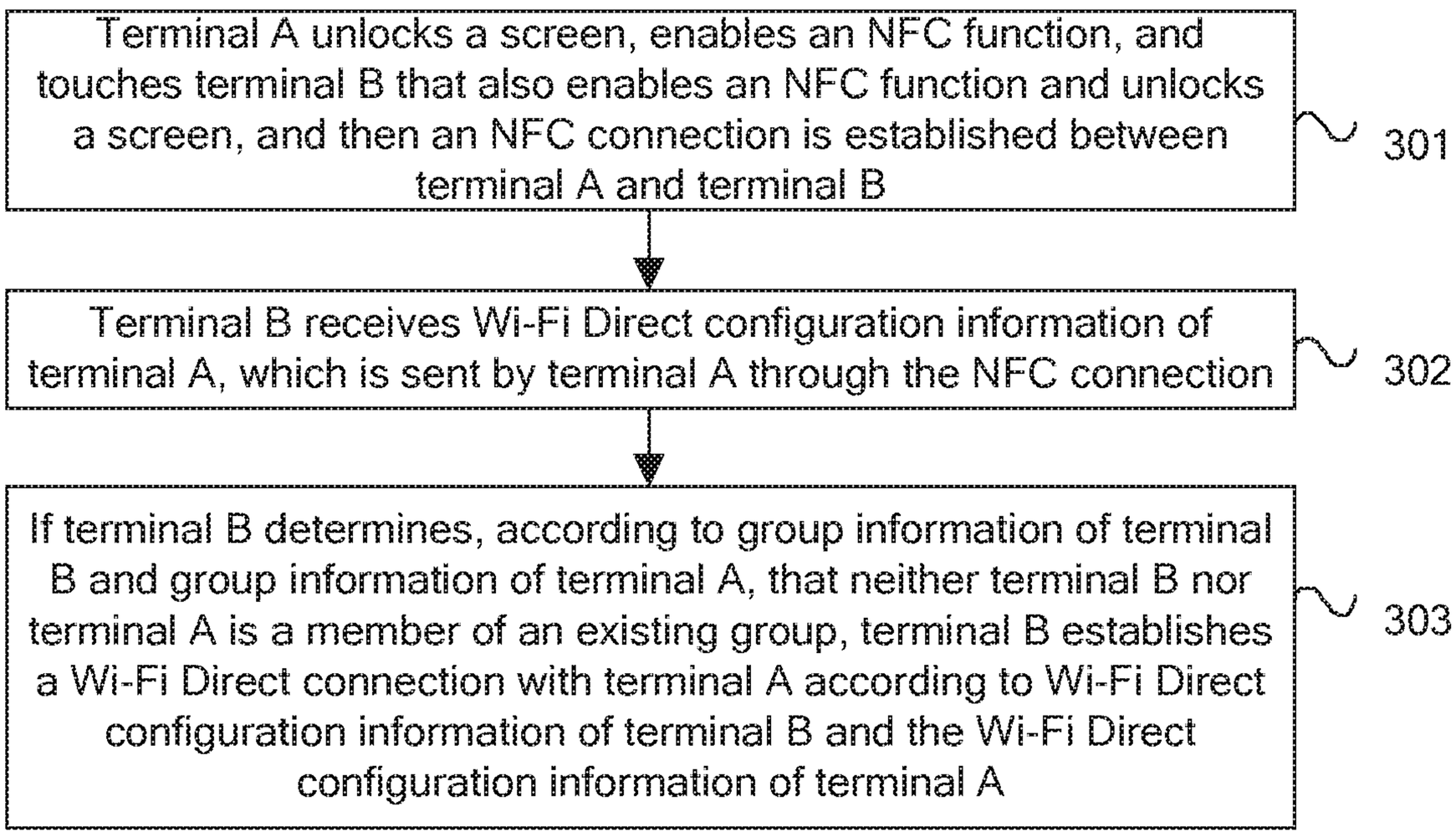
Terminal A unlocks a screen, enables an NFC function, and touches terminal B that also enables an NFC function and unlocks a screen, and then an NFC connection is established between terminal A and terminal B
301
Terminal B receives Wi-Fi Direct configuration information of terminal A, which is sent by terminal A through the NFC connection
302
If terminal B determines, according to group information of terminal B and group information of terminal A, that neither terminal B nor terminal A is a member of an existing group, terminal B establishes a Wi-Fi Direct connection with terminal A according to Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A
303

FIG. 3

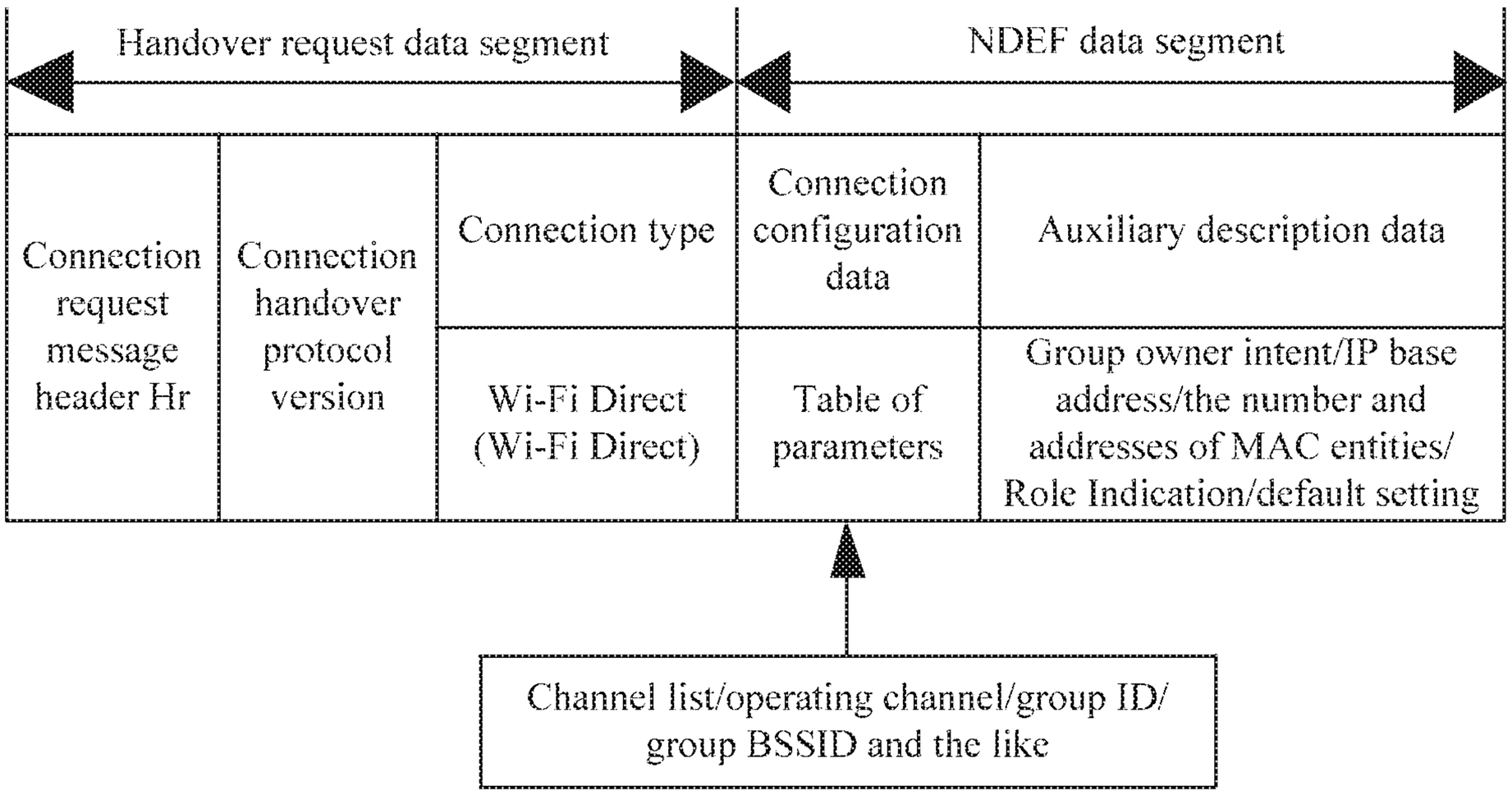
Handover request data segment
NDEF data segment
Connection request message header Hr
Connection handover protocol version
Connection type
Wi-Fi Direct (Wi-Fi Direct)
Connection configuration data
Table of parameters
Auxiliary description data
Group owner intent/IP base address/the number and addresses of MAC entities/ Role Indication/default setting
Channel list/operating channel/group ID/ group BSSID and the like

FIG. 4

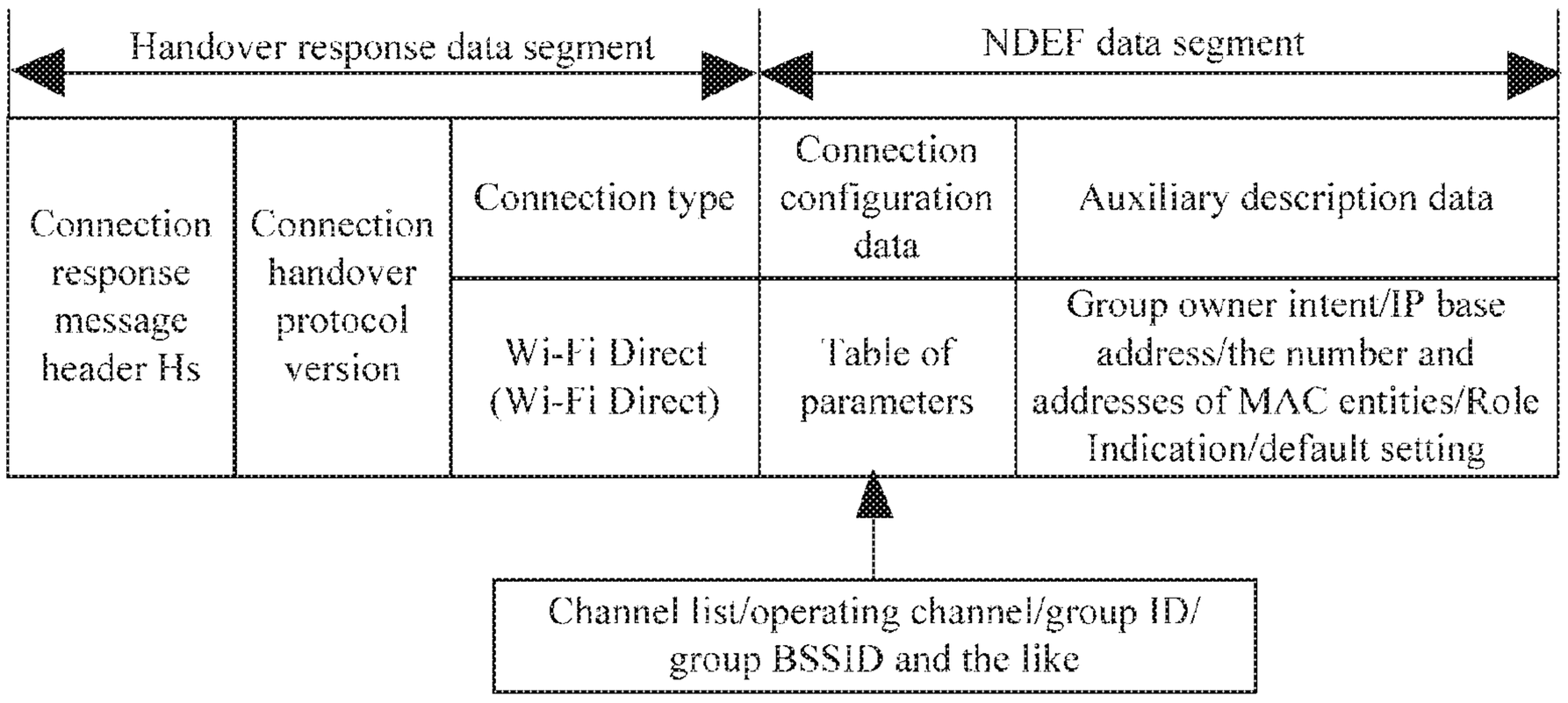
Handover response data segment
NDEF data segment
Connection response message header Hs
Connection handover protocol version
Connection type
Wi-Fi Direct (Wi-Fi Direct)
Connection configuration data
Table of parameters
Auxiliary description data
Group owner intent/IP base address/the number and addresses of MAC entities/Role Indication/default setting
Channel list/operating channel/group ID/ group BSSID and the like

FIG. 5

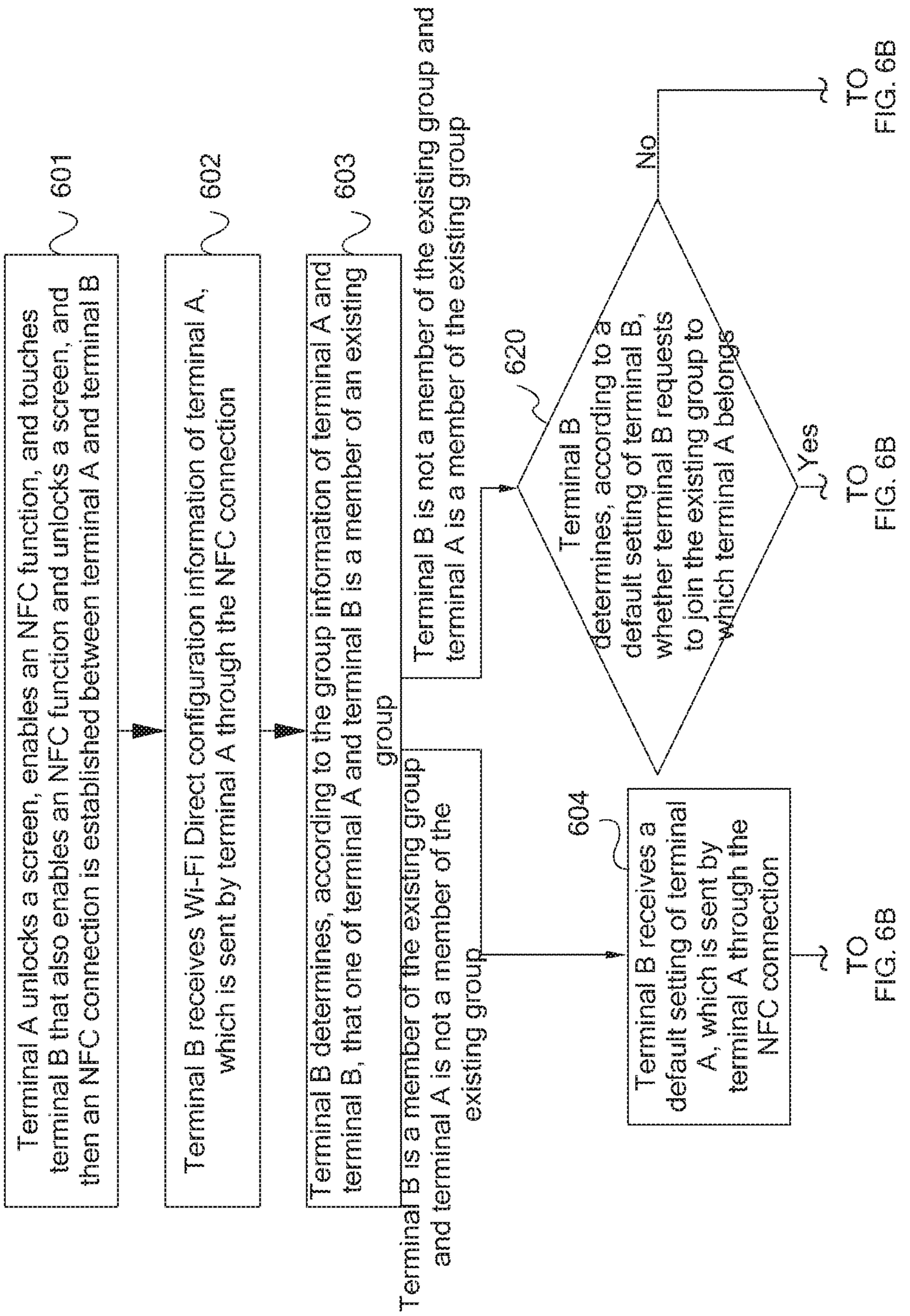
601
Terminal A unlocks a screen, enables an NFC function, and touches terminal B that also enables an NFC function and unlocks a screen, and then an NFC connection is established between terminal A and terminal B
602
Terminal B receives Wi-Fi Direct configuration information of terminal A, which is sent by terminal A through the NFC connection
603
Terminal B determines, according to the group information of terminal A and terminal B, that one of terminal A and terminal B is a member of an existing group
Terminal B is a member of the existing group and terminal A is not a member of the existing group
Terminal B is not a member of the existing group and terminal A is a member of the existing group
620
Terminal B determines, according to a default setting of terminal B, whether terminal B requests to join the existing group to which terminal A belongs
No
Yes
604
Terminal B receives a default setting of terminal A, which is sent by terminal A through the NFC connection
TO FIG. 6B
TO FIG. 6B
TO FIG. 6B

FIG. 6A

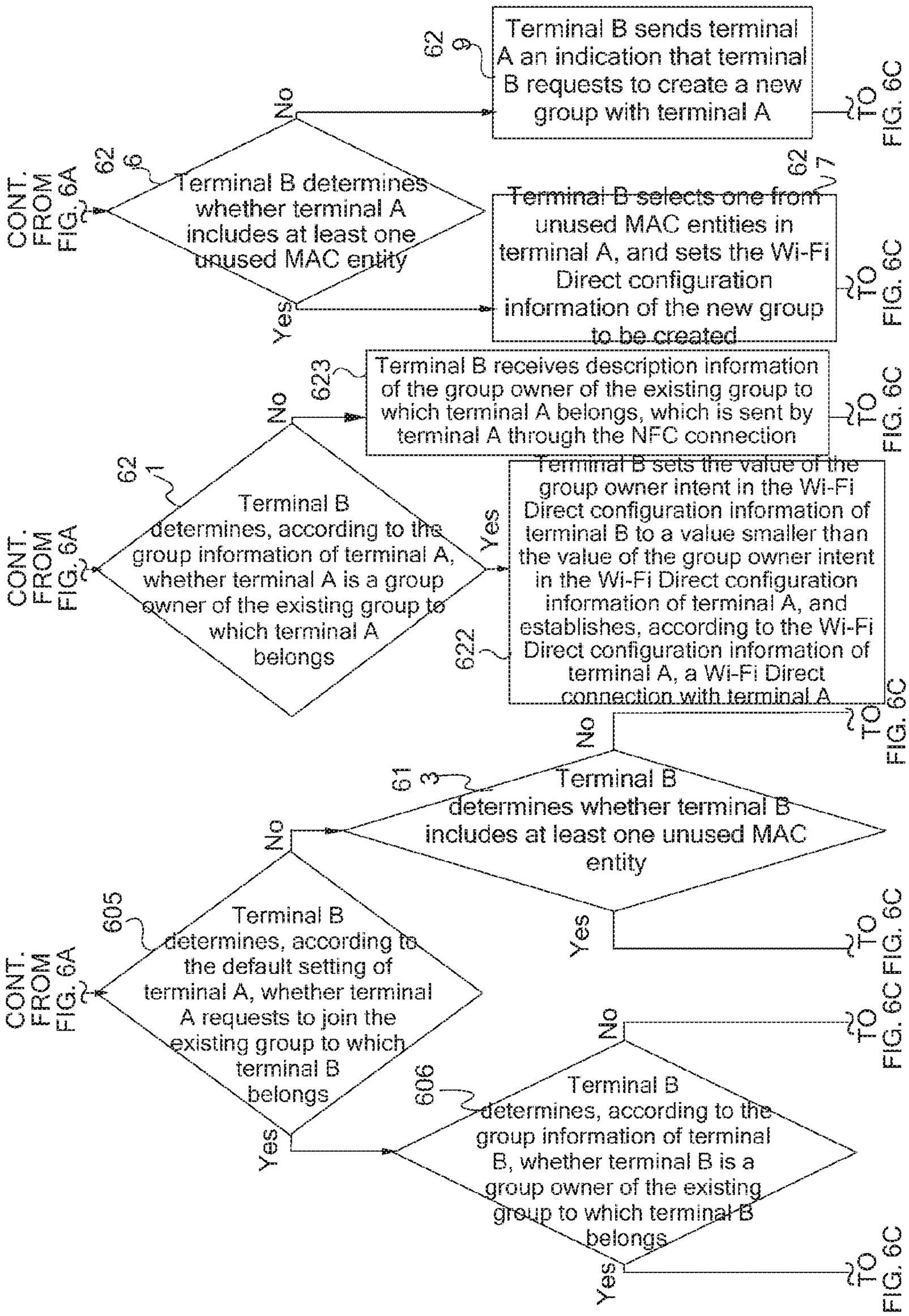
CONT. FROM FIG. 6A
62 6
Terminal B determines whether terminal A includes at least one unused MAC entity
No
Yes
62 9
Terminal B sends terminal A an indication that terminal B requests to create a new group with terminal A
TO FIG. 6C
62 7
Terminal B selects one from unused MAC entities in terminal A, and sets the Wi-Fi Direct configuration information of the new group to be created
TO FIG. 6C
CONT. FROM FIG. 6A
62 1
Terminal B determines, according to the group information of terminal A, whether terminal A is a group owner of the existing group to which terminal A belongs
No
623
Terminal B receives description information of the group owner of the existing group to which terminal A belongs, which is sent by terminal A through the NFC connection
TO FIG. 6C
Yes
622
Terminal B sets the value of the group owner intent in the Wi-Fi Direct configuration information of terminal B to a value smaller than the value of the group owner intent in the Wi-Fi Direct configuration information of terminal A, and establishes, according to the Wi-Fi Direct configuration information of terminal A, a Wi-Fi Direct connection with terminal A
TO FIG. 6C
61 3
Terminal B determines whether terminal B includes at least one unused MAC entity
No
Yes
TO FIG. 6C
CONT. FROM FIG. 6A
605
Terminal B determines, according to the default setting of terminal A, whether terminal A requests to join the existing group to which terminal B belongs
No
TO FIG. 6C
Yes
606
Terminal B determines, according to the group information of terminal B, whether terminal B is a group owner of the existing group to which terminal B belongs
Yes
TO FIG. 6C

FIG. 6B

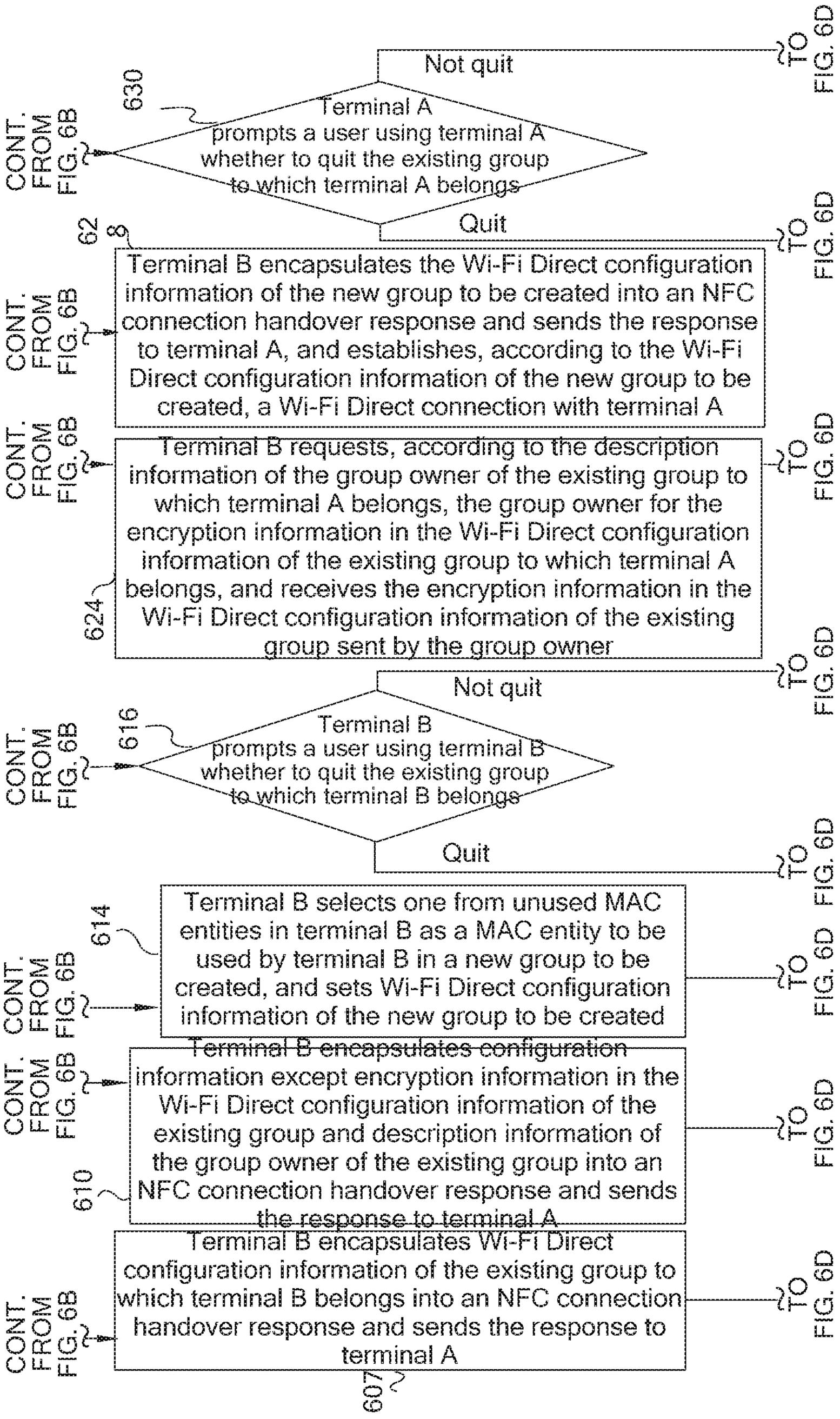
CONT. FROM FIG. 6B
630
Terminal A prompts a user using terminal A whether to quit the existing group to which terminal A belongs
Not quit
Quit
TO FIG. 6D
628
Terminal B encapsulates the Wi-Fi Direct configuration information of the new group to be created into an NFC connection handover response and sends the response to terminal A, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal A
624
Terminal B requests, according to the description information of the group owner of the existing group to which terminal A belongs, the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group to which terminal A belongs, and receives the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner
616
Terminal B prompts a user using terminal B whether to quit the existing group to which terminal B belongs
614
Terminal B selects one from unused MAC entities in terminal B as a MAC entity to be used by terminal B in a new group to be created, and sets Wi-Fi Direct configuration information of the new group to be created
610
Terminal B encapsulates configuration information except encryption information in the Wi-Fi Direct configuration information of the existing group and description information of the group owner of the existing group into an NFC connection handover response and sends the response to terminal A
607
Terminal B encapsulates Wi-Fi Direct configuration information of the existing group to which terminal B belongs into an NFC connection handover response and sends the response to terminal A

FIG. 6C

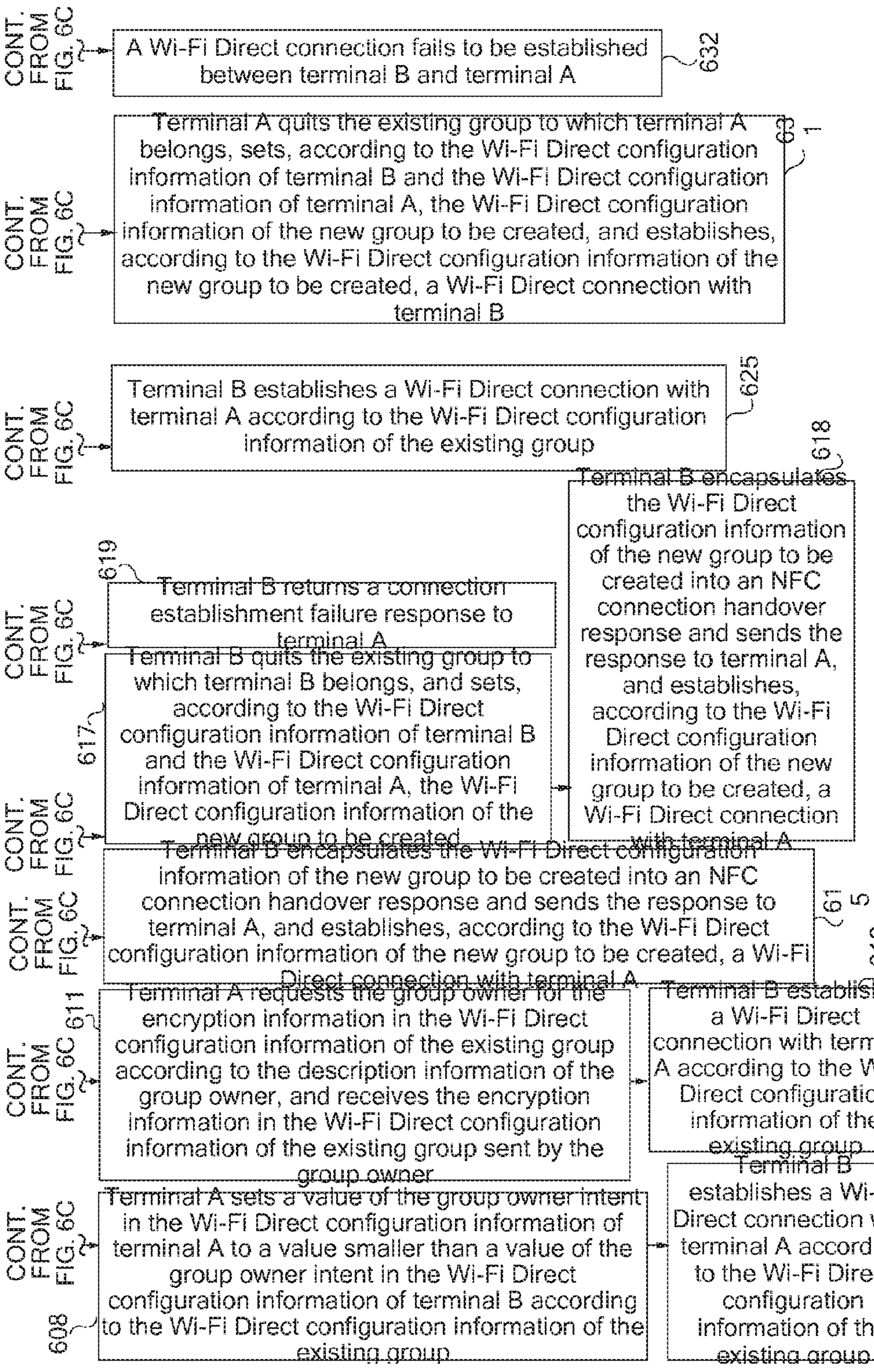
CONT. FROM FIG. 6C
A Wi-Fi Direct connection fails to be established between terminal B and terminal A
632
CONT. FROM FIG. 6C
Terminal A quits the existing group to which terminal A belongs, sets, according to the Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A, the Wi-Fi Direct configuration information of the new group to be created, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal B
621
CONT. FROM FIG. 6C
Terminal B establishes a Wi-Fi Direct connection with terminal A according to the Wi-Fi Direct configuration information of the existing group
625
Terminal B encapsulates the Wi-Fi Direct configuration information of the new group to be created into an NFC connection handover response and sends the response to terminal A, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal A
618
CONT. FROM FIG. 6C
619
Terminal B returns a connection establishment failure response to terminal A
CONT. FROM FIG. 6C
617
Terminal B quits the existing group to which terminal B belongs, and sets, according to the Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A, the Wi-Fi Direct configuration information of the new group to be created
CONT. FROM FIG. 6C
Terminal B encapsulates the Wi-Fi Direct configuration information of the new group to be created into an NFC connection handover response and sends the response to terminal A, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal A
615
CONT. FROM FIG. 6C
611
Terminal A requests the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group according to the description information of the group owner, and receives the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner
612
Terminal B establishes a Wi-Fi Direct connection with terminal A according to the Wi-Fi Direct configuration information of the existing group
CONT. FROM FIG. 6C
608
Terminal A sets a value of the group owner intent in the Wi-Fi Direct configuration information of terminal A to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of terminal B according to the Wi-Fi Direct configuration information of the existing group
609
Terminal B establishes a Wi-Fi Direct connection with terminal A according to the Wi-Fi Direct configuration information of the existing group

FIG. 6D

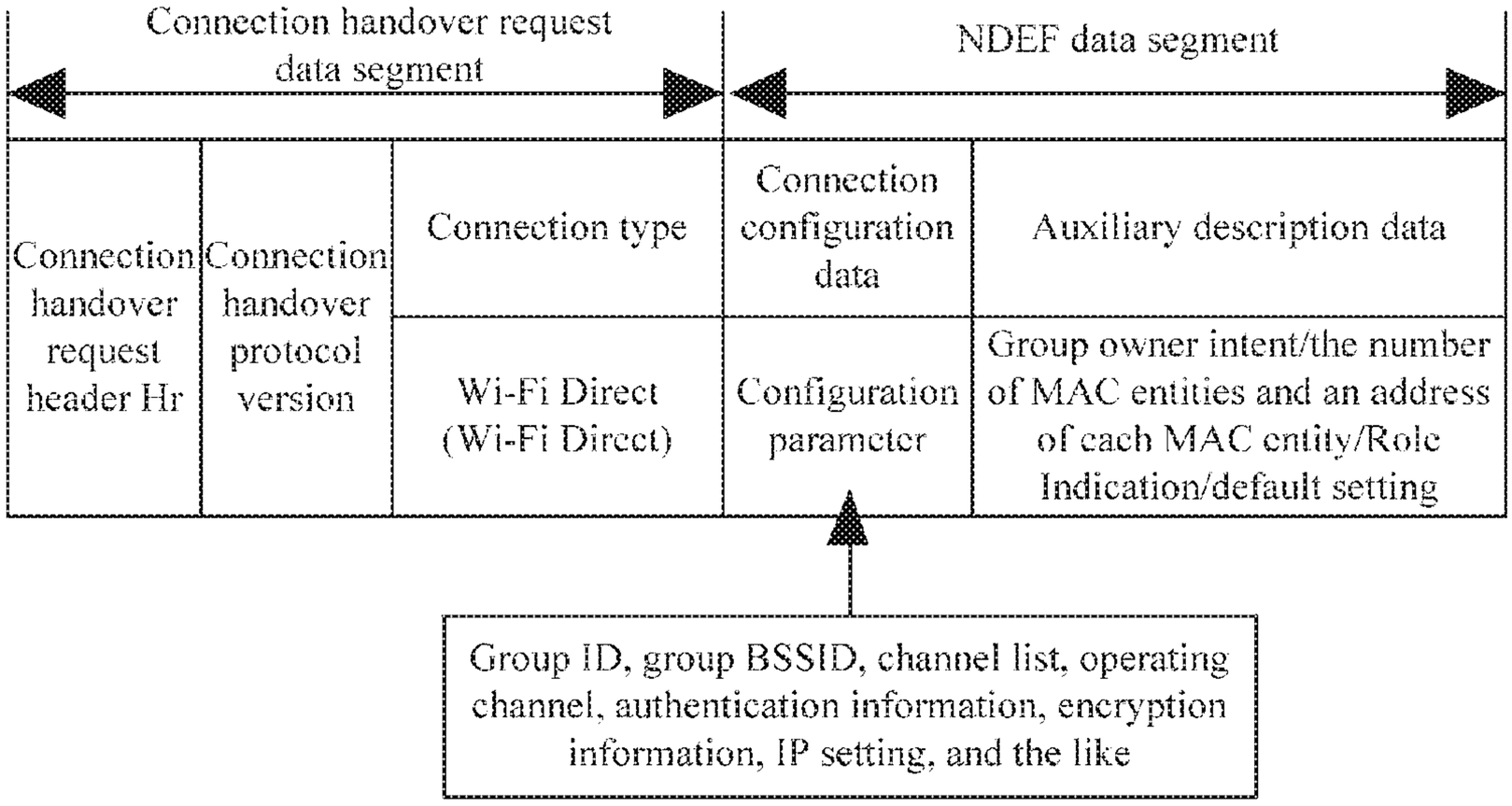
Connection handover request data segment
NDEF data segment
Connection handover request header Hr
Connection handover protocol version
Connection type
Connection configuration data
Auxiliary description data
Wi-Fi Direct (Wi-Fi Direct)
Configuration parameter
Group owner intent/the number of MAC entities and an address of each MAC entity/Role Indication/default setting
Group ID, group BSSID, channel list, operating channel, authentication information, encryption information, IP setting, and the like

FIG. 7

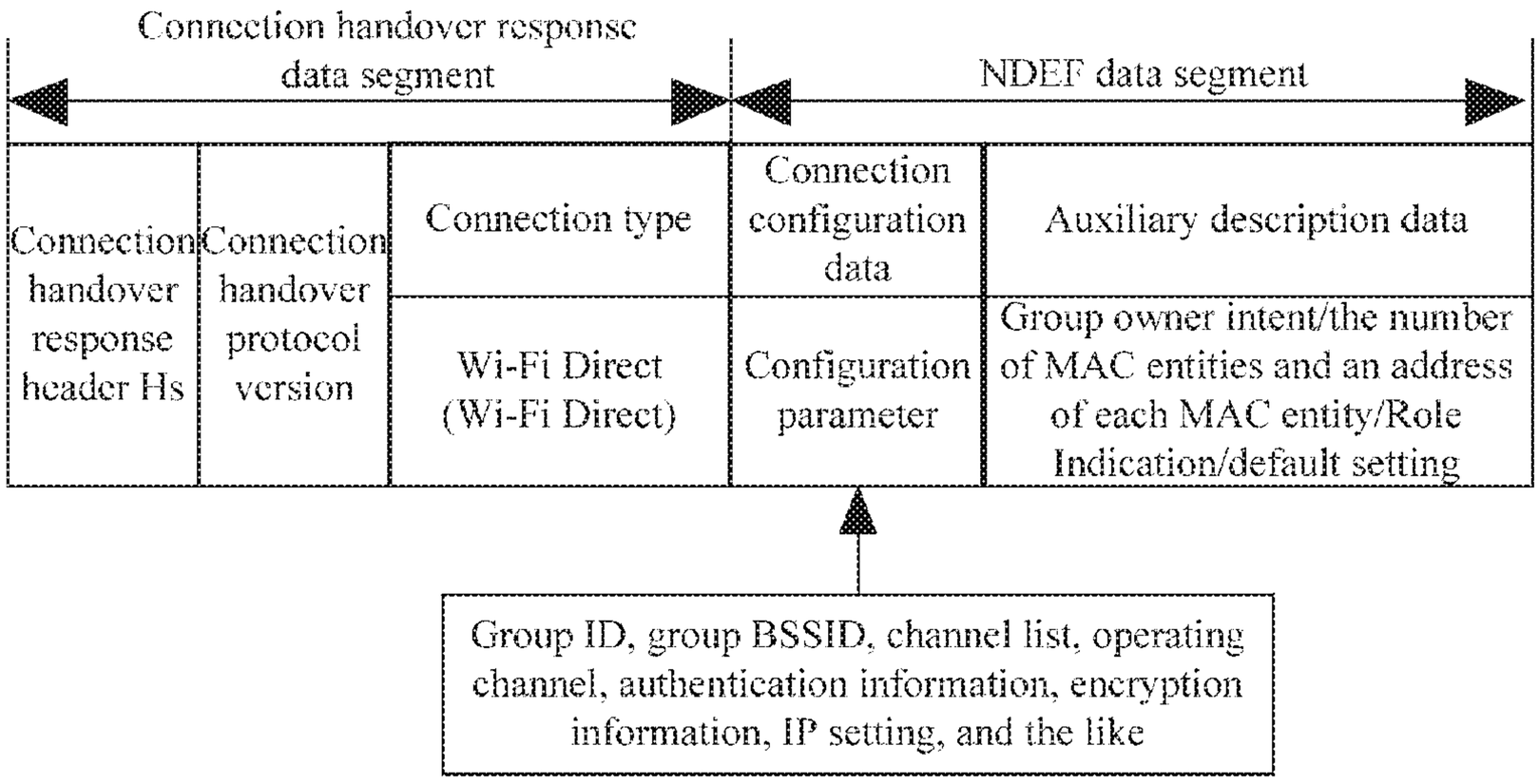
Connection handover response data segment
NDEF data segment
Connection handover response header Hs
Connection handover protocol version
Connection type
Connection configuration data
Auxiliary description data
Wi-Fi Direct (Wi-Fi Direct)
Configuration parameter
Group owner intent/the number of MAC entities and an address of each MAC entity/Role Indication/default setting
Group ID, group BSSID, channel list, operating channel, authentication information, encryption information, IP setting, and the like

FIG. 8

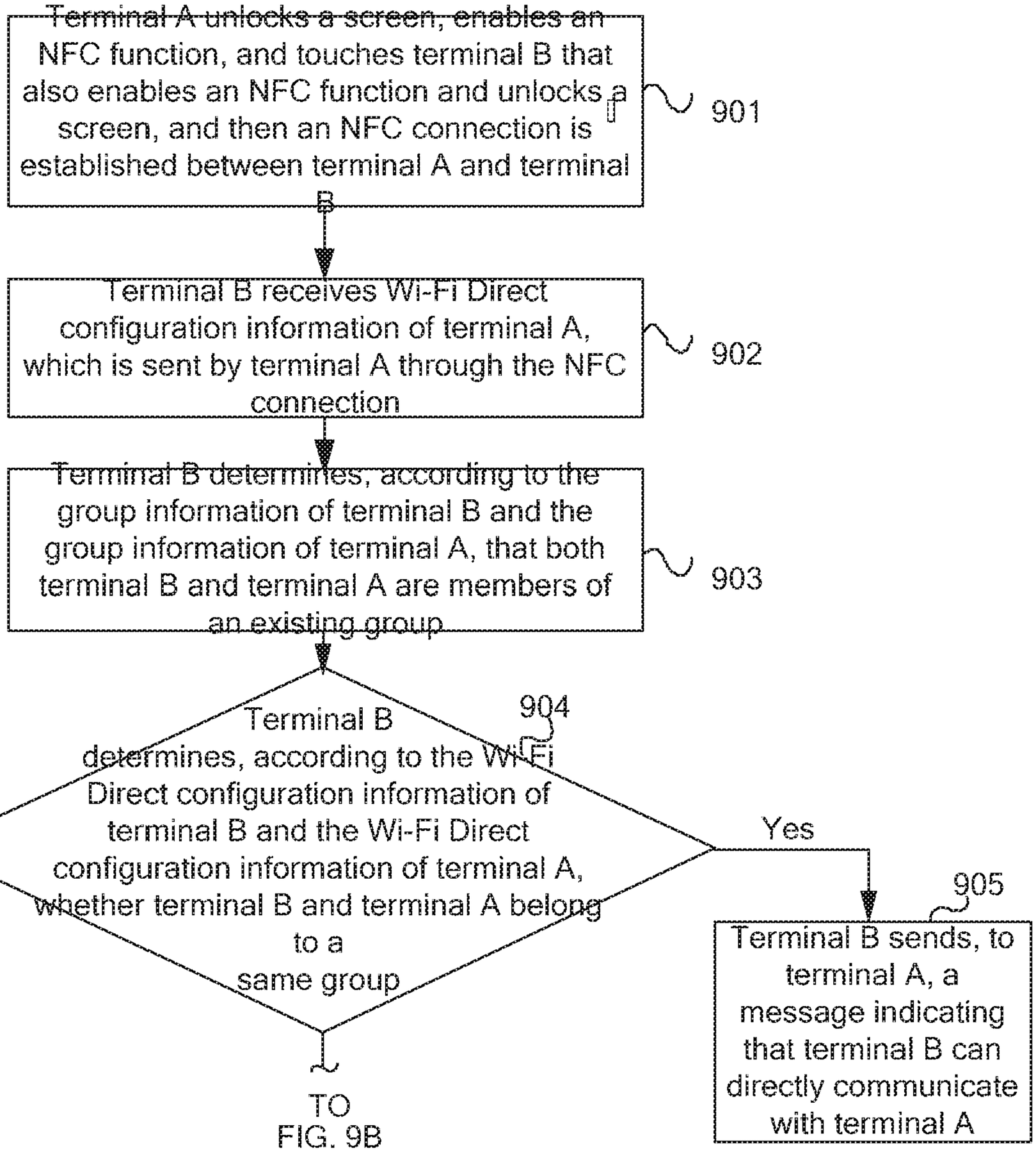
Terminal A unlocks a screen, enables an NFC function, and touches terminal B that also enables an NFC function and unlocks a screen, and then an NFC connection is established between terminal A and terminal B
901
Terminal B receives Wi-Fi Direct configuration information of terminal A, which is sent by terminal A through the NFC connection
902
Terminal B determines, according to the group information of terminal B and the group information of terminal A, that both terminal B and terminal A are members of an existing group
903
Terminal B determines, according to the Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A, whether terminal B and terminal A belong to a same group
904
Yes
TO FIG. 9B
Terminal B sends, to terminal A, a message indicating that terminal B can directly communicate with terminal A
905

FIG. 9A

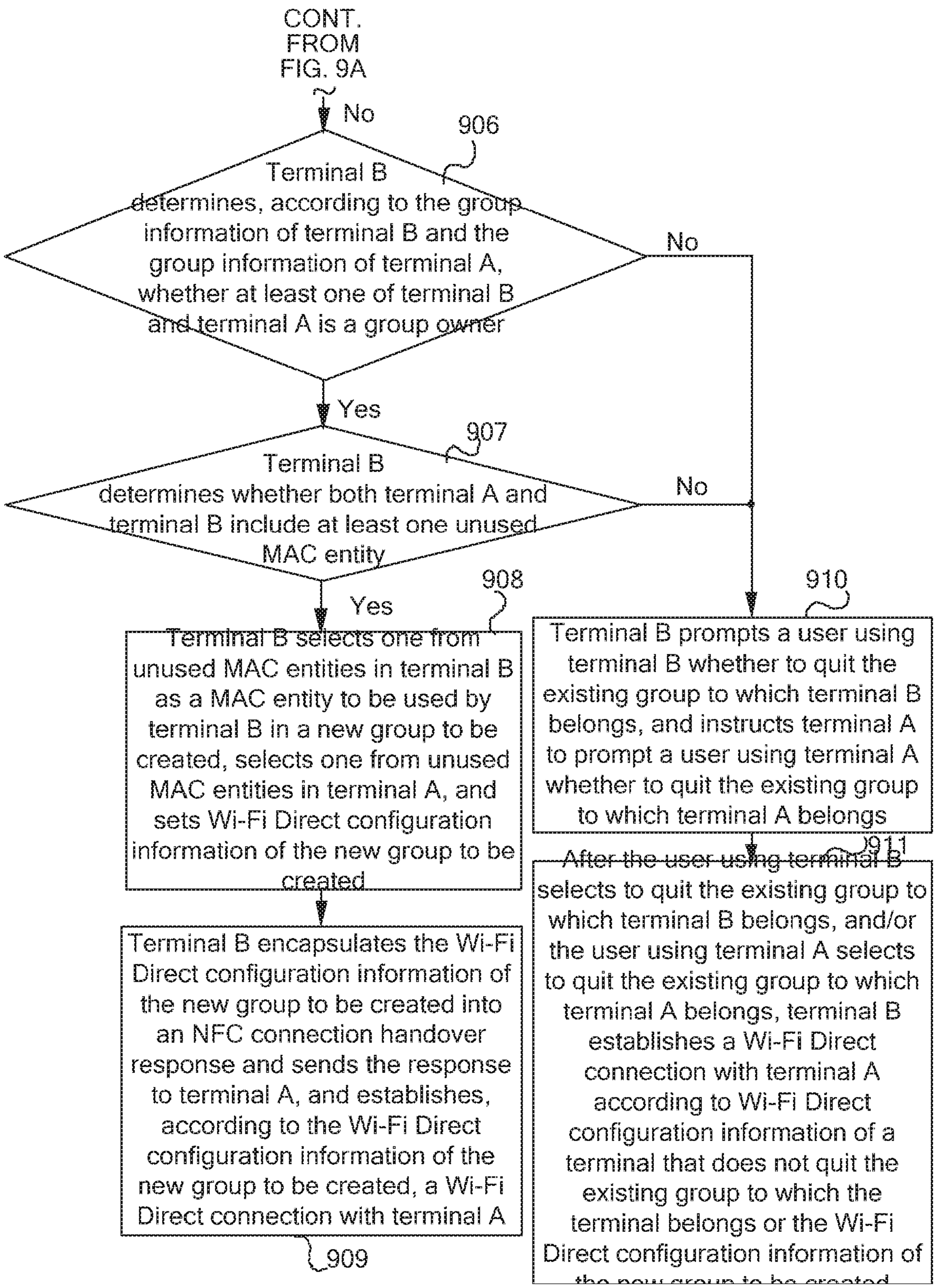
CONT. FROM FIG. 9A
No
906
Terminal B determines, according to the group information of terminal B and the group information of terminal A, whether at least one of terminal B and terminal A is a group owner
No
Yes
907
Terminal B determines whether both terminal A and terminal B include at least one unused MAC entity
No
908
Yes
Terminal B selects one from unused MAC entities in terminal B as a MAC entity to be used by terminal B in a new group to be created, selects one from unused MAC entities in terminal A, and sets Wi-Fi Direct configuration information of the new group to be created
Terminal B encapsulates the Wi-Fi Direct configuration information of the new group to be created into an NFC connection handover response and sends the response to terminal A, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal A
909
910
Terminal B prompts a user using terminal B whether to quit the existing group to which terminal B belongs, and instructs terminal A to prompt a user using terminal A whether to quit the existing group to which terminal A belongs
911
After the user using terminal B selects to quit the existing group to which terminal B belongs, and/or the user using terminal A selects to quit the existing group to which terminal A belongs, terminal B establishes a Wi-Fi Direct connection with terminal A according to Wi-Fi Direct configuration information of a terminal that does not quit the existing group to which the terminal belongs or the Wi-Fi Direct configuration information of

FIG. 9B

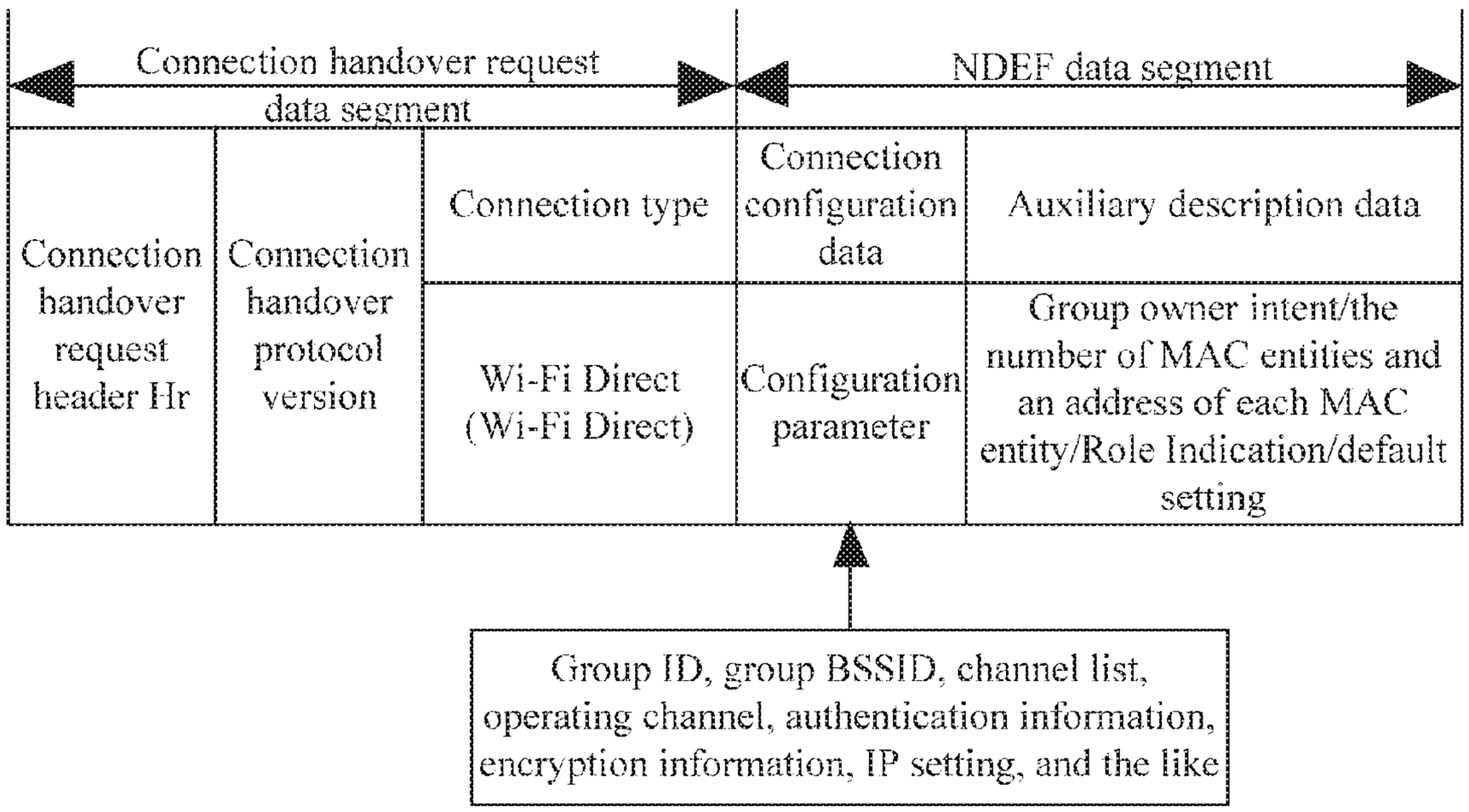
Connection handover request data segment
NDEF data segment
Connection handover request header Hr
Connection handover protocol version
Connection type
Wi-Fi Direct (Wi-Fi Direct)
Connection configuration data
Configuration parameter
Auxiliary description data
Group owner intent/the number of MAC entities and an address of each MAC entity/Role Indication/default setting
Group ID, group BSSID, channel list, operating channel, authentication information, encryption information, IP setting, and the like

FIG. 10

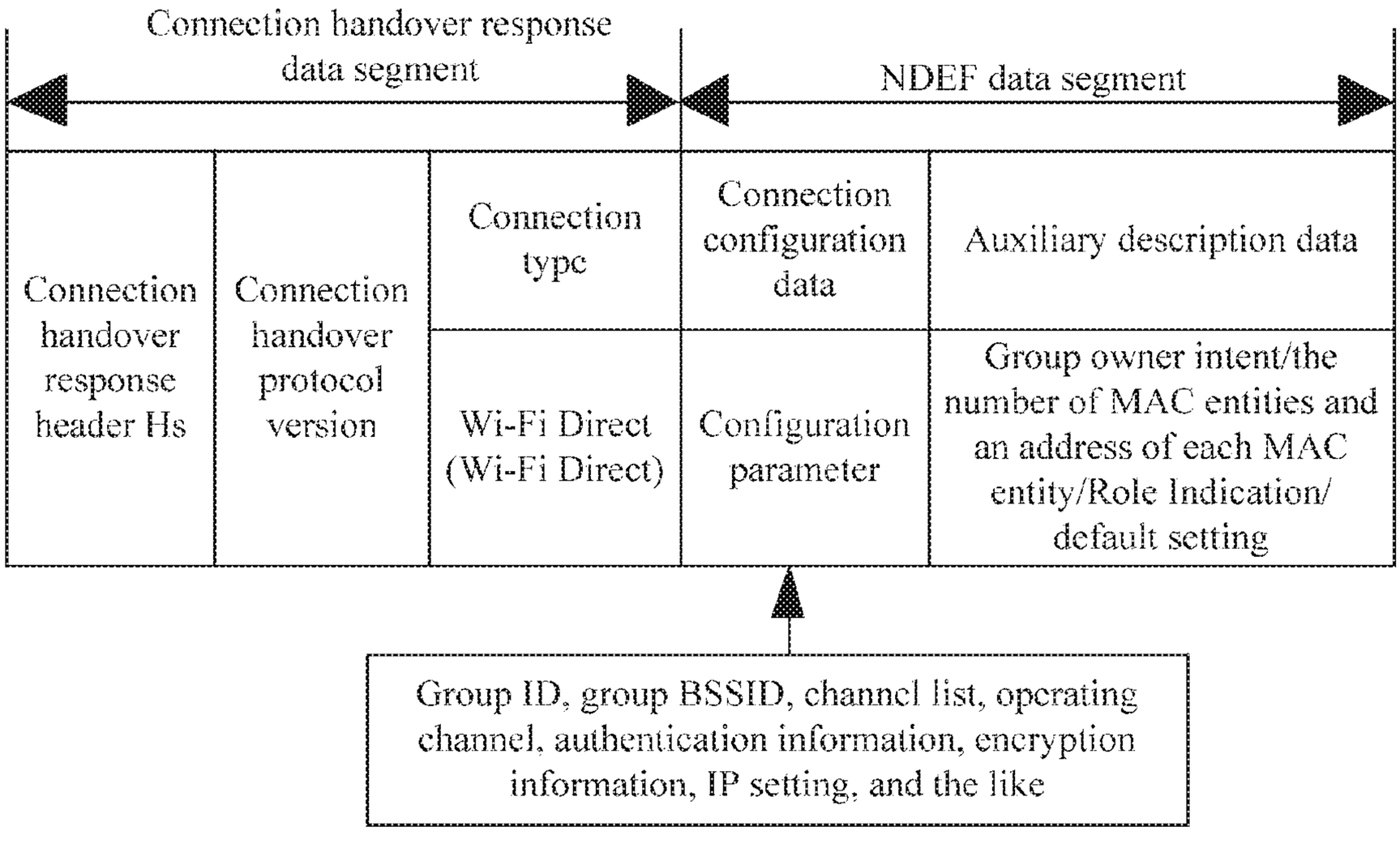
Connection handover response data segment
NDEF data segment
Connection handover response header Hs
Connection handover protocol version
Connection type
Wi-Fi Direct (Wi-Fi Direct)
Connection configuration data
Configuration parameter
Auxiliary description data
Group owner intent/the number of MAC entities and an address of each MAC entity/Role Indication/default setting
Group ID, group BSSID, channel list, operating channel, authentication information, encryption information, IP setting, and the like

FIG. 11

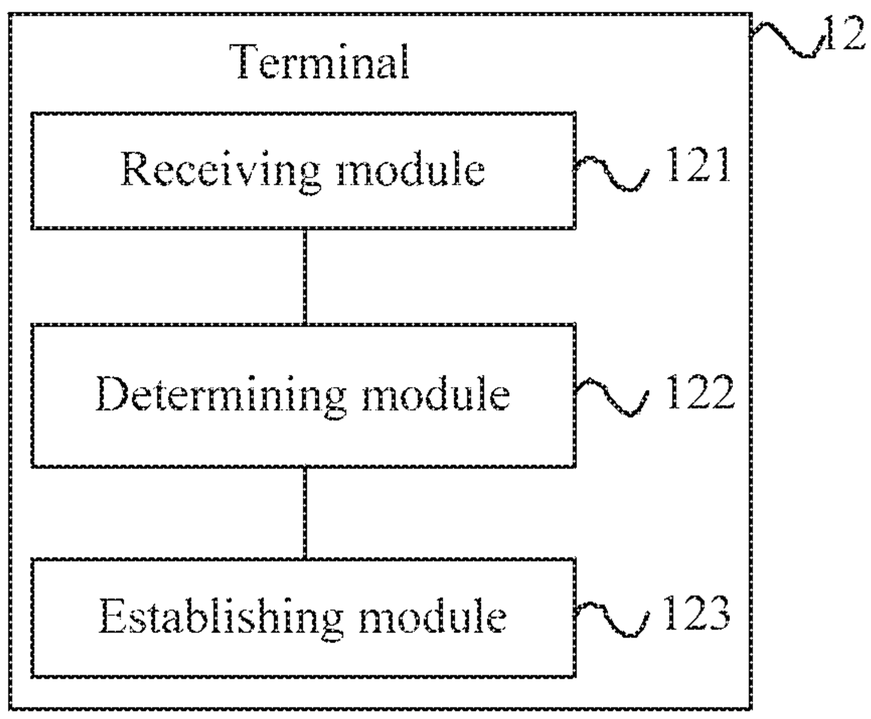
12
Terminal
Receiving module
121
Determining module
122
Establishing module
123

FIG. 12

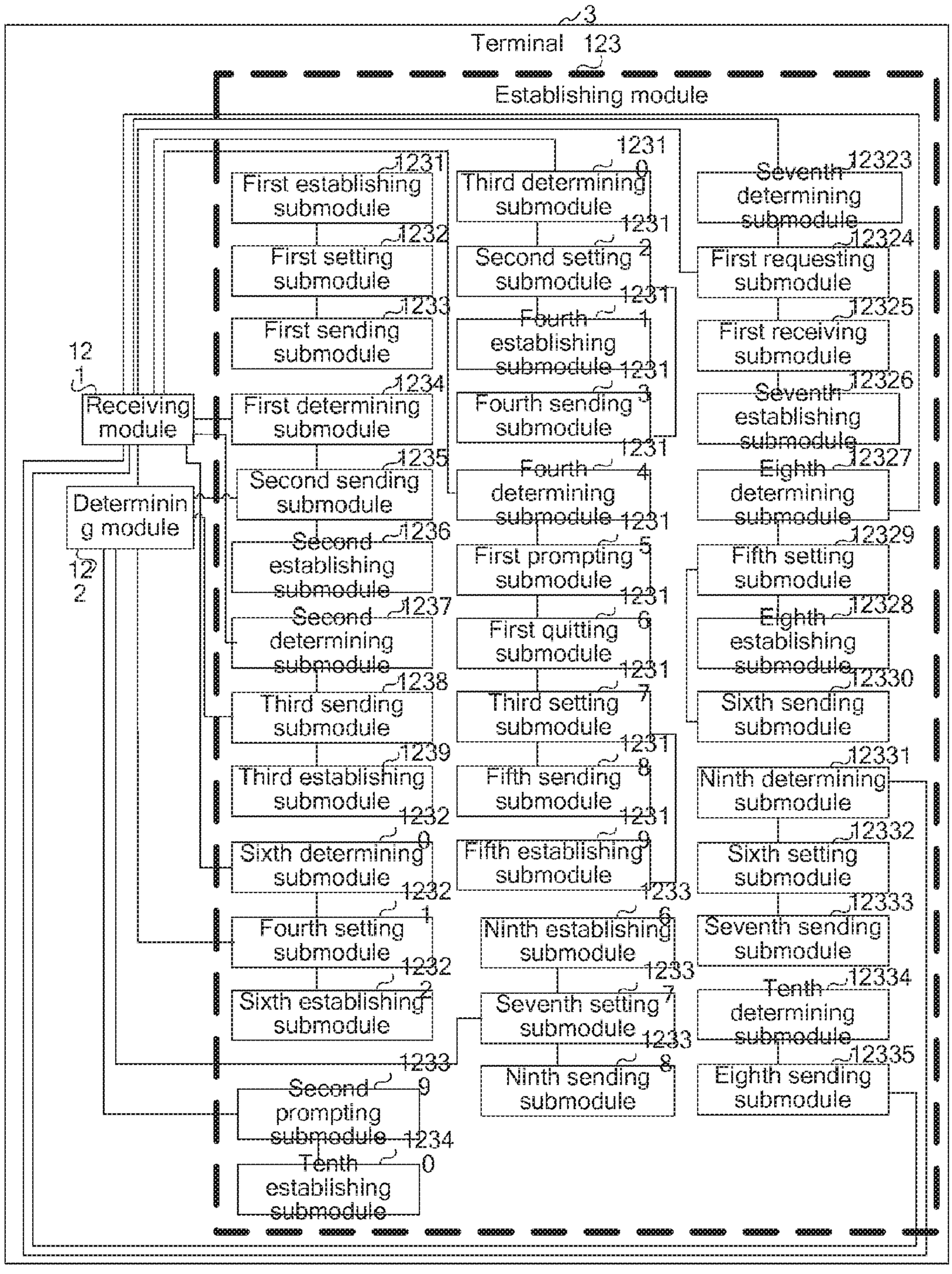
3
Terminal
123
Establishing module
12
1
Receiving module
Determining module
122
First establishing submodule
1231
First setting submodule
1232
First sending submodule
1233
First determining submodule
1234
Second sending submodule
1235
Second establishing submodule
1236
Second determining submodule
1237
Third sending submodule
1238
Third establishing submodule
1239
Sixth determining submodule
12320
Fourth setting submodule
12321
Sixth establishing submodule
12322
Second prompting submodule
12340
Tenth establishing submodule
Third determining submodule
12310
Second setting submodule
12311
Fourth establishing submodule
12312
Fourth sending submodule
12313
Fourth determining submodule
12314
First prompting submodule
12315
First quitting submodule
12316
Third setting submodule
12317
Fifth sending submodule
12318
Fifth establishing submodule
12319
Ninth establishing submodule
12330
Seventh setting submodule
12331
Ninth sending submodule
Seventh determining submodule
12323
First requesting submodule
12324
First receiving submodule
12325
Seventh establishing submodule
12326
Eighth determining submodule
12327
Fifth setting submodule
12329
Eighth establishing submodule
12328
Sixth sending submodule
12330
Ninth determining submodule
12331
Sixth setting submodule
12332
Seventh sending submodule
12333
Tenth determining submodule
12334
Eighth sending submodule
12335

FIG. 13

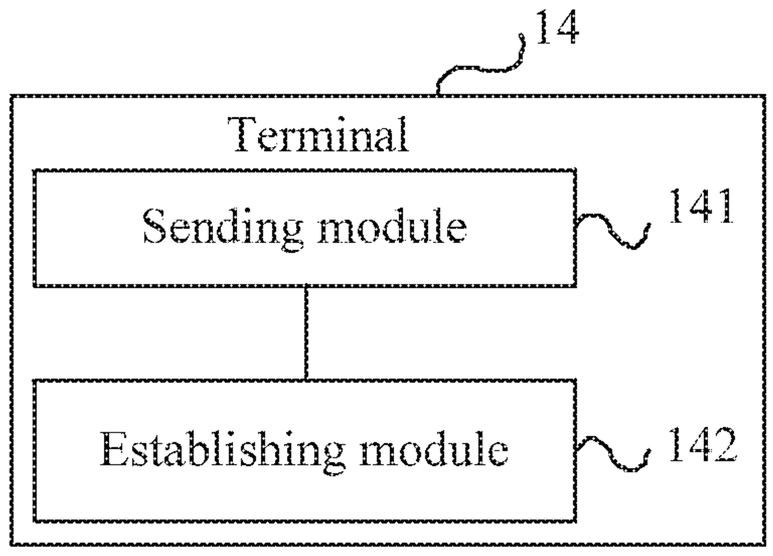

FIG. 14

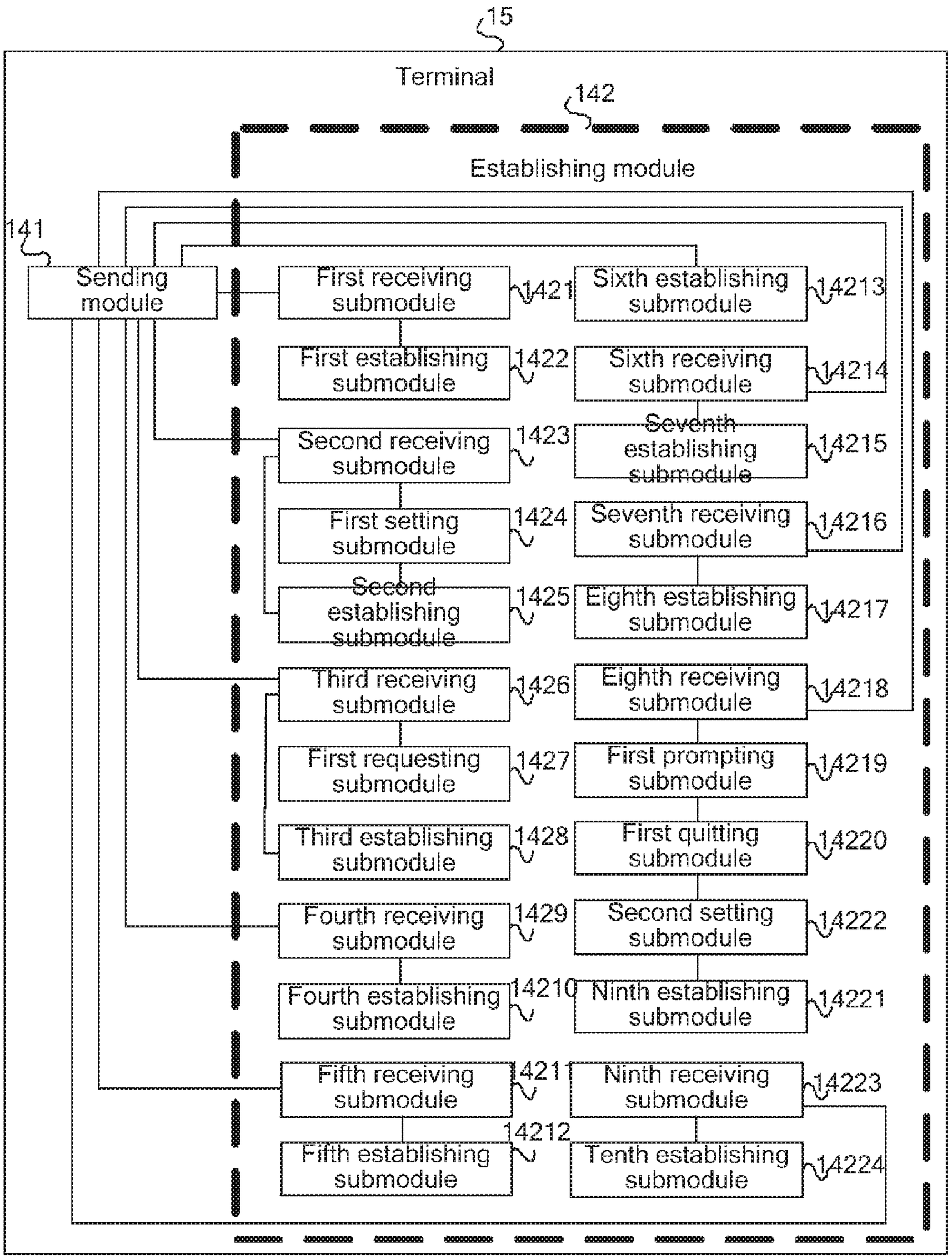
15
Terminal
142
Establishing module
141
Sending module
First receiving submodule
1421
First establishing submodule
1422
Second receiving submodule
1423
First setting submodule
1424
Second establishing submodule
1425
Third receiving submodule
1426
First requesting submodule
1427
Third establishing submodule
1428
Fourth receiving submodule
1429
Fourth establishing submodule
14210
Fifth receiving submodule
1421
Fifth establishing submodule
14212
Sixth establishing submodule
14213
Sixth receiving submodule
14214
Seventh establishing submodule
14215
Seventh receiving submodule
14216
Eighth establishing submodule
14217
Eighth receiving submodule
14218
First prompting submodule
14219
First quitting submodule
14220
Second setting submodule
14222
Ninth establishing submodule
14221
Ninth receiving submodule
14223
Tenth establishing submodule
14224

FIG. 15

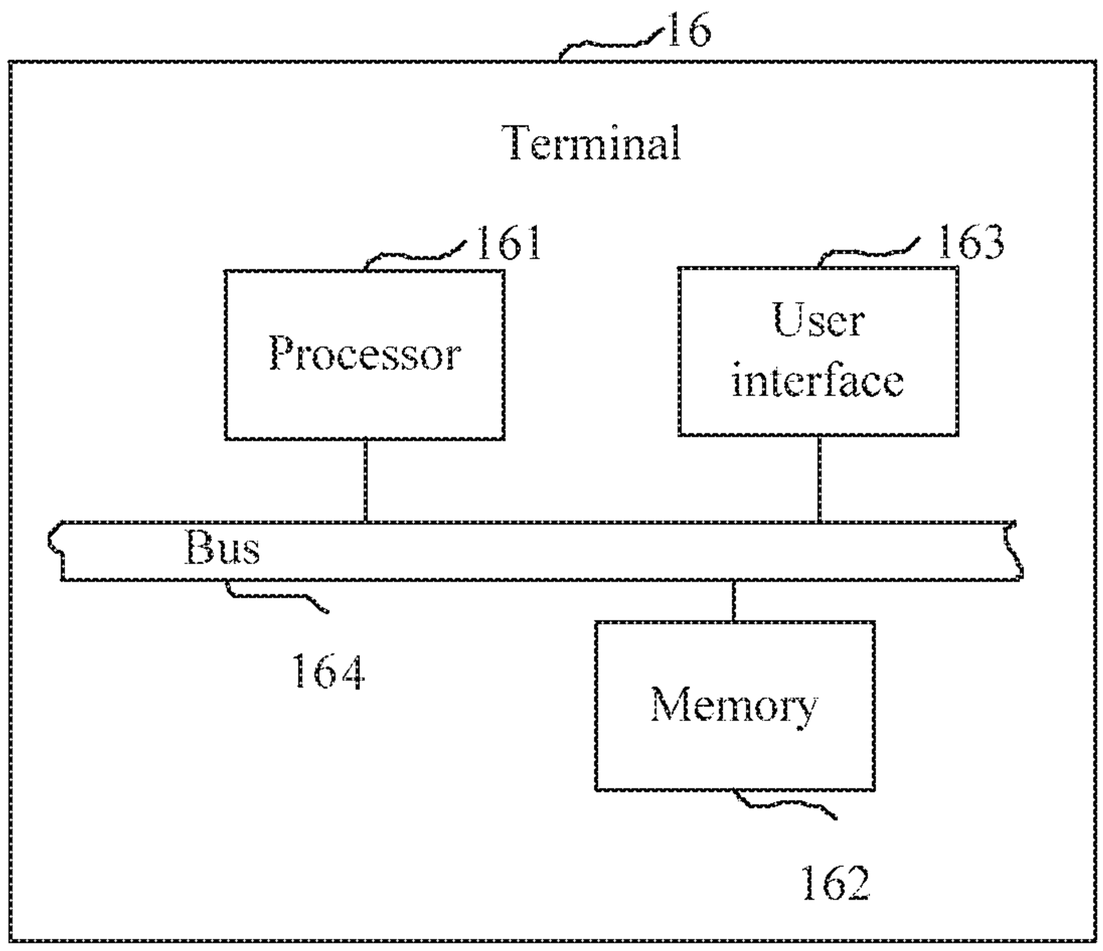
16
Terminal
161
Processor
163
User interface
Bus
164
Memory
162

FIG. 16

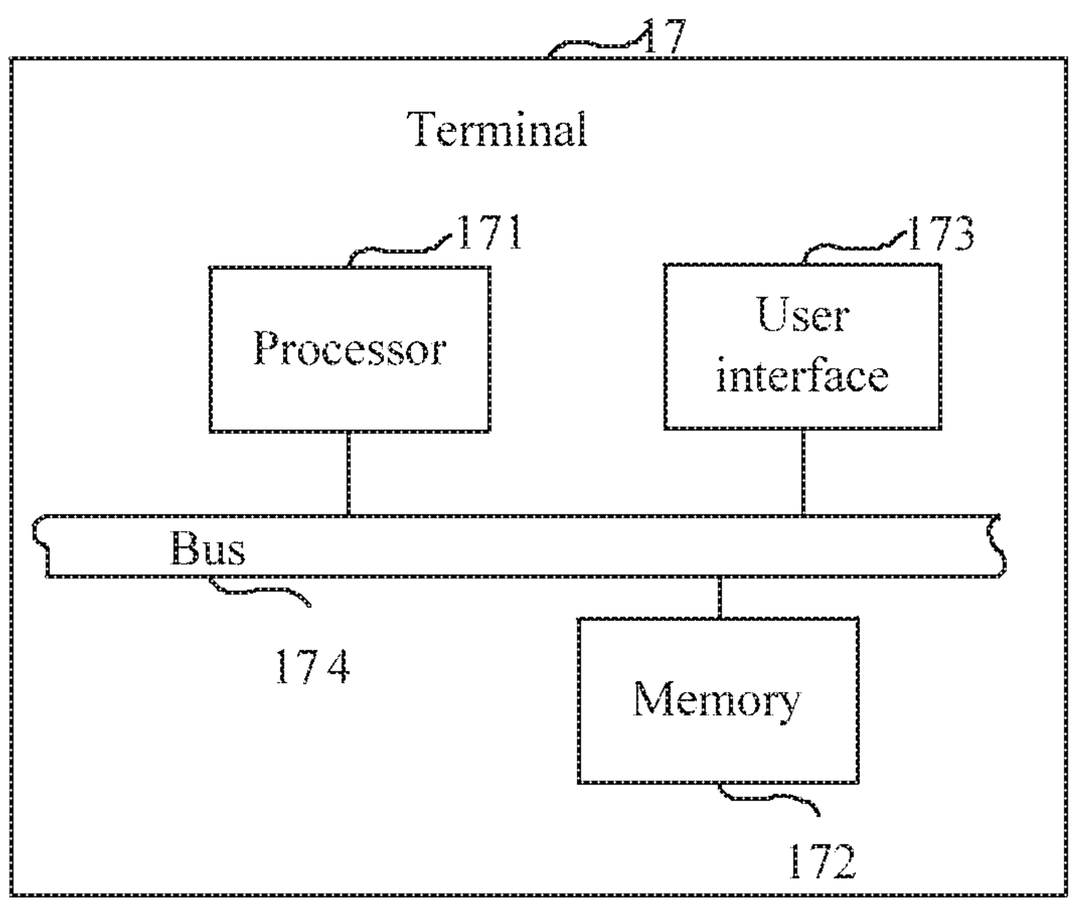
17
Terminal
171
Processor
173
User interface
Bus
174
Memory
172

FIG. 17

METHOD AND TERMINAL FOR ESTABLISHING A COMMUNICATION CONNECTION

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS-REFERENCE TO RELATED APPLICATIONS

This application *is a Reissue Application of patent application Ser. No. 14/690,701 filed on Apr. 20, 2015, issued as U.S. Pat. No. 9,345,057 on May 17, 2016, which* is a continuation of International Application No. PCT/CN2012/083692**[,]** filed on Oct. 29, 2012, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

The present invention relates to the field of communications technologies and in particular, to a method and a terminal for establishing a communication connection.

BACKGROUND

Near field communication (NFC) is a short-range wireless communications technology. It is based on radio frequency identification (RFID) technology, and uses electromagnetic induction to implement short-range communication between electronic devices. A user only needs to touch or approach a device to implement a visual, secure, and contactless information exchange, payment transaction, or the like. NFC operates on a 13.56 MHz frequency, and supports four rates: 106 kbit/s, 212 kbit/s, 424 kbit/s, and 848 kbit/s. NFC can work within a 20-centimeter range, and a typical value is 4 cm. NFC is quite suitable for exchange of small data due to its simple operation and low data transmission rate; for a large file (for example, a high definition picture or a high definition video in scores of megabytes), if NFC is used for transmission, a disadvantage of a low speed seriously affects user experience. Therefore, the NFC Forum puts forward an NFC-based connection handover technology. Two terminals that simultaneously support NFC, Bluetooth, and wireless fidelity (Wi-Fi) may simply touch each other to exchange connection configuration information of Bluetooth or Wi-Fi by using NFC. Afterward, the terminals may use the configuration information to establish a Bluetooth connection or a Wi-Fi connection, and use the established Bluetooth connection or Wi-Fi connection to transmit a large file.

Wi-Fi Direct is an 802.11-based point-to-point connection technology formulated by the Wi-Fi Alliance. Wi-Fi Direct may also be referred to as Wi-Fi point-to-point (Wi-Fi P2P). Wi-Fi Direct uses an 802.11 physical layer, and makes modifications to an existing 802.11 media access control (MAC) layer and higher layers so that the layers are suitable for a scenario in which two devices discover each other and establish a point-to-point connection.

In the prior art, a connection establishment procedure defined by the Wi-Fi Direct protocol includes processes such as device discovery, group owner (GO) negotiation, and exchange of Wi-Fi Protected Setup protocol (WPS) authentication information. The whole connection establishment procedure is relatively complicated and lengthy. In addition, two terminals not joining any group may use a manner defined by the Wi-Fi Direct protocol to establish a connection. A terminal not joining any group may use a manner defined by the Wi-Fi Direct protocol to join an existing group and communicate with a GO or with a client (Client) in the group through the GO. Due to restrictions of the Wi-Fi Direct protocol, a client in a group and a GO or client in another group cannot discover each other and further establish a connection and communicate with each other.

SUMMARY

The present invention provides a method and a terminal for establishing a communication connection, so as to simplify a process of establishing a Wi-Fi Direct connection such that both of two terminals can establish a Wi-Fi Direct connection between the two terminals within an NFC communication range.

In a first aspect, an embodiment of the present invention provides a method for establishing a communication connection, including: (1) sending, by a first terminal, wireless fidelity (Wi-Fi) Direct configuration information of the first terminal to a second terminal through a near field communication (NFC) connection between the first terminal and the second terminal, wherein the Wi-Fi Direct configuration information of the first terminal comprises group information of the first terminal, the group information of the first terminal indicating: the first terminal being not a member of an existing group, the first terminal being a group owner of an existing group to which the first terminal belongs, or the first terminal being a client of an existing group to which the first terminal belongs; (2) receiving, by the first terminal, Wi-Fi Direct configuration information of the second terminal from the second terminal through the NFC connection between the first terminal and the second terminal, wherein the Wi-Fi Direct configuration information of the second terminal comprises group information of the second terminal, the group information of the second terminal indicating: the second terminal being not a member of an existing group, the second terminal being a group owner of an existing group to which the second terminal belongs, or the second terminal being a client of an existing group to which the second terminal belongs; and (3) establishing a Wi-Fi Direct connection between the first terminal and the second terminal according to the Wi-Fi Direct configuration information of the second terminal.

In a second aspect, an embodiment of the present invention provides a method for establishing a communication connection, including: (1) receiving, by a second terminal, wireless fidelity (Wi-Fi) Direct configuration information of a first terminal from the first terminal through a near field communication (NFC) connection between the second terminal and the first terminal, wherein the Wi-Fi Direct configuration information of the first terminal comprises group information of the first terminal, the group information of the first terminal indicating: the first terminal being not a member of an existing group, the first terminal being a group owner of an existing group to which the first terminal belongs, or the first terminal being a client of an existing group to which the first terminal belongs; (2) sending, by the second terminal, Wi-Fi Direct configuration information of the second terminal to the first terminal through the NFC connection between the second terminal and the first terminal, wherein the Wi-Fi Direct configuration information of the second terminal comprises group information of the second terminal, the group information of the

second terminal indicating: the second terminal being not a member of an existing group, the second terminal being a group owner of an existing group to which the second terminal belongs, or the second terminal being a client of an existing group to which the second terminal belongs; (3) establishing a Wi-Fi Direct connection between the second terminal and the first terminal according to the Wi-Fi Direct configuration information of the first terminal.

In a third aspect, an embodiment of the present invention provides a terminal, wherein the terminal is a first terminal and the terminal comprises a memory, configured to store an executable program code; and at least one processor, configured to run, by reading the executable program code stored in the memory, a program corresponding to the executable program code so as to perform the following steps: (1) send wireless fidelity (Wi-Fi) Direct configuration information of the first terminal to a second terminal through a near field communication (NFC) connection between the first terminal and the second terminal, wherein the Wi-Fi Direct configuration information of the first terminal comprises group information of the first terminal, the group information of the first terminal indicating: the first terminal being not a member of an existing group, the first terminal being a group owner of an existing group to which the first terminal belongs, or the first terminal being a client of an existing group to which the first terminal belongs; (2) receive Wi-Fi Direct configuration information of the second terminal from the second terminal through the NFC connection between the first terminal and the second terminal, wherein the Wi-Fi Direct configuration information of the second terminal comprises group information of the second terminal, the group information of the second terminal indicating: the second terminal being not a member of an existing group, the second terminal being a group owner of an existing group to which the second terminal belongs, or the second terminal being a client of an existing group to which the second terminal belongs; and (3) establish a Wi-Fi Direct connection between the first terminal and the second terminal according to the Wi-Fi Direct configuration information of the second terminal.

In a fourth aspect, an embodiment of the present invention provides a terminal, wherein the terminal is a second terminal and the terminal comprises a memory, configured to store an executable program code; and at least one processor, configured to run, by reading the executable program code stored in the memory, a program corresponding to the executable program code so as to perform the following steps: (1) receive wireless fidelity (Wi-Fi) Direct configuration information of a first terminal from the first terminal through a near field communication (NFC) connection between the second terminal and the first terminal, wherein the Wi-Fi Direct configuration information of the first terminal comprises group information of the first terminal, the group information of the first terminal indicating: the first terminal being not a member of an existing group, the first terminal being a group owner of an existing group to which the first terminal belongs, or the first terminal being a client of an existing group to which the first terminal belongs; (2) send Wi-Fi Direct configuration information of the second terminal to the first terminal through the NFC connection between the second terminal and the first terminal, wherein the Wi-Fi Direct configuration information of the second terminal comprises group information of the second terminal, the group information of the second terminal comprises: the second terminal being not a member of an existing group, or the second terminal being a group owner of an existing group to which the second terminal belongs, or the

second terminal being a client of an existing group to which the second terminal belongs; and (3) establish a Wi-Fi Direct connection between the second terminal and the first terminal according to the Wi-Fi Direct configuration information of the first terminal. In embodiments of the present invention, the first terminal and the second terminal may exchange Wi-Fi Direct configuration information by using an NFC connection, and a device discovery procedure and a GO negotiation procedure are implicitly included in the exchange process, thereby sparing handshake procedures such as device discovery, GO negotiation, and WPS authentication information exchange that are performed by using radio signaling and defined in the Wi-Fi Direct protocol, and simplifying a Wi-Fi Direct connection establishment procedure.

In addition, the Wi-Fi Direct protocol specifies that a client of a Wi-Fi Direct group cannot actively discover a GO or a client of another group. In this scenario, a Wi-Fi Direct connection cannot be established by using radio signaling, but this restriction does not exist when embodiments of the present invention are used. As long as the first terminal and the second terminal are within an NFC communication range, the first terminal and the second terminal can exchange configuration information, and both can establish a Wi-Fi Direct connection between the first terminal and the second terminal.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a flowchart of an embodiment of a method for establishing a communication connection according to the present invention;

FIG. **2** is a schematic diagram of an embodiment of an application scenario according to the present invention;

FIG. **3** is a flowchart of another embodiment of a method for establishing a communication connection according to the present invention;

FIG. **4** is a schematic diagram of an embodiment of a format of a connection handover request according to the present invention;

FIG. **5** is a schematic diagram of an embodiment of a format of a connection handover response according to the present invention;

FIG. **6**A, FIG. **6**B, FIG. **6**C, and FIG. **6**D are a flowchart of still another embodiment of a method for establishing a communication connection according to the present invention;

FIG. **7** is a schematic diagram of another embodiment of a format of a connection handover request according to the present invention;

FIG. **8** is a schematic diagram of another embodiment of a format of a connection handover response according to the present invention;

FIG. **9**A and FIG. **9**B are a flowchart of still another embodiment of a method for establishing a communication connection according to the present invention;

FIG. **10** is a schematic diagram of still another embodiment of a format of a connection handover request according to the present invention;

FIG. **11** is a schematic diagram of still another embodiment of a format of a connection handover response according to the present invention;

FIG. **12** is a schematic structural diagram of an embodiment of a terminal according to the present invention;

FIG. **13** is a schematic structural diagram of another embodiment of a terminal according to the present invention;

FIG. **14** is a schematic structural diagram of still another embodiment of a terminal according to the present invention;

FIG. **15** is a schematic structural diagram of still another embodiment of a terminal according to the present invention;

FIG. **16** is a schematic structural diagram of still another embodiment of a terminal according to the present invention; and

FIG. **17** is a schematic structural diagram of still another embodiment of a terminal according to the present invention.

DESCRIPTION OF EMBODIMENTS

To make the objectives, technical solutions, and advantages of the present invention clearer, the present invention is described in further detail below with reference to embodiments and the accompanying drawings.

FIG. **1** is a flowchart of an embodiment of a method for establishing a communication connection according to the present invention. As shown in FIG. **1**, the method for establishing a communication connection may include:

Step **101**: A first terminal exchanges Wi-Fi Direct configuration information with a second terminal through an NFC connection between the first terminal and the second terminal, where the exchanged Wi-Fi Direct configuration information includes group information of the first terminal or second terminal.

Step **102**: Establish a Wi-Fi Direct connection between the first terminal and the second terminal according to the exchanged Wi-Fi Direct configuration information.

Specifically, in an embodiment, step **101** in which a first terminal exchanges Wi-Fi Direct configuration information with a second terminal through an NFC connection between the first terminal and the second terminal, may be: receiving, by the first terminal, Wi-Fi Direct configuration information of the second terminal, which is sent by the second terminal through the NFC connection.

The Wi-Fi Direct configuration information of the second terminal includes the group information of the second terminal.

Step **102** in which a Wi-Fi Direct connection is established between the first terminal and the second terminal according to the exchanged Wi-Fi Direct configuration information, may be: if the first terminal determines, according to the group information of the first terminal and the group information of the second terminal, that neither the first terminal nor the second terminal is a member of an existing group, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal; or if the first terminal determines, according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a member of an existing group, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group or a new group to be created.

It should be noted that in this embodiment, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created means that the first terminal creates a new group with the second terminal.

In this embodiment, the Wi-Fi Direct configuration information of the first terminal includes the group information of the first terminal, where a value of the group information of the first terminal may be: the first terminal being not a member of an existing group, or the first terminal being a group owner of an existing group to which the first terminal belongs, or the first terminal being a client of an existing group to which the first terminal belongs; further, the Wi-Fi Direct configuration information of the first terminal may further include: a group owner intent of the first terminal, the number of MAC entities in the first terminal, and an address of each MAC entity;

the Wi-Fi Direct configuration information of the second terminal may further include: a group owner intent of the second terminal, the number of MAC entities in the second terminal, and an address of each MAC entity; where a value of the group information of the second terminal may be: the second terminal being not a member of an existing group, or the second terminal being a group owner of an existing group to which the second terminal belongs, or the second terminal being a client of an existing group to which the second terminal belongs; and

the Wi-Fi Direct configuration information of the new group to be created includes an identifier of the new group to be created, a BSSID of the new group to be created, an operating channel of the new group to be created, the group owner intent of the first terminal, an IP base address of the new group to be created, and an address of a MAC entity used by the first terminal in the new group to be created.

In an implementation manner of this embodiment, if the first terminal determines, according to the group information of the first terminal and the group information of the second terminal, that neither the first terminal nor the second terminal is a member of an existing group, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal may be: setting, by the first terminal according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new group to be created; then sending, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created to the second terminal through the NFC connection; and finally, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created.

When setting the Wi-Fi Direct configuration information of the new group to be created, for example, when setting an identifier of the new group to be created, the first terminal may use a group identifier in the Wi-Fi Direct configuration information of the first terminal, or may also use a group identifier in the Wi-Fi Direct configuration information of the second terminal, or may neither use a group identifier in the Wi-Fi Direct configuration information of the first terminal nor use a group identifier in the Wi-Fi Direct configuration information of the second terminal but set a new identifier for the new group to be created. Likewise, the BSSID of the new group to be created, the operating channel of the new group to be created, the IP base address of the new group to be created, and the address of the MAC entity used in the new group to be created may also be set in the preceding manner, that is, corresponding information included in the Wi-Fi Direct configuration information of the

first terminal or second terminal may be used, or a new value is set. Details are not repeated herein.

In another implementation manner of this embodiment, determining, by the first terminal according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a member of an existing group may be:

determining, by the first terminal according to the group information of the first terminal and the group information of the second terminal, that the first terminal is a member of an existing group and the second terminal is not a member of an existing group.

Further, the first terminal receives a default setting of the second terminal, which is sent by the second terminal through the NFC connection. Specifically, the default setting of the second terminal may be included in the Wi-Fi Direct configuration information of the second terminal and sent to the first terminal; or the default setting may also not be included in the Wi-Fi Direct configuration information of the second terminal but is sent to the first terminal along with the Wi-Fi Direct configuration information of the second terminal, where the default setting reflects that the second terminal requests to join the existing group to which the first terminal belongs or that the second terminal requests to create a new group with the first terminal.

In a specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group may be: determining, by the first terminal according to the default setting of the second terminal, that the second terminal requests to join the existing group to which the first terminal belongs; if the first terminal determines, according to the group information of the first terminal, that the first terminal is a group owner of the existing group to which the first terminal belongs, sending, by the first terminal, Wi-Fi Direct configuration information of the existing group to which the first terminal belongs, to the second terminal through the NFC connection, so that the second terminal sets a value of the group owner intent in the Wi-Fi Direct configuration information of the second terminal to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal according to the Wi-Fi Direct configuration information of the existing group, and in this way, the second terminal can be used as a client to join the existing group to which the first terminal belongs; and then establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group may be: determining, by the first terminal according to the default setting of the second terminal, that the second terminal requests to join the existing group to which the first terminal belongs; if the first terminal determines, according to the group information of the first terminal, that the first terminal is a client of the existing group to which the first terminal belongs, sending, by the first terminal, configuration information except encryption information in the Wi-Fi Direct configuration information of the existing group and description information of a group owner of the existing group to the second terminal through the NFC connection, so that the second terminal requests the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group according to the description information of the group owner and receives the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner, and in this way, the second terminal obtains all Wi-Fi Direct configuration information of the existing group to which the first terminal belongs; and then, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In still another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: determining, by the first terminal according to the default setting of the second terminal, that the second terminal requests to create a new group with the first terminal; if the first terminal determines that the first terminal includes at least one unused MAC entity, selecting, by the first terminal, one from unused MAC entities in the first terminal as a MAC entity to be used by the first terminal in the new group to be created, and setting the Wi-Fi Direct configuration information of the new group to be created; then, sending, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created to the second terminal through the NFC connection, and establishing, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal, where the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the first terminal belongs, and the Wi-Fi Direct configuration information of the new group to be created further includes the group information of the first terminal. Specifically, when setting the Wi-Fi Direct configuration information of the new group to be created, the first terminal may use a part or all of the Wi-Fi Direct configuration information of the second terminal, or may also not use the Wi-Fi Direct configuration information of the second terminal but set new Wi-Fi Direct configuration information for the new group to be created. The present invention does not limit a manner of setting, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which the first terminal belongs.

In still another specific implementation mode of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: determining, by the first terminal according to the default setting of the second terminal, that the second terminal requests to create a new group with the first terminal; if the first terminal determines that all MAC entities in the first terminal are used, prompting, by the first terminal, a user using the first terminal whether to quit the existing group to which the first terminal belongs; if the user using the first terminal selects to quit the existing group to which the first terminal belongs, quitting, by the first terminal, the existing group to which the first terminal belongs, and then setting, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new

group to be created, where a value of the group owner intent of the first terminal is different from a value of the group owner intent of the second terminal in the Wi-Fi Direct configuration information of the new group to be created; and next, sending, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created to the second terminal through the NFC connection, and establishing, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal.

In still another implementation manner of this embodiment, determining, by the first terminal according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a member of an existing group may be: determining, by the first terminal according to the group information of the first terminal and the group information of the second terminal, that the second terminal is a member of an existing group and the first terminal is not a member of an existing group.

In a specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group may be: determining, by the first terminal according to a default setting of the first terminal, that the first terminal requests to join the existing group to which the second terminal belongs; if the first terminal determines, according to the group information of the second terminal, that the second terminal is a group owner of the existing group to which the second terminal belongs, setting, by the first terminal, a value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of the second terminal, so that the first terminal can join the existing group as a client of the existing group to which the second terminal belongs; and then establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the second terminal, where the Wi-Fi Direct configuration information of the second terminal is Wi-Fi Direct configuration information of the existing group to which the second terminal belongs.

In another specific implementation manner of this implementation manner, when the second terminal is a client of the existing group to which the second terminal belongs, the Wi-Fi Direct configuration information of the second terminal is configuration information except encryption information in Wi-Fi Direct configuration information of the existing group to which the second terminal belongs; further, the first terminal further receives description information of a group owner of the existing group to which the second terminal belongs, which is sent by the second terminal through the NFC connection. Specifically, the description information of the group owner of the existing group to which the second terminal belongs may be included in the Wi-Fi Direct configuration information of the second terminal; or the description information of the group owner of the existing group to which the second terminal belongs may also not be included in the Wi-Fi Direct configuration information of the second terminal but is sent to the first terminal along with the Wi-Fi Direct configuration information of the second terminal.

In this way, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group may be: determining, by the first terminal according to a default setting of the first terminal, that the first terminal requests to join the existing group to which the second terminal belongs; requesting, by the first terminal according to the description information of the group owner of the existing group to which the second terminal belongs, the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs, and receiving the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner; and then establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In still another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: determining, by the first terminal according to a default setting of the first terminal, that the first terminal requests to create a new group with the second terminal; if the first terminal determines that the second terminal includes at least one unused MAC entity, selecting, by the first terminal, one from unused MAC entities in the second terminal, and setting the Wi-Fi Direct configuration information of the new group to be created; and then sending, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created to the second terminal through the NFC connection, and establishing, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal.

The Wi-Fi Direct configuration information of the new group to be created further includes an address of the MAC entity selected by the first terminal from the second terminal, and the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the second terminal belongs. Specifically, when setting the Wi-Fi Direct configuration information of the new group to be created, the first terminal may use a part or all of the Wi-Fi Direct configuration information of the first terminal, or may also not use the Wi-Fi Direct configuration information of the first terminal but set new Wi-Fi Direct configuration information for the new group to be created. The present invention does not limit a manner of setting, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs.

In still another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: determining, by the first terminal according to a default setting of the first terminal, that the first terminal requests to create a new group with the second terminal; if the first terminal determines that the second terminal includes at least one unused MAC entity, setting, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, where the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the second terminal belongs; and then sending, by the first terminal, the Wi-Fi Direct configuration information of the new group to

be created to the second terminal through the NFC connection, so that the second terminal selects one from unused MAC entities in the second terminal and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the first terminal. Specifically, when setting the Wi-Fi Direct configuration information of the new group to be created, the first terminal may use a part or all of the Wi-Fi Direct configuration information of the first terminal, or may also not use the Wi-Fi Direct configuration information of the first terminal but set new Wi-Fi Direct configuration information for the new group to be created. The present invention does not limit a manner of setting, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs.

In still another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: determining, by the first terminal according to a default setting of the first terminal, that the first terminal requests to create a new group with the second terminal; and if the first terminal determines that all MAC entities in the second terminal are used, sending, by the first terminal, the second terminal an indication that the first terminal requests to create a new group with the second terminal, so that the second terminal prompts a user using the second terminal whether to quit the existing group to which the second terminal belongs, and quits, after the user using the second terminal selects to quit the existing group to which the second terminal belongs, the existing group to which the second terminal belongs, sets, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new group to be created, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the first terminal.

In still another implementation manner of this embodiment, determining, by the first terminal according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a member of an existing group may be: determining, by the first terminal according to the group information of the first terminal and the group information of the second terminal, that both the first terminal and the second terminal are members of an existing group.

In a specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: if the first terminal determines, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, that the first terminal and the second terminal do not belong to a same group and that both the first terminal and the second terminal include at least one unused MAC entity, and the first terminal determines, according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a group owner, selecting, by the first terminal, one from unused MAC entities in the first terminal as a MAC entity to be used by the first terminal in the new group to be created, and selecting one from unused MAC entities in the second terminal; and then setting the Wi-Fi Direct configuration information of the new group to be created, where the Wi-Fi Direct configuration information of the new group to be created may further include an address of the MAC entity selected by the first terminal from the second terminal; and finally, sending, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created to the second terminal through the NFC connection, and establishing, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal.

In this embodiment, if only one of the first terminal and the second terminal is a group owner in the existing group, the terminal being a group owner in the existing group must be a client in the new group, and a value of the group owner intent of the terminal must be set to be smaller than a value of the group owner intent of the peer end in the Wi-Fi Direct configuration information of the new group; if both the first terminal and the second terminal are group owners in the existing group, group owner intents of the two terminals in the Wi-Fi Direct configuration information of the new group may be set at random, as long as values of the group owner intents of the two terminals are set to be different.

In another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group or a new group to be created may be: if the first terminal determines, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, that the first terminal and the second terminal do not belong to a same group, and the first terminal determines, according to the group information of the first terminal and the group information of the second terminal, that neither the first terminal nor the second terminal is a group owner, or if the first terminal determines, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, that the first terminal and the second terminal do not belong to a same group and that all MAC entities in the first terminal and/or the second terminal are used, prompting, by the first terminal, a user using the first terminal whether to quit the existing group to which the first terminal belongs, and instructing the second terminal to prompt a user using the second terminal whether to quit the existing group to which the second terminal belongs; and after the user using the first terminal selects to quit the existing group to which the first terminal belongs, and/or the user using the second terminal selects to quit the existing group to which the second terminal belongs, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a terminal that does not quit the existing group to which the terminal belongs or the Wi-Fi Direct configuration information of the new group to be created.

If the first terminal or the second terminal not only reserves an original connection but also establishes a new connection, the terminal cannot be used as a client in both of the two groups. Specifically, if the terminal is used as a client in the original connection, the terminal must be used as a group owner in the new connection; if the terminal is used as a group owner in the original connection, the terminal can be used as a group owner or a client in the new group.

Specifically, in another embodiment, step **101** in which a first terminal exchanges Wi-Fi Direct configuration information with a second terminal through an NFC connection between the first terminal and the second terminal, may be: sending, by the first terminal, Wi-Fi Direct configuration information of the first terminal to the second terminal through the NFC connection between the first terminal and the second terminal, where the Wi-Fi Direct configuration information of the first terminal includes group information of the first terminal.

Step **102** in which a Wi-Fi Direct connection is established between the first terminal and the second terminal according to the exchanged Wi-Fi Direct configuration information, may be: if neither the first terminal nor the second terminal is a member of an existing group, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the first terminal and Wi-Fi Direct configuration information of the second terminal; or if at least one of the first terminal and the second terminal is a member of an existing group, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group or a new group to be created.

It should be noted that the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal means that the first terminal creates a new group with the second terminal.

In this case, the Wi-Fi Direct configuration information of the first terminal may further include: a group owner intent of the first terminal, the number of MAC entities in the first terminal, and an address of each MAC entity; a value of the group information of the first terminal may be: the first terminal being not a member of an existing group, or the first terminal being a group owner of an existing group to which the first terminal belongs, or the first terminal being a client of an existing group to which the first terminal belongs;

the Wi-Fi Direct configuration information of the second terminal may include: the group information of the second terminal, a group owner intent of the second terminal, the number of MAC entities in the second terminal, and an address of each MAC entity; a value of the group information of the second terminal may be: the second terminal being not a member of an existing group, or the second terminal being a group owner of an existing group to which the second terminal belongs, or the second terminal being a client of an existing group to which the second terminal belongs; and

the Wi-Fi Direct configuration information of the new group to be created includes an identifier of the new group to be created, a BSSID of the new group to be created, an operating channel of the new group to be created, the group owner intent of the second terminal, an IP base address of the new group to be created, and an address of a MAC entity used by the second terminal in the new group to be created.

In an implementation manner of this embodiment, if neither the first terminal nor the second terminal is a member of an existing group, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the first terminal and Wi-Fi Direct configuration information of the second terminal may be: receiving, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection, where the Wi-Fi Direct configuration information of the new group to be created is set, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, and sent by the second terminal to the first terminal; and then establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created.

In another implementation manner of this embodiment, if at least one of the first terminal and the second terminal is a member of an existing group, further, the first terminal further sends a default setting of the first terminal to the second terminal through the NFC connection. The default setting of the first terminal may be included in the Wi-Fi Direct configuration information of the first terminal and sent to the second terminal; or the default setting of the first terminal may also not be included in the Wi-Fi Direct configuration information of the first terminal but is sent to the second terminal along with the Wi-Fi Direct configuration information of the first terminal. The default setting of the first terminal may be that the first terminal requests to join the existing group to which the second terminal belongs or that the first terminal requests to create a new group with the second terminal.

In a specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group may be: when the first terminal is not a member of the existing group and the second terminal is a member of the existing group, receiving, by the first terminal, the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs, which is sent by the second terminal through the NFC connection, where the Wi-Fi Direct configuration information of the existing group is sent by the second terminal to the first terminal after the second terminal determines, according to the default setting of the first terminal, that the first terminal requests to join the existing group to which the second terminal belongs, and the second terminal determines, according to the group information of the second terminal, that the second terminal is a group owner of the existing group to which the second terminal belongs; then setting, by the first terminal, a value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of the second terminal according to the Wi-Fi Direct configuration information of the existing group, so that the first terminal, used as a client, joins the existing group to which the second terminal belongs; and finally, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group may be: when the first terminal is not a member of the existing group and the second terminal is a member of the existing group, receiving, by the first terminal, configuration information except encryption information in Wi-Fi Direct configuration information of the existing group to which the second terminal belongs and description information of a group owner of the existing group, which are sent by the second terminal through the NFC connection, where the configuration information except the encryption information in the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs and the description information of the group owner of the existing group are

sent by the second terminal to the first terminal after the second terminal determines, according to the default setting of the first terminal, that the first terminal requests to join the existing group to which the second terminal belongs, and the second terminal determines, according to the group information of the second terminal, that the second terminal is a client of the existing group to which the second terminal belongs; then requesting, by the first terminal, the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group according to the description information of the group owner, and receiving the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner; and finally, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In still another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: when the first terminal is not a member of the existing group and the second terminal is a member of the existing group, receiving, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection, and establishing, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal; where the Wi-Fi Direct configuration information of the new group to be created is sent by the second terminal to the first terminal after the second terminal selects one from unused MAC entities in the second terminal as a MAC entity to be used by the second terminal in the new group to be created and sets the Wi-Fi Direct configuration information of the new group to be created, when the second terminal determines, according to the default setting of the first terminal, that the first terminal requests to create a new group with the second terminal, and the second terminal determines that the second terminal includes at least one unused MAC entity; and the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the second terminal belongs, and the Wi-Fi Direct configuration information of the new group to be created further includes the group information of the second terminal.

In still another specific implementation manner of this implementation manner, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: when the first terminal is not a member of the existing group and the second terminal is a member of the existing group, receiving, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection; then establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created; where the Wi-Fi Direct configuration information of the new group to be created is sent by the second terminal to the first terminal after the second terminal quits the existing group to which the second terminal belongs and sets, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new group to be created, if a user using the second terminal selects to quit the existing group to which the second terminal belongs when the second terminal prompts the user using the second terminal whether to quit the existing group to which the second terminal belongs, when the second terminal determines, according to the default setting of the first terminal, that the first terminal requests to create a new group with the second terminal, and the second terminal determines that all MAC entities in the second terminal are used; and a value of the group owner intent of the second terminal is different from a value of the group owner intent of the first terminal in the Wi-Fi Direct configuration information of the new group to be created.

In still another implementation manner of this embodiment, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group may be: when the first terminal is a member of the existing group and the second terminal is not a member of the existing group, if the second terminal determines, according to a default setting of the second terminal, that the second terminal requests to join the existing group to which the first terminal belongs, and the second terminal determines, according to the group information of the first terminal, that the first terminal is a group owner of the existing group to which the first terminal belongs, establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the first terminal after the second terminal sets a value of the group owner intent in the Wi-Fi Direct configuration information of the second terminal to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal; and in this case, the Wi-Fi Direct configuration information of the first terminal is Wi-Fi Direct configuration information of the existing group to which the first terminal belongs.

In still another implementation manner of this embodiment, when the first terminal is a member of the existing group and the second terminal is not a member of the existing group, and the first terminal is a client of the existing group to which the first terminal belongs, the Wi-Fi Direct configuration information of the first terminal sent by the first terminal is configuration information except encryption information in Wi-Fi Direct configuration information of the existing group to which the first terminal belongs; and in this case, the first terminal further sends description information of a group owner of the existing group to which the first terminal belongs, to the second terminal through the NFC connection. Specifically, the description information of the group owner of the existing group to which the first terminal belongs may be included in the Wi-Fi Direct configuration information of the first terminal; or the description information of the group owner of the existing group to which the first terminal belongs may also not be included in the Wi-Fi Direct configuration information of the first terminal but is sent to the second terminal along with the Wi-Fi Direct configuration information of the first terminal.

In still another implementation manner of this embodiment, when the first terminal is a member of the existing group and the second terminal is not a member of the existing group, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: receiving, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection, and establishing, according to the Wi-Fi

Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal; where the Wi-Fi Direct configuration information of the new group to be created is sent by the second terminal to the first terminal after the second terminal selects one from unused MAC entities in the first terminal and sets the Wi-Fi Direct configuration information of the new group to be created, after the second terminal determines, according to a default setting of the second terminal, that the second terminal requests to create a new group with the first terminal, and the second terminal determines that the first terminal includes at least one unused MAC entity; and the Wi-Fi Direct configuration information of the new group to be created further includes an address of the MAC entity selected by the second terminal from the first terminal, and the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the first terminal belongs.

In still another implementation manner of this embodiment, when the first terminal is a member of the existing group and the second terminal is not a member of the existing group, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: receiving, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection, where the Wi-Fi Direct configuration information of the new group to be created that is sent by the second terminal is set and sent by the second terminal to the first terminal after the second terminal determines, according to a default setting of the second terminal, that the second terminal requests to create a new group with the first terminal, and determines that the first terminal includes at least one unused MAC entity, and the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the first terminal belongs; and then selecting, by the first terminal, one from unused MAC entities in the first terminal, and establishing, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal.

In still another implementation manner of this embodiment, when the first terminal is a member of the existing group and the second terminal is not a member of the existing group, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: receiving, by the first terminal, an indication sent by the second terminal that the second terminal requests to create a new group with the first terminal, where the indication is sent by the second terminal to the first terminal after the second terminal determines, according to a default setting of the second terminal, that the second terminal requests to create a new group with the first terminal, and determines that all MAC entities in the first terminal are used; and then prompting, by the first terminal, a user using the first terminal whether to quit the existing group to which the first terminal belongs, and quitting the existing group to which the first terminal belongs after the user using the first terminal selects to quit the existing group to which the first terminal belongs, setting, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new group to be created, and establishing, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal.

In still another implementation manner of this embodiment, when both the first terminal and the second terminal are members of an existing group, the establishing, by the first terminal, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a new group to be created may be: receiving, by the first terminal, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection, and establishing, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the second terminal; where the Wi-Fi Direct configuration information of the new group to be created is sent by the second terminal to the first terminal after the second terminal selects one from unused MAC entities in the second terminal as a MAC entity to be used by the second terminal in the new group to be created, selects one from unused MAC entities in the first terminal, and sets the Wi-Fi Direct configuration information of the new group to be created, when the second terminal determines, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, that the first terminal and the second terminal do not belong to a same group and that both the first terminal and the second terminal include at least one unused MAC entity, and the second terminal determines, according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a group owner; and the Wi-Fi Direct configuration information of the new group to be created further includes an address of the MAC entity selected by the second terminal from the first terminal.

In this embodiment, if only one of the first terminal and the second terminal is a group owner, the terminal being a group owner in the existing group must be a client in the new group, and the group owner intent of the terminal must be set to be smaller than the group owner intent of the peer end in the Wi-Fi Direct configuration information of the new group; if both the first terminal and the second terminal are group owners in the existing group, group owner intents of the two terminals in the configuration information of the new group may be set at random, as long as values of the group owner intents of the two terminals are set to be different.

In the foregoing embodiment, the first terminal and the second terminal exchange Wi-Fi Direct configuration information by using an NFC connection, and a device discovery procedure and a GO negotiation procedure are implicitly included in the exchange process, thereby sparing handshake procedures such as device discovery, GO negotiation, and WPS authentication information exchange that are performed by using radio signaling and defined in the Wi-Fi Direct protocol, and simplifying a Wi-Fi Direct connection establishment procedure. In addition, the Wi-Fi Direct protocol specifies that a client of a Wi-Fi Direct group cannot actively discover a GO or a client of another group. In this scenario, a Wi-Fi Direct connection cannot be established by using radio signaling, but this restriction does not exist when the technical solution provided by this embodiment is used. As long as the first terminal and the second terminal are within an NFC communication range, the first terminal and the second terminal can exchange configuration information, and both can establish a Wi-Fi Direct connection between the first terminal and the second terminal.

In the method for establishing a communication connection according to the present invention, a Wi-Fi Direct connection is established by using an NFC connection handover. Two terminals using the method provided by the present invention to establish a Wi-Fi Direct connection both need to support the NFC and Wi-Fi Direct functions. As shown in FIG. **2**, terminal A and terminal B separately read their own Wi-Fi Direct configuration information, then exchange Wi-Fi Direct configuration information with the peer end, with which a connection is established, in a touch manner through an NFC interface, and establish a Wi-Fi Direct connection according to the method provided by the present invention. FIG. **2** is a schematic diagram of an embodiment of an application scenario according to the present invention.

In FIG. **2**, Wi-Fi Direct configuration information exchanged between terminal A and terminal B includes the following content:

(1) ID of a Wi-Fi P2P group (Wi-Fi P2P, namely, Wi-Fi Direct);

(2) BSSID of the Wi-Fi P2P group;

(3) channel list (Channel list);

(4) operating channel of an existing group (Operating Channel; if neither of the two terminals joins the existing group, the content is filled with an agreed null value);

(5) authentication information (authentication, which may be WPS authentication information or other authentication information);

(6) encryption information (encryption, which may be WPS encryption information or other encryption information);

(7) the number of MAC entities, and an address of each MAC entity (the number of MAC entities that a terminal has and the address of each MAC entity);

(8) group owner intent (GO Intent);

(9) group information, a value of which may be that the terminal is not in an existing group, or that the terminal is a group owner in an existing group, or that the terminal is a client in an existing group;

(10) IP base address (to avoid an IP address conflict between two groups when a terminal acts as a member of the two groups);

(11) other content that is defined by the Wi-Fi Direct protocol and may be exchanged by using a radio signal frame; and

(12) default setting option, indicating whether the terminal requests to join the existing group or requests to create a new group; this option is optional.

FIG. **3** is a flowchart of another embodiment of a method for establishing a communication connection according to the present invention. As shown in FIG. **3**, the method for establishing a communication connection may include:

Step **301**: Terminal A unlocks a screen, enables an NFC function, and touches terminal B that also enables an NFC function and unlocks a screen, and then an NFC connection is established between terminal A and terminal B.

Step **302**: Terminal B receives Wi-Fi Direct configuration information of terminal A, which is sent by terminal A through the NFC connection.

During specific implementation, terminal A and terminal B may use a "handover request collision resolution mechanism" defined in the NFC connection handover protocol to decide Requester and Selector identities. However, this embodiment is described by using that terminal A is a Requester and terminal B is a Selector as an example.

In this embodiment, Wi-Fi Direct configuration information of terminal B includes group information of terminal B, and Wi-Fi Direct configuration information of terminal A includes group information of terminal A.

In this embodiment, the Wi-Fi Direct configuration information of terminal B may further include: a group owner intent of terminal B, the number of MAC entities in terminal B, and an address of each MAC entity; where a value of the group information of terminal B may be: terminal B being not a member of an existing group, or terminal B being a group owner of an existing group to which terminal B belongs, or terminal B being a client of an existing group to which terminal B belongs; and

the Wi-Fi Direct configuration information of terminal A may further include: a group owner intent of terminal A, the number of MAC entities in terminal A, and an address of each MAC entity; where a value of the group information of terminal A may be: terminal A being not a member of an existing group, or terminal A being a group owner of an existing group to which terminal A belongs, or terminal A being a client of an existing group to which terminal A belongs.

Step **303**: If terminal B determines, according to the group information of terminal B and the group information of terminal A, that neither terminal B nor terminal A is a member of an existing group, terminal B establishes a Wi-Fi Direct connection with terminal A according to the Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A.

Specifically, terminal B may set, according to the Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A, Wi-Fi Direct configuration information of a new group to be created, where the Wi-Fi Direct configuration information of the new group to be created includes an identifier of the new group to be created, a BSSID of the new group to be created, an operating channel of the new group to be created, the group owner intent of terminal B, an IP base address of the new group to be created, and an address of a MAC entity used by terminal B in the new group to be created; then, terminal B sends the Wi-Fi Direct configuration information of the new group to be created to terminal B through the NFC connection; and finally, terminal B establishes a Wi-Fi Direct connection with terminal A according to the Wi-Fi Direct configuration information of the new group to be created.

When setting the Wi-Fi Direct configuration information of the new group to be created, for example, when setting an identifier of the new group to be created, terminal B may use a group identifier in the Wi-Fi Direct configuration information of terminal B, or may also use a group identifier in the Wi-Fi Direct configuration information of terminal A, or may neither use a group identifier in the Wi-Fi Direct configuration information of terminal B nor use a group identifier in the Wi-Fi Direct configuration information of terminal A but set a new identifier for the new group to be created. Likewise, the BSSID of the new group to be created, the operating channel of the new group to be created, the IP base address of the new group to be created, and the address of the MAC entity used in the new group to be created may also be set in the preceding manner, that is, corresponding information included in the Wi-Fi Direct configuration information of terminal B or terminal A may be used, or a new value is set. Details are not repeated herein.

In step **302** of this embodiment, sending, by terminal A, the Wi-Fi Direct configuration information of terminal A to terminal B through the NFC connection may be: sending, by terminal A, an NFC connection handover request message to

terminal B, where the NFC connection handover request message carries the Wi-Fi Direct configuration information of terminal A.

Specifically, an encapsulation format of the NFC connection handover request message may be as shown in FIG. **4**. In step **303**, an encapsulation format of an NFC connection handover response may be as shown in FIG. **5**. FIG. **4** is a schematic diagram of an embodiment of a format of a connection handover request according to the present invention; and FIG. **5** is a schematic diagram of an embodiment of a format of a connection handover response according to the present invention.

In the foregoing message encapsulation format, a part of the Wi-Fi Direct configuration information is placed in connection configuration data, and a part thereof is placed in auxiliary description data. Actually, all of the Wi-Fi Direct configuration information may be placed in the connection configuration data, or may be placed in the auxiliary description data, which is not limited by this embodiment.

In the foregoing embodiment, in addition to exchanging encryption information, terminal B and terminal A need to exchange a series of parameters required for establishing a Wi-Fi Direct connection, such as group information, the number of MAC entities, and the address of each MAC entity, but the parameters can be completely exchanged only after multiple times of exchange by using radio signaling in the prior art. However, in this embodiment, the parameters are included in the Wi-Fi Direct configuration information and are completely exchanged through the NFC connection at a time, so that a process of establishing a Wi-Fi Direct connection is simplified.

FIG. **6**A, FIG. **6**B, FIG. **6**C, and FIG. **6**D are a flowchart of still another embodiment of a method for establishing a communication connection according to the present invention. As shown in FIG. **6**A, FIG. **6**B, FIG. **6**C, and FIG. **6**D, the method for establishing a communication connection may include:

Step **601**: Terminal A unlocks a screen, enables an NFC function, and touches terminal B that also enables an NFC function and unlocks a screen, and then an NFC connection is established between terminal A and terminal B.

Step **602**: Terminal B receives Wi-Fi Direct configuration information of terminal A, which is sent by terminal A through the NFC connection.

During specific implementation, terminal A and terminal B may use a "handover request collision resolution mechanism" defined in the NFC connection handover protocol to decide Requester and Selector identities. However, this embodiment is described by using that terminal A is a Requester and terminal B is a Selector as an example.

In this embodiment, Wi-Fi Direct configuration information of terminal B includes group information of terminal B, and the Wi-Fi Direct configuration information of terminal A includes group information of terminal A.

In this embodiment, the Wi-Fi Direct configuration information of terminal B may further include: a group owner intent of terminal B, the number of MAC entities in terminal B, and an address of each MAC entity; where a value of the group information of terminal B may be: terminal B being not a member of an existing group, or terminal B being a group owner of an existing group to which terminal B belongs, or terminal B being a client of an existing group to which terminal B belongs; and

the Wi-Fi Direct configuration information of terminal A may further include: a group owner intent of terminal A, the number of MAC entities in terminal A, and an address of each MAC entity; where a value of the group information of terminal A may be: terminal A being not a member of an existing group, or terminal A being a group owner of an existing group to which terminal A belongs, or terminal A being a client of an existing group to which terminal A belongs.

Step **603**: Terminal B determines, according to the group information of terminal A and terminal B, that one of terminal A and terminal B is a member of an existing group. If terminal B is a member of the existing group and terminal A is not a member of the existing group, step **604** is performed; if terminal B is not a member of the existing group and terminal A is a member of the existing group, step **620** is performed.

Step **604**: Terminal B receives a default setting of terminal A, which is sent by terminal A through the NFC connection.

Specifically, the default setting of terminal A may be included in the Wi-Fi Direct configuration information of terminal A; or the default setting may also not be included in the Wi-Fi Direct configuration information of terminal A but is sent to terminal B along with the Wi-Fi Direct configuration information of terminal A.

The default setting of terminal A reflects that terminal A requests to join the existing group to which terminal B belongs or that terminal A requests to create a new group with terminal B.

Step **605**: Terminal B determines, according to the default setting of terminal A, whether terminal A requests to join the existing group to which terminal B belongs; and if terminal A requests to join the existing group to which terminal B belongs, step **606** is performed; or if terminal A does not request to join the existing group to which terminal B belongs, that is, if terminal B determines, according to the default setting of terminal A, that terminal A requests to create a new group with terminal B, step **613** is performed.

Step **606**: Terminal B determines, according to the group information of terminal B, whether terminal B is a group owner of the existing group to which terminal B belongs. If terminal B is a group owner of the existing group to which terminal B belongs, step **607** is performed; if terminal B is not a group owner of the existing group to which terminal B belongs but is a client of the existing group, step **610** is performed.

Step **607**: Terminal B encapsulates Wi-Fi Direct configuration information of the existing group to which terminal B belongs into an NFC connection handover response and sends the response to terminal A.

Step **608**: Terminal A sets a value of the group owner intent in the Wi-Fi Direct configuration information of terminal A to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of terminal B according to the Wi-Fi Direct configuration information of the existing group. In this way, terminal A can be used as a client to join the existing group to which terminal B belongs.

Step **609**: Terminal B establishes a Wi-Fi Direct connection with terminal A according to the Wi-Fi Direct configuration information of the existing group.

Step **610**: Terminal B encapsulates configuration information except encryption information in the Wi-Fi Direct configuration information of the existing group and description information of the group owner of the existing group into an NFC connection handover response and sends the response to terminal A.

Step **611**: Terminal A requests the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group according to the description information of the group owner, and receives the

encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner.

Specifically, terminal A may request the group owner for the encryption information in a wireless connection (for example, Wi-Fi) manner, or may also obtain the encryption information by an additional touch (that is, by establishing an NFC connection with the group owner). In this way, terminal A also obtains all Wi-Fi Direct configuration information of the existing group, and then step **612** is performed.

Step **612**: Terminal B establishes a Wi-Fi Direct connection with terminal A according to the Wi-Fi Direct configuration information of the existing group.

Step **613**: Terminal B determines whether terminal B includes at least one unused MAC entity. If terminal B includes at least one unused MAC entity, step **614** is performed. If terminal B does not include at least one unused MAC entity, that is, if terminal B determines that all MAC entities in terminal B are used, step **616** is performed.

Step **614**: Terminal B selects one from unused MAC entities in terminal B as a MAC entity to be used by terminal B in a new group to be created, and sets Wi-Fi Direct configuration information of the new group to be created.

The Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which terminal B belongs. Specifically, when setting the Wi-Fi Direct configuration information of the new group to be created, terminal B may use a part or all of the Wi-Fi Direct configuration information of terminal A, for example, may use a group ID in the Wi-Fi Direct configuration information of terminal A as an identifier of the new group to be created, and/or use a group BSSID in the Wi-Fi Direct configuration information of terminal A as a BSSID of the new group to be created; or may also not use the Wi-Fi Direct configuration information of terminal A but set new Wi-Fi Direct configuration information for the new group to be created. The present invention does not limit a manner of setting, by terminal B, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which terminal B belongs.

In addition, the Wi-Fi Direct configuration information of the new group to be created further includes the group information of terminal A.

Step **615**: Terminal B encapsulates the Wi-Fi Direct configuration information of the new group to be created into an NFC connection handover response and sends the response to terminal A, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal A.

Step **616**: Terminal B prompts a user using terminal B whether to quit the existing group to which terminal B belongs; and if the user using terminal B selects to quit the existing group to which terminal B belongs, step **617** is performed; or if the user using terminal B selects not to quit the existing group to which terminal B belongs, step **619** is performed.

Step **617**: Terminal B quits the existing group to which terminal B belongs, and sets, according to the Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A, the Wi-Fi Direct configuration information of the new group to be created.

The Wi-Fi Direct configuration information of the new group to be created includes an identifier of the new group to be created, a BSSID of the new group to be created, an operating channel of the new group to be created, the group owner intent of terminal B, an IP base address of the new group to be created, and an address of a MAC entity used by terminal B in the new group to be created.

A value of the group owner intent of terminal B is different from a value of the group owner intent of terminal A in the Wi-Fi Direct configuration information of the new group to be created.

Step **618**: Terminal B encapsulates the Wi-Fi Direct configuration information of the new group to be created into an NFC connection handover response and sends the response to terminal A, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal A.

Step **619**: Terminal B returns a connection establishment failure response to terminal A.

Step **620**: Terminal B determines, according to a default setting of terminal B, whether terminal B requests to join the existing group to which terminal A belongs. If terminal B requests to join the existing group to which terminal A belongs, step **621** is performed; if terminal B determines, according to the default setting of terminal B, that terminal B does not request to join the existing group to which terminal A belongs but requests to create a new group with terminal A, step **626** is performed.

Step **621**: Terminal B determines, according to the group information of terminal A, whether terminal A is a group owner of the existing group to which terminal A belongs. If terminal A is a group owner of the existing group to which terminal A belongs, step **622** is performed; if terminal A is not a group owner of the existing group to which terminal A belongs but is a client of the existing group, step **623** is performed.

Step **622**: Terminal B sets the value of the group owner intent in the Wi-Fi Direct configuration information of terminal B to a value smaller than the value of the group owner intent in the Wi-Fi Direct configuration information of terminal A, and establishes, according to the Wi-Fi Direct configuration information of terminal A, a Wi-Fi Direct connection with terminal A.

In this step, terminal B sets the value of the group owner intent in the Wi-Fi Direct configuration information of terminal B to a value smaller than the value of the group owner intent in the Wi-Fi Direct configuration information of terminal A. In this way, terminal B can be used as a client of the existing group to which terminal A belongs to join the existing group.

The Wi-Fi Direct configuration information of terminal A is Wi-Fi Direct configuration information of the existing group to which terminal A belongs.

Step **623**: Terminal B receives description information of the group owner of the existing group to which terminal A belongs, which is sent by terminal A through the NFC connection.

Specifically, the description information of the group owner of the existing group to which terminal A belongs may be included in the Wi-Fi Direct configuration information of terminal A; or the description information of the group owner of the existing group to which terminal A belongs may also not be included in the Wi-Fi Direct configuration information of terminal A but is sent to terminal B along with the Wi-Fi Direct configuration information of terminal A.

In this case, the Wi-Fi Direct configuration information of terminal A is configuration information except encryption information in the Wi-Fi Direct configuration information of the existing group to which terminal A belongs.

In this embodiment, the description information of the group owner of the existing group to which terminal A belongs may be sent along with the Wi-Fi Direct configuration information of terminal A, or may also be sent separately, which is not limited by this embodiment. That is, when terminal A is a client of the existing group to which terminal A belongs, terminal A may send the Wi-Fi Direct configuration information of terminal A with the description information of the group owner of the existing group to which terminal A belongs, to terminal B through the NFC connection in step **602**, for example, encapsulate the two pieces of information into an NFC connection handover request and send the request to terminal B; or terminal A may also first add the Wi-Fi Direct configuration information of terminal A into an NFC connection handover request and send the request to terminal B in step **602**, and then carry the description information of the group owner of the existing group to which terminal A belongs into an NFC connection handover request or another message and send the message to terminal B through the NFC connection in step **623**.

Step **624**: Terminal B requests, according to the description information of the group owner of the existing group to which terminal A belongs, the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group to which terminal A belongs, and receives the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner.

Specifically, terminal B may request the group owner for the encryption information in a wireless connection manner, or may also obtain the encryption information by an additional touch (that is, by establishing an NFC connection with the group owner). In this way, terminal B also obtains all Wi-Fi Direct configuration information of the existing group, and then step **625** is performed.

Step **625**: Terminal B establishes a Wi-Fi Direct connection with terminal A according to the Wi-Fi Direct configuration information of the existing group.

Step **626**: Terminal B determines whether terminal A includes at least one unused MAC entity. If terminal A includes at least one unused MAC entity, step **627** is performed. If terminal A does not include at least one unused MAC entity, that is, if terminal B determines that all MAC entities in terminal A are used, step **629** is performed.

Step **627**: Terminal B selects one from unused MAC entities in terminal A, and sets the Wi-Fi Direct configuration information of the new group to be created.

The Wi-Fi Direct configuration information of the new group to be created further include an address of the MAC entity selected by terminal B from terminal A, and the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which terminal A belongs. Specifically, when setting the Wi-Fi Direct configuration information of the new group to be created, terminal B may use a part or all of the Wi-Fi Direct configuration information of terminal B, for example, may use a group ID in the Wi-Fi Direct configuration information of terminal B as an identifier of the new group to be created, and/or use a group BSSID in the Wi-Fi Direct configuration information of terminal B as a BSSID of the new group to be created; or may also not use the Wi-Fi Direct configuration information of terminal B but set new Wi-Fi Direct configuration information for the new group to be created. The present invention does not limit a manner of setting, by terminal B, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which terminal A belongs.

Step **628**: Terminal B encapsulates the Wi-Fi Direct configuration information of the new group to be created into an NFC connection handover response and sends the response to terminal A, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal A.

In another implementation manner of this embodiment, step **627** and step **628** may also be as follows: Terminal B sets the Wi-Fi Direct configuration information of the new group to be created, where the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which terminal A belongs; then terminal B sends the Wi-Fi Direct configuration information of the new group to be created to terminal A through the NFC connection. Then, terminal A selects one from unused MAC entities in terminal A and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal B. When setting the Wi-Fi Direct configuration information of the new group to be created, terminal B may use a part or all of the Wi-Fi Direct configuration information of terminal B, for example, may use a group ID in the Wi-Fi Direct configuration information of terminal B as an identifier of the new group to be created, and/or use a group BSSID in the Wi-Fi Direct configuration information of terminal B as a BSSID of the new group to be created; or may also not use the Wi-Fi Direct configuration information of terminal B but set new Wi-Fi Direct configuration information for the new group to be created. The present invention does not limit a manner of setting, by terminal B, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which terminal A belongs.

Step **629**: Terminal B sends terminal A an indication that terminal B requests to create a new group with terminal A.

Step **630**: Terminal A prompts a user using terminal A whether to quit the existing group to which terminal A belongs. If the user using terminal A selects to quit the existing group to which terminal A belongs, step **631** is performed; if the user using terminal A selects not to quit the existing group to which terminal A belongs, step **632** is performed.

Step **631**: Terminal A quits the existing group to which terminal A belongs, sets, according to the Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A, the Wi-Fi Direct configuration information of the new group to be created, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal B.

After terminal A quits the existing group to which terminal A belongs, because neither terminal A nor terminal B is a member of an existing group, terminal A and terminal B may establish a Wi-Fi Direct connection according to the method provided by the embodiment shown in FIG. **3** of the present invention. Details are not repeated herein.

Step **632**: A Wi-Fi Direct connection fails to be established between terminal B and terminal A.

In this embodiment, only one of terminal A and terminal B is a member of an existing group. If the member of the

existing group is a group owner of the existing group to which the member belongs, the member may be used as a group owner or a client in the new group to be created; if the member of the existing group is a client of the existing group to which the member belongs, the terminal can only be used as a group owner in the new group to be created.

In this embodiment, if terminal A is a member of the existing group and terminal A is a GO of the existing group to which terminal A belongs, and terminal B requests to join the existing group to which terminal A belongs, a format of an NFC connection handover request sent by terminal A to terminal B may be as shown in FIG. **7**. FIG. **7** is a schematic diagram of another embodiment of a format of a connection handover request according to the present invention.

If terminal B is a member of the existing group and terminal B is a GO of the existing group to which terminal B belongs, and terminal A requests to join the existing group to which terminal B belongs, a format of a connection handover response sent by terminal B to terminal A may be as shown in FIG. **8**. FIG. **8** is a schematic diagram of another embodiment of a format of a connection handover response according to the present invention.

It should be noted that when the member of the existing group is a client of the existing group, the connection handover request shown in FIG. **7** or the connection handover response shown in FIG. **8** does not include authentication information or encryption information; when the member of the existing group quits the existing group, or when two terminals create a new group, reference may be made to FIG. **4** and FIG. **5** for the formats of the connection handover request and the connection handover response. Details are not repeated herein.

In the foregoing embodiment, terminal A and terminal B exchange Wi-Fi Direct configuration information by using an NFC connection, and a device discovery procedure and a GO negotiation procedure are implicitly included in the exchange process, thereby sparing handshake procedures such as device discovery, GO negotiation, and WPS authentication information exchange that are performed by using radio signaling and defined in the Wi-Fi Direct protocol, and simplifying a Wi-Fi Direct connection establishment procedure. In addition, the Wi-Fi Direct protocol specifies that a client cannot actively discover a GO or a client of another group. In this scenario, a Wi-Fi Direct connection cannot be established by using radio signaling, but this restriction does not exist when the technical solution provided by this embodiment is used. As long as terminal A and terminal B are within an NFC communication range, terminal A and terminal B can exchange configuration information, and both can establish a Wi-Fi Direct connection between terminal A and terminal B.

FIG. **9**A and FIG. **9**B are a flowchart of still another embodiment of a method for establishing a communication connection according to the present invention. As shown in FIG. **9**A and FIG. **9**B, the method for establishing a communication connection may include:

Step **901**: Terminal A unlocks a screen, enables an NFC function, and touches terminal B that also enables an NFC function and unlocks a screen, and then an NFC connection is established between terminal A and terminal B.

Step **902**: Terminal B receives Wi-Fi Direct configuration information of terminal A, which is sent by terminal A through the NFC connection.

During specific implementation, terminal A and terminal B may use a "handover request collision resolution mechanism" defined in the NFC connection handover protocol to decide Requester and Selector identities. However, this embodiment is described by using that terminal A is a Requester and terminal B is a Selector as an example.

In this embodiment, Wi-Fi Direct configuration information of terminal B includes group information of terminal B.

In this embodiment, the Wi-Fi Direct configuration information of terminal B may further include: a group owner intent of terminal B, the number of MAC entities in terminal B, and an address of each MAC entity; where a value of the group information of terminal B may be: terminal B being not a member of an existing group, or terminal B being a group owner of an existing group to which terminal B belongs, or terminal B being a client of an existing group to which terminal B belongs; and

the Wi-Fi Direct configuration information of terminal A includes group information of terminal A, and the Wi-Fi Direct configuration information of terminal A may further include: a group owner intent of terminal A, the number of MAC entities in terminal A, and an address of each MAC entity; where a value of the group information of terminal A may be: terminal A being not a member of an existing group, or terminal A being a group owner of the existing group to which terminal A belongs, or terminal A being a client of the existing group to which terminal A belongs.

Step **903**: Terminal B determines, according to the group information of terminal B and the group information of terminal A, that both terminal B and terminal A are members of an existing group.

Step **904**: Terminal B determines, according to the Wi-Fi Direct configuration information of terminal B and the Wi-Fi Direct configuration information of terminal A, whether terminal B and terminal A belong to a same group. If terminal B and terminal A belong to a same group, step **905** is performed; if terminal B and terminal A do not belong to a same group, step **906** is performed.

Specifically, terminal B may check whether group IDs, group BSSIDs, MAC addresses of GOs, IP base addresses, and the like in the Wi-Fi Direct configuration information of terminal B and terminal A are the same, so as to determine whether terminal B and terminal A belong to a same group; if all the group IDs, group BSSIDs, MAC addresses of GOs, IP base addresses, and the like in the Wi-Fi Direct configuration information are the same, it can be determined that terminal B and terminal A belong to a same group; otherwise, it can be determined that terminal B and terminal A do not belong to a same group.

Step **905**: Terminal B sends, to terminal A, a message indicating that terminal B can directly communicate with terminal A.

Specifically, if both terminal B and terminal A are clients, communication may be performed by using a GO, or a direct data connection is established with aid of a GO to perform communication; if one of terminal B and terminal A is a GO and the other is a client, communication may be directly performed.

Step **906**: Terminal B determines, according to the group information of terminal B and the group information of terminal A, whether at least one of terminal B and terminal A is a group owner. If at least one of terminal B and terminal A is a group owner, step **907** is performed; if neither terminal B nor terminal A is a group owner, that is, both terminal B and terminal A are clients of the existing group, and step **910** is performed.

Step **907**: Terminal B determines whether both terminal A and terminal B include at least one unused MAC entity; and if both terminal A and terminal B include at least one unused MAC entity, step **908** is performed; if all MAC entities in terminal A and/or terminal B are used, step **910** is performed.

Step **908**: Terminal B selects one from unused MAC entities in terminal B as a MAC entity to be used by terminal B in a new group to be created, selects one from unused MAC entities in terminal A, and sets Wi-Fi Direct configuration information of the new group to be created.

The Wi-Fi Direct configuration information of the new group to be created may further include an address of the MAC entity selected by terminal B from terminal A.

In this embodiment, if only one of terminal B and terminal A is a group owner in the existing group, the terminal being a group owner in the existing group must be a client in the new group, and the group owner intent of the terminal must be set to be smaller than the group owner intent of the peer end in the Wi-Fi Direct configuration information of the new group; if both terminal B and terminal A are group owners in the existing group, group owner intents of the two terminals in the configuration information of the new group may be set at random, as long as values of the group owner intents of the two terminals are set to be different.

Step **909**: Terminal B encapsulates the Wi-Fi Direct configuration information of the new group to be created into an NFC connection handover response and sends the response to terminal A, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with terminal A.

Step **910**: Terminal B prompts a user using terminal B whether to quit the existing group to which terminal B belongs, and instructs terminal A to prompt a user using terminal A whether to quit the existing group to which terminal A belongs.

Step **911**: After the user using terminal B selects to quit the existing group to which terminal B belongs, and/or the user using terminal A selects to quit the existing group to which terminal A belongs, terminal B establishes a Wi-Fi Direct connection with terminal A according to Wi-Fi Direct configuration information of a terminal that does not quit the existing group to which the terminal belongs or the Wi-Fi Direct configuration information of the new group to be created.

In this embodiment, if terminal B or terminal A not only reserves an original connection but also establishes a new connection, the terminal cannot be used as a client in both of the two groups. Specifically, if the terminal is used as a client in the original connection, the terminal must be used as a group owner in the new connection; if the terminal is used as a group owner in the original connection, the terminal can be used as a group owner or a client in the new group.

Specifically, if the user using terminal B selects to quit the existing group to which terminal B belongs, or the user using terminal A selects to quit the existing group to which terminal A belongs, terminal A and terminal B may establish a Wi-Fi Direct connection and communicate by using the method provided by the embodiment shown in FIG. **6**A, FIG. **6**B, FIG. **6**C, and FIG. **6**D of the present invention; if the user using terminal B selects to quit the existing group to which terminal B belongs, and the user using terminal A also selects to quit the existing group to which terminal A belongs, terminal A and terminal B may establish a Wi-Fi Direct connection and communicate by using the method provided by the embodiment shown in FIG. **3** of the present invention. Details are not repeated herein.

In this embodiment, when terminal A establishes an inter-group connection with terminal B to form a new group, formats of a used connection handover request and a used connection handover response may be as shown in FIG. **10** and FIG. **11** respectively. FIG. **10** is a schematic diagram of still another embodiment of a format of a connection handover request according to the present invention; and FIG. **11** is a schematic diagram of still another embodiment of a format of a connection handover response according to the present invention.

In the foregoing embodiment, terminal A and terminal B exchange Wi-Fi Direct configuration information by using an NFC connection, and a device discovery procedure and a GO negotiation procedure are implicitly included in the exchange process, thereby sparing handshake procedures such as device discovery, GO negotiation, and WPS authentication information exchange that are performed by using radio signaling and defined in the Wi-Fi Direct protocol, and simplifying a Wi-Fi Direct connection establishment procedure. In addition, the Wi-Fi Direct protocol specifies that a client cannot actively discover a GO or a client of another group. In this scenario, a Wi-Fi Direct connection cannot be established by using radio signaling, but this restriction does not exist when the technical solution provided by this embodiment is used. As long as terminal A and terminal B are within an NFC communication range, terminal A and terminal B can exchange configuration information, and both can establish a Wi-Fi Direct connection between terminal A and terminal B.

Persons of ordinary skill in the art may understand that all or a part of the steps in the method embodiments may be implemented by a program instructing relevant hardware. The program may be stored in a computer readable storage medium. When the program is run, the steps in the method embodiments are performed. The storage medium may be any medium that is capable of storing program code, such as a ROM, a RAM, a magnetic disk, or an optical disc.

FIG. **12** is a schematic structural diagram of an embodiment of a terminal according to the present invention. A terminal **12** in this embodiment is a first terminal, and can implement the procedure of the embodiment shown in FIG. **1** of the present invention. As shown in FIG. **12**, the terminal **12** may include: a receiving module **121**, a determining module **122**, and an establishing module **123**;

the receiving module **121** is configured to receive Wi-Fi Direct configuration information of a second terminal, which is sent by the second terminal through an NFC connection between the first terminal and the second terminal, where the Wi-Fi Direct configuration information of the second terminal includes group information of the second terminal;

the determining module **122** is configured to determine, according to group information of the first terminal and the group information of the second terminal received by the receiving module **121**, that neither the first terminal nor the second terminal is a member of an existing group; or determine, according to group information of the first terminal and the group information of the second terminal received by the receiving module **121**, that at least one of the first terminal and the second terminal is a member of an existing group; and

the establishing module **123** is configured to establish a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal when the determining module **122** determines that neither the first terminal nor the second terminal is a member of an existing group; or establish, when the determining module **122** determines that at least one of the first terminal and the second terminal is a member of an existing group, a Wi-Fi Direct connection with the second

terminal according to Wi-Fi Direct configuration information of the existing group or a new group to be created.

In this embodiment, the Wi-Fi Direct configuration information of the second terminal received by the receiving module **121** may further include: a group owner intent of the second terminal, the number of MAC entities in the second terminal, and an address of each MAC entity;

the group information of the second terminal includes: the second terminal being not a member of an existing group, or the second terminal being a group owner of an existing group to which the second terminal belongs, or the second terminal being a client of an existing group to which the second terminal belongs;

the Wi-Fi Direct configuration information of the first terminal includes the group information of the first terminal; the group information of the first terminal includes: the first terminal being not a member of an existing group, or the first terminal being a group owner of an existing group to which the first terminal belongs, or the first terminal being a client of an existing group to which the first terminal belongs; and

further, the Wi-Fi Direct configuration information of the first terminal may further include: a group owner intent of the first terminal, the number of MAC entities in the first terminal, and an address of each MAC entity; and

the Wi-Fi Direct configuration information of the new group to be created includes an identifier of the new group to be created, a BSSID of the new group to be created, an operating channel of the new group to be created, the group owner intent of the first terminal, an IP base address of the new group to be created, and an address of a MAC entity used by the first terminal in the new group to be created.

In this embodiment, the first terminal and the second terminal exchange Wi-Fi Direct configuration information by using an NFC connection, and a device discovery procedure and a GO negotiation procedure are implicitly included in the exchange process, thereby sparing handshake procedures such as device discovery, GO negotiation, and WPS authentication information exchange that are performed by using radio signaling and defined in the Wi-Fi Direct protocol, and simplifying a Wi-Fi Direct connection establishment procedure. In addition, the Wi-Fi Direct protocol specifies that a client of a Wi-Fi Direct group cannot actively discover a GO or a client of another group. In this scenario, a Wi-Fi Direct connection cannot be established by using radio signaling, but this restriction does not exist in this embodiment. As long as the first terminal and the second terminal are within an NFC communication range, the first terminal and the second terminal can exchange configuration information, and both can establish a Wi-Fi Direct connection between the first terminal and the second terminal.

FIG. **13** is a schematic structural diagram of another embodiment of a terminal according to the present invention. Compared with the terminal **12** shown in FIG. **12**, a difference of a terminal **13** shown in FIG. **13** lies in that, in an implementation manner of this embodiment, when the determining module **122** determines that neither the first terminal nor the second terminal is a member of an existing group, the establishing module **123** may include: a first establishing submodule **1231**, a first setting submodule **1232**, and a first sending submodule **1233**;

the first setting submodule **1232** is configured to set, according to Wi-Fi Direct configuration information of the first terminal and Wi-Fi Direct configuration information of the second terminal, Wi-Fi Direct configuration information of a new group to be created; when the first setting submodule **1232** sets the Wi-Fi Direct configuration information of the new group to be created, for example, when the first setting submodule **1232** sets an identifier of the new group to be created, the first setting submodule **1232** may use a group identifier in the Wi-Fi Direct configuration information of the first terminal, or may also use a group identifier in the Wi-Fi Direct configuration information of the second terminal, or may neither use a group identifier in the Wi-Fi Direct configuration information of the first terminal nor use a group identifier in the Wi-Fi Direct configuration information of the second terminal but set a new identifier for the new group to be created. Likewise, a BSSID of the new group to be created, an operating channel of the new group to be created, an IP base address of the new group to be created, and an address of a MAC entity used in the new group to be created may also be set in the preceding manner, that is, corresponding information included in the Wi-Fi Direct configuration information of the first terminal or second terminal may be used, or a new value is set. Details are not repeated herein;

the first sending submodule **1233** is configured to send the Wi-Fi Direct configuration information of the new group to be created, which is set by the first setting submodule **1232**, to the second terminal through an NFC connection; and

the first establishing submodule **1231** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created.

In another implementation manner of this embodiment, the determining module **122** being configured to determine, according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a member of an existing group may be: the determining module **122** being specifically configured to determine, according to the group information of the first terminal and the group information of the second terminal, that the first terminal is a member of an existing group and the second terminal is not a member of an existing group.

Further, the receiving module **121** is further configured to receive a default setting of the second terminal, which is sent by the second terminal through the NFC connection. Specifically, the default setting of the second terminal may be included in the Wi-Fi Direct configuration information of the second terminal; or the default setting may also not be included in the Wi-Fi Direct configuration information of the second terminal but is sent to the first terminal along with the Wi-Fi Direct configuration information of the second terminal, where the default setting reflects that the second terminal requests to join the existing group to which the first terminal belongs or that the second terminal requests to create a new group with the first terminal.

In a specific implementation manner of this implementation manner, the establishing module **123** may include: a first determining submodule **1234**, a second sending submodule **1235**, and a second establishing submodule **1236**;

the first determining submodule **1234** is configured to determine, according to the default setting of the second terminal received by the receiving module **121**, that the second terminal requests to join the existing group to which the first terminal belongs;

the second sending submodule **1235** is configured to send Wi-Fi Direct configuration information of the existing group to which the first terminal belongs, to the second terminal through the NFC connection when the determining module **122** determines, according to the group information of the first terminal, that the first terminal is a group owner of the existing group to which the first terminal belongs, after the first determining submodule **1234** determines that the sec-

ond terminal requests to join the existing group to which the first terminal belongs, so that the second terminal sets a value of the group owner intent in the Wi-Fi Direct configuration information of the second terminal to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal according to the Wi-Fi Direct configuration information of the existing group, and in this way, the second terminal can be used as a client to join the existing group to which the first terminal belongs; and

the second establishing submodule **1236** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In another specific implementation manner of this implementation manner, the establishing module **123** may include: a second determining submodule **1237**, a third sending submodule **1238**, and a third establishing submodule **1239**;

the second determining submodule **1237** is configured to determine, according to the default setting of the second terminal received by the receiving module **121**, that the second terminal requests to join the existing group to which the first terminal belongs;

the third sending submodule **1238** is configured to send configuration information except encryption information in the Wi-Fi Direct configuration information of the existing group and description information of a group owner of the existing group to the second terminal through the NFC connection when the determining module **122** determines, according to the group information of the first terminal, that the first terminal is a client of the existing group to which the first terminal belongs, after the second determining submodule **1237** determines that the second terminal requests to join the existing group to which the first terminal belongs, so that the second terminal requests the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group according to the description information of the group owner, and receives the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner; and

the third establishing submodule **1239** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In still another specific implementation manner of this implementation manner, the establishing module **123** may include: a third determining submodule **12310**, a fourth establishing submodule **12311**, a second setting submodule **12312**, and a fourth sending submodule **12313**;

the third determining submodule **12310** is configured to determine, according to the default setting of the second terminal received by the receiving module **121**, that the second terminal requests to create a new group with the first terminal;

the second setting submodule **12312** is configured to select one from unused MAC entities in the first terminal as a MAC entity to be used by the first terminal in the new group to be created, and set the Wi-Fi Direct configuration information of the new group to be created, when the third determining submodule **12310** determines that the first terminal includes at least one unused MAC entity, after the third determining submodule **12310** determines that the second terminal requests to create a new group with the first terminal, where the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the first terminal belongs, and the Wi-Fi Direct configuration information of the new group to be created further includes the group information of the first terminal; specifically, when setting the Wi-Fi Direct configuration information of the new group to be created, the second setting submodule **12312** may use a part or all of the Wi-Fi Direct configuration information of the second terminal, or may also not use the Wi-Fi Direct configuration information of the second terminal but set new Wi-Fi Direct configuration information for the new group to be created; the present invention does not limit a manner of setting, by the second setting submodule **12312**, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which the first terminal belongs;

the fourth sending submodule **12313** is configured to send the Wi-Fi Direct configuration information of the new group to be created, which is set by the second setting submodule **12312**, to the second terminal through the NFC connection; and

the fourth establishing submodule **12311** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is set by the second setting submodule **12312**.

In still another specific implementation manner of this implementation manner, the establishing module **123** may include: a fourth determining submodule **12314**, a first prompting submodule **12315**, a first quitting submodule **12316**, a third setting submodule **12317**, a fifth sending submodule **12318**, and a fifth establishing submodule **12319**;

the fourth determining submodule **12314** is configured to determine, according to the default setting of the second terminal received by the receiving module **121**, that the second terminal requests to create a new group with the first terminal;

the first prompting submodule **12315** is configured to prompt a user using the first terminal whether to quit the existing group to which the first terminal belongs, when the fourth determining submodule **12314** determines that all MAC entities in the first terminal are used, after the fourth determining submodule **12314** determines that the second terminal requests to create a new group with the first terminal;

the first quitting submodule **12316** is configured to make the first terminal quit the existing group to which the first terminal belongs, after the user using the first terminal selects to quit the existing group to which the first terminal belongs;

the third setting submodule **12317** is configured to set, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new group to be created, after the first quitting submodule **12316** makes the first terminal quit the existing group to which the first terminal belongs, where a value of the group owner intent of the first terminal is different from a value of the group owner intent of the second terminal in the Wi-Fi Direct configuration information of the new group to be created;

the fifth sending submodule **12318** is configured to send the Wi-Fi Direct configuration information of the new group

to be created, which is set by the third setting submodule **12317**, to the second terminal through the NFC connection; and

the fifth establishing submodule **12319** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is set by the third setting submodule **12317**.

In still another implementation manner of this embodiment, the determining module **122** being configured to determine, according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a member of an existing group includes: the determining module **122** being specifically configured to determine, according to the group information of the first terminal and the group information of the second terminal, that the second terminal is a member of an existing group and the first terminal is not a member of an existing group.

In a specific implementation manner of this implementation manner, the establishing module **123** may include: a sixth determining submodule **12320**, a fourth setting submodule **12321**, and a sixth establishing submodule **12322**;

the sixth determining submodule **12320** is configured to determine, according to a default setting of the first terminal received by the receiving module **121**, that the first terminal requests to join the existing group to which the second terminal belongs;

the fourth setting submodule **12321** is configured to set a value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of the second terminal when the determining module **122** determines, according to the group information of the second terminal, that the second terminal is a group owner of the existing group to which the second terminal belongs, after the sixth determining submodule **12320** determines that the first terminal requests to join the existing group to which the second terminal belongs; and

the sixth establishing submodule **12322** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the second terminal, where the Wi-Fi Direct configuration information of the second terminal is Wi-Fi Direct configuration information of the existing group to which the second terminal belongs.

In another specific implementation manner of this implementation manner, when the second terminal is a client of the existing group to which the second terminal belongs, the Wi-Fi Direct configuration information of the second terminal received by the receiving module **121** is configuration information except encryption information in Wi-Fi Direct configuration information of the existing group to which the second terminal belongs;

in this specific implementation manner, the receiving module **121** is further configured to receive description information of a group owner of the existing group to which the second terminal belongs, which is sent by the second terminal through the NFC connection; and specifically, the description information of the group owner of the existing group to which the second terminal belongs may be included in the Wi-Fi Direct configuration information of the second terminal; or the description information of the group owner of the existing group to which the second terminal belongs may also not be included in the Wi-Fi Direct configuration information of the second terminal but is sent to the first terminal along with the Wi-Fi Direct configuration information of the second terminal.

In this specific implementation manner, the establishing module **123** may include: a seventh determining submodule **12323**, a first requesting submodule **12324**, a first receiving submodule **12325**, and a seventh establishing submodule **12326**;

the seventh determining submodule **12323** is configured to determine, according to a default setting of the first terminal received by the receiving module **121**, that the first terminal requests to join the existing group to which the second terminal belongs;

the first requesting submodule **12324** is configured to request, according to the description information of the group owner of the existing group to which the second terminal belongs, which is received by the receiving module **121**, the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs;

the first receiving submodule **12325** is configured to receive the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner, and in this way, the first terminal obtains all Wi-Fi Direct configuration information of the existing group; and

the seventh establishing submodule **12326** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In still another specific implementation manner of this implementation manner, the establishing module **123** may include: an eighth determining submodule **12327**, an eighth establishing submodule **12328**, a fifth setting submodule **12329**, and a sixth sending submodule **12330**;

the eighth determining submodule **12327** is configured to determine, according to a default setting of the first terminal received by the receiving module **121**, that the first terminal requests to create a new group with the second terminal;

the fifth setting submodule **12329** is configured to select one from unused MAC entities in the second terminal and set the Wi-Fi Direct configuration information of the new group to be created, when the eighth determining submodule **12327** determines that the second terminal includes at least one unused MAC entity, after the eighth determining submodule **12327** determines that the first terminal requests to create a new group with the second terminal, where the Wi-Fi Direct configuration information of the new group to be created further includes an address of the MAC entity selected by the first terminal from the second terminal, and the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the second terminal belongs; specifically, when setting the Wi-Fi Direct configuration information of the new group to be created, the fifth setting submodule **12329** may use a part or all of the Wi-Fi Direct configuration information of the first terminal, or may also not use the Wi-Fi Direct configuration information of the first terminal but set new Wi-Fi Direct configuration information for the new group to be created; the present invention does not limit a manner of setting, by the fifth setting submodule **12329**, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs;

the sixth sending submodule **12330** is configured to send the Wi-Fi Direct configuration information of the new group to be created, which is set by the fifth setting submodule **12329**, to the second terminal through the NFC connection; and

the eighth establishing submodule **12328** is further configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is set by the fifth setting submodule **12329**.

In still another specific implementation manner of this implementation manner, the establishing module **123** may include: a ninth determining submodule **12331**, a sixth setting submodule **12332**, and a seventh sending submodule **12333**;

the ninth determining submodule **12331** is configured to determine, according to a default setting of the first terminal received by the receiving module **121**, that the first terminal requests to create a new group with the second terminal;

the sixth setting submodule **12332** is configured to set the Wi-Fi Direct configuration information of the new group to be created, when the ninth determining submodule **12331** determines that the second terminal includes at least one unused MAC entity, after the ninth determining submodule **12331** determines that the first terminal requests to create a new group with the second terminal, where the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the second terminal belongs; specifically, when setting the Wi-Fi Direct configuration information of the new group to be created, the sixth setting submodule **12332** may use a part or all of the Wi-Fi Direct configuration information of the first terminal, or may also not use the Wi-Fi Direct configuration information of the first terminal but set new Wi-Fi Direct configuration information for the new group to be created; the present invention does not limit a manner of setting, by the sixth setting submodule **12332**, the Wi-Fi Direct configuration information of the new group to be created, as long as the Wi-Fi Direct configuration information of the new group to be created does not conflict with the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs; and

the seventh sending submodule **12333** is configured to send the Wi-Fi Direct configuration information of the new group to be created, which is set by the sixth setting submodule **12332**, to the second terminal through the NFC connection, so that the second terminal selects one from unused MAC entities in the second terminal and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the first terminal.

In still another specific implementation manner of this implementation manner, the establishing module **123** may include: a tenth determining submodule **12334** and an eighth sending submodule **12335**;

the tenth determining submodule **12334** is configured to determine, according to a default setting of the first terminal received by the receiving module **121**, that the first terminal requests to create a new group with the second terminal; and

the eighth sending submodule **12335** is configured to send the second terminal an indication that the first terminal requests to create a new group with the second terminal, when the tenth determining submodule **12334** determines that all MAC entities in the second terminal are used, after the tenth determining submodule **12334** determines that the first terminal requests to create a new group with the second terminal, so that the second terminal prompts a user using the second terminal whether to quit the existing group to which the second terminal belongs, and quits, after the user using the second terminal selects to quit the existing group to which the second terminal belongs, the existing group to which the second terminal belongs, sets, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new group to be created, and establishes, according to the Wi-Fi Direct configuration information of the new group to be created, a Wi-Fi Direct connection with the first terminal.

In still another implementation manner of this embodiment, the determining module **122** being configured to determine, according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a member of an existing group includes: the determining module **122** being specifically configured to determine, according to the group information of the first terminal and the group information of the second terminal, that both the first terminal and the second terminal are members of an existing group.

In a specific implementation manner of this implementation manner, the establishing module **123** may include: a ninth establishing submodule **12336**, a seventh setting submodule **12337**, and a ninth sending submodule **12338**;

the seventh setting submodule **12337** is configured to select one from unused MAC entities in the first terminal as a MAC entity to be used by the first terminal in the new group to be created, select one from unused MAC entities in the second terminal, and set the Wi-Fi Direct configuration information of the new group to be created, when it is determined, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, that the first terminal and the second terminal do not belong to a same group and that both the first terminal and the second terminal include at least one unused MAC entity, and the determining module **122** determines, according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a group owner, where the Wi-Fi Direct configuration information of the new group to be created further includes an address of the MAC entity selected by the first terminal from the second terminal;

the ninth sending submodule **12338** is configured to send the Wi-Fi Direct configuration information of the new group to be created, which is set by the seventh setting submodule **12337**, to the second terminal through the NFC connection; and

the ninth establishing submodule **12336** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is set by the seventh setting submodule **12337**.

It should be noted that in this embodiment, if only one of the first terminal and the second terminal is a group owner in the existing group, the terminal being a group owner in the existing group must be a client in the new group, and the group owner intent of the terminal must be set to be smaller than the group owner intent of the peer end in the Wi-Fi Direct configuration information of the new group; if both the first terminal and the second terminal are group owners in the existing group, group owner intents of the two terminals in the configuration information of the new group

may be set at random, as long as values of the group owner intents of the two terminals are set to be different.

In another specific implementation manner of this implementation manner, the establishing module **123** may include: a second prompting submodule **12339** and a tenth establishing submodule **12340**;

the second prompting submodule **12339** is configured to prompt a user using the first terminal whether to quit the existing group to which the first terminal belongs, and instruct the second terminal to prompt a user using the second terminal whether to quit the existing group to which the second terminal belongs, when it is determined, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, that the first terminal and the second terminal do not belong to a same group, and the determining module **122** determines, according to the group information of the first terminal and the group information of the second terminal, that neither the first terminal nor the second terminal is a group owner, or when it is determined, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, that the first terminal and the second terminal do not belong to a same group and that all MAC entities in the first terminal and/or the second terminal are used; and

the tenth establishing submodule **12340** is configured to establish a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of a terminal that does not quit the existing group to which the terminal belongs or the Wi-Fi Direct configuration information of the new group to be created, after the user using the first terminal selects to quit the existing group to which the first terminal belongs, and/or the user using the second terminal selects to quit the existing group to which the second terminal belongs.

If the first terminal or the second terminal not only reserves an original connection but also establishes a new connection, the terminal cannot be used as a client in both of the two groups. Specifically, if the terminal is used as a client in the original connection, the terminal must be used as a group owner in the new connection; if the terminal is used as a group owner in the original connection, the terminal can be used as a group owner or a client in the new group.

In the foregoing embodiment, the first terminal and the second terminal exchange Wi-Fi Direct configuration information by using an NFC connection, and a device discovery procedure and a GO negotiation procedure are implicitly included in the exchange process, thereby sparing handshake procedures such as device discovery, GO negotiation, and WPS authentication information exchange that are performed by using radio signaling and defined in the Wi-Fi Direct protocol, and simplifying a Wi-Fi Direct connection establishment procedure. In addition, the Wi-Fi Direct protocol specifies that a client cannot actively discover a GO or a client of another group. In this scenario, a Wi-Fi Direct connection cannot be established by using radio signaling, but this restriction does not exist when the technical solution provided by this embodiment is used. As long as the first terminal and the second terminal are within an NFC communication range, the first terminal and the second terminal can exchange configuration information, and both can establish a Wi-Fi Direct connection between the first terminal and the second terminal.

FIG. **14** is a schematic structural diagram of still another embodiment of a terminal according to the present invention. A terminal **14** in this embodiment can be used as a first terminal to implement the procedure of the embodiment shown in FIG. **1** of the present invention. As shown in FIG. **14**, the terminal **14** may include: a sending module **141** and an establishing module **142**;

the sending module **141** is configured to send Wi-Fi Direct configuration information of the first terminal to a second terminal through an NFC connection between the first terminal and the second terminal, where the Wi-Fi Direct configuration information of the first terminal includes group information of the first terminal; and

the establishing module **142** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the first terminal and Wi-Fi Direct configuration information of the second terminal when neither the first terminal nor the second terminal is a member of an existing group; or establish, when at least one of the first terminal and the second terminal is a member of an existing group, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group or a new group to be created.

In this embodiment, the Wi-Fi Direct configuration information of the first terminal sent by the sending module **141** may further include: a group owner intent of the first terminal, the number of MAC entities in the first terminal, and an address of each MAC entity;

a value of the group information of the first terminal may be: the first terminal being not a member of an existing group, or the first terminal being a group owner of an existing group to which the first terminal belongs, or the first terminal being a client of an existing group to which the first terminal belongs;

the Wi-Fi Direct configuration information of the second terminal may include: group information of the second terminal, a group owner intent of the second terminal, the number of MAC entities in the second terminal, and an address of each MAC entity;

a value of the group information of the second terminal may be: the second terminal being not a member of an existing group, or the second terminal being a group owner of an existing group to which the second terminal belongs, or the second terminal being a client of an existing group to which the second terminal belongs; and

the Wi-Fi Direct configuration information of the new group to be created includes an identifier of the new group to be created, a BSSID of the new group to be created, an operating channel of the new group to be created, the group owner intent of the second terminal, an IP base address of the new group to be created, and an address of a MAC entity used by the second terminal in the new group to be created.

In the foregoing embodiment, the first terminal and the second terminal exchange Wi-Fi Direct configuration information by using an NFC connection, and a device discovery procedure and a GO negotiation procedure are implicitly included in the exchange process, thereby sparing handshake procedures such as device discovery, GO negotiation, and WPS authentication information exchange that are performed by using radio signaling and defined in the Wi-Fi Direct protocol, and simplifying a Wi-Fi Direct connection establishment procedure. In addition, the Wi-Fi Direct protocol specifies that a client cannot actively discover a GO or a client of another group. In this scenario, a Wi-Fi Direct connection cannot be established by using radio signaling, but this restriction does not exist when the technical solution provided by this embodiment is used. As long as the first terminal and the second terminal are within an NFC com-

munication range, the first terminal and the second terminal can exchange configuration information, and both can establish a Wi-Fi Direct connection between the first terminal and the second terminal.

FIG. **15** is a schematic structural diagram of still another embodiment of a terminal according to the present invention. Compared with the terminal **14** shown in FIG. **14**, a difference of a terminal **15** shown in FIG. **15** lies in that, in an implementation manner of this embodiment, when neither the first terminal nor the second terminal is a member of an existing group, the establishing module **142** may include: a first receiving submodule **1421** and a first establishing submodule **1422**;

the first receiving submodule **1421** is configured to receive Wi-Fi Direct configuration information of a new group to be created, which is sent by the second terminal through the NFC connection, where the Wi-Fi Direct configuration information of the new group to be created is set, according to Wi-Fi Direct configuration information of the first terminal and Wi-Fi Direct configuration information of the second terminal, and sent by the second terminal to the first terminal; and

the first establishing submodule **1422** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is received by the first receiving submodule **1421**.

In another implementation manner of this embodiment, when at least one of the first terminal and the second terminal is a member of an existing group, the sending module **141** is further configured to send a default setting of the first terminal to the second terminal through the NFC connection. Specifically, the default setting of the first terminal may be included in the Wi-Fi Direct configuration information of the first terminal and sent to the second terminal; or the default setting may also not be included in the Wi-Fi Direct configuration information of the first terminal but is sent to the second terminal along with the Wi-Fi Direct configuration information of the first terminal. The default setting of the first terminal may be that the first terminal requests to join an existing group to which the second terminal belongs or that the first terminal requests to create a new group with the second terminal.

In a specific implementation manner of this implementation manner, the establishing module **142** may include: a second receiving submodule **1423**, a first setting submodule **1424**, and a second establishing submodule **1425**;

the second receiving submodule **1423** is configured to receive, when the first terminal is not a member of an existing group and the second terminal is a member of an existing group, Wi-Fi Direct configuration information of the existing group to which the second terminal belongs, which is sent by the second terminal through the NFC connection, where the Wi-Fi Direct configuration information of the existing group is sent by the second terminal to the first terminal after the second terminal determines, according to the default setting of the first terminal, that the first terminal requests to join the existing group to which the second terminal belongs, and the second terminal determines, according to the group information of the second terminal, that the second terminal is a group owner of the existing group to which the second terminal belongs;

the first setting submodule **1424** is configured to set a value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of the second terminal according to the Wi-Fi Direct configuration information of the existing group received by the second receiving submodule **1423**; and

the second establishing submodule **1425** is configured to establish, after the first setting submodule **1424** sets the value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group received by the second receiving submodule **1423**.

In another specific implementation manner of this implementation manner, the establishing module **142** may include: a third receiving submodule **1426**, a first requesting submodule **1427**, and a third establishing submodule **1428**;

the third receiving submodule **1426** is configured to receive, when the first terminal is not a member of an existing group and the second terminal is a member of an existing group, configuration information except encryption information in Wi-Fi Direct configuration information of the existing group to which the second terminal belongs and description information of a group owner of the existing group, which are sent by the second terminal through the NFC connection, where the configuration information except the encryption information in the Wi-Fi Direct configuration information of the existing group to which the second terminal belongs and the description information of the group owner of the existing group are sent by the second terminal to the first terminal after the second terminal determines, according to the default setting of the first terminal, that the first terminal requests to join the existing group to which the second terminal belongs, and the second terminal determines, according to the group information of the second terminal, that the second terminal is a client of the existing group to which the second terminal belongs;

the first requesting submodule **1427** is configured to request the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group according to the description information of the group owner received by the third receiving submodule **1426**, and in this way, the first terminal obtains all Wi-Fi Direct configuration information of the existing group;

the third receiving submodule **1426** is further configured to receive, after the first requesting submodule **1427** requests the group owner for the encryption information in the Wi-Fi Direct configuration information of the existing group, the encryption information in the Wi-Fi Direct configuration information of the existing group sent by the group owner; and

the third establishing submodule **1428** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the existing group.

In still another specific implementation manner of this implementation manner, the establishing module **142** may include: a fourth receiving submodule **1429** and a fourth establishing submodule **14210**;

the fourth receiving submodule **1429** is configured to receive, when the first terminal is not a member of an existing group and the second terminal is a member of an existing group, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection; and

the fourth establishing submodule **14210** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is received by the fourth receiving submodule **1429**; where

the Wi-Fi Direct configuration information of the new group to be created is sent by the second terminal to the first terminal after the second terminal selects one from unused MAC entities in the second terminal as a MAC entity to be used by the second terminal in the new group to be created and sets the Wi-Fi Direct configuration information of the new group to be created, when the second terminal determines, according to the default setting of the first terminal, that the first terminal requests to create a new group with the second terminal, and the second terminal determines that the second terminal includes at least one unused MAC entity, where the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the second terminal belongs, and the Wi-Fi Direct configuration information of the new group to be created further includes the group information of the second terminal.

In still another specific implementation manner of this implementation manner, the establishing module **142** may include: a fifth receiving submodule **14211** and a fifth establishing submodule **14212**;

the fifth receiving submodule **14211** is configured to receive, when the first terminal is not a member of an existing group and the second terminal is a member of an existing group, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection; and

the fifth establishing submodule **14212** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created; where

the Wi-Fi Direct configuration information of the new group to be created is sent by the second terminal to the first terminal after the second terminal quits the existing group to which the second terminal belongs and sets, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new group to be created, if a user using the second terminal selects to quit the existing group to which the second terminal belongs when the second terminal prompts the user using the second terminal whether to quit the existing group to which the second terminal belongs, when the second terminal determines, according to the default setting of the first terminal, that the first terminal requests to create a new group with the second terminal, and the second terminal determines that all MAC entities in the second terminal are used; and a value of the group owner intent of the second terminal is different from a value of the group owner intent of the first terminal in the Wi-Fi Direct configuration information of the new group to be created.

In still another implementation manner of this embodiment, the establishing module **142** may include: a sixth establishing submodule **14213**;

the sixth establishing submodule **14213** is configured to establish, when the first terminal is a member of an existing group and the second terminal is not a member of an existing group, a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the first terminal after the second terminal sets a value of the group owner intent in the Wi-Fi Direct configuration information of the second terminal to a value smaller than a value of the group owner intent in the Wi-Fi Direct configuration information of the first terminal, if the second terminal determines, according to a default setting of the second terminal, that the second terminal requests to join the existing group to which the first terminal belongs, and the second terminal determines, according to the group information of the first terminal, that the first terminal is a group owner of the existing group to which the first terminal belongs, and in this case, the Wi-Fi Direct configuration information of the first terminal is Wi-Fi Direct configuration information of the existing group to which the first terminal belongs.

In still another implementation manner of this embodiment, when the first terminal is a member of an existing group and the second terminal is not a member of an existing group, and the first terminal is a client of the existing group to which the first terminal belongs, the Wi-Fi Direct configuration information of the first terminal sent by the sending module **141** is configuration information except encryption information in the Wi-Fi Direct configuration information of the existing group to which the first terminal belongs; and

the sending module **141** is further configured to send description information of a group owner of the existing group to which the first terminal belongs, to the second terminal through the NFC connection; and specifically, the description information of the group owner of the existing group to which the first terminal belongs may be included in the Wi-Fi Direct configuration information of the first terminal; or the description information of the group owner of the existing group to which the first terminal belongs may also not be included in the Wi-Fi Direct configuration information of the first terminal but is sent to the second terminal along with the Wi-Fi Direct configuration information of the first terminal.

In still another implementation manner of this embodiment, the establishing module **142** may include: a sixth receiving submodule **14214** and a seventh establishing submodule **14215**;

the sixth receiving submodule **14214** is configured to receive, when the first terminal is a member of an existing group and the second terminal is not a member of an existing group, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection; and

the seventh establishing submodule **14215** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is received by the sixth receiving submodule **14214**;

specifically, the Wi-Fi Direct configuration information of the new group to be created that is received by the sixth receiving submodule **14214** is sent by the second terminal to the first terminal after the second terminal selects one from unused MAC entities in the first terminal and sets the Wi-Fi Direct configuration information of the new group to be created, after the second terminal determines, according to a default setting of the second terminal, that the second terminal requests to create a new group with the first terminal, and the second terminal determines that the first terminal includes at least one unused MAC entity, where the Wi-Fi Direct configuration information of the new group to be created further includes an address of the MAC entity selected by the second terminal from the first terminal, and the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the second terminal belongs.

In still another implementation manner of this embodiment, the establishing module **142** may include: a seventh receiving submodule **14216** and an eighth establishing submodule **14217**;

the seventh receiving submodule **14216** is configured to receive, when the first terminal is a member of an existing group and the second terminal is not a member of an existing group, Wi-Fi Direct configuration information sent by the second terminal through the NFC connection, where the Wi-Fi Direct configuration information sent by the second terminal is set and sent by the second terminal to the first terminal after the second terminal determines, according to a default setting of the second terminal, that the second terminal requests to create a new group with the first terminal and determines that the first terminal includes at least one unused MAC entity, and the Wi-Fi Direct configuration information of the new group to be created does not conflict with Wi-Fi Direct configuration information of the existing group to which the first terminal belongs; and

the eighth establishing submodule **14217** is configured to select one from unused MAC entities in the first terminal, and establish, according to the Wi-Fi Direct configuration information of the new group to be created that is received by the seventh receiving submodule **14216**, a Wi-Fi Direct connection with the second terminal.

In still another implementation manner of this embodiment, the establishing module **142** may include: an eighth receiving submodule **14218**, a first prompting submodule **14219**, a first quitting submodule **14220**, a ninth establishing submodule **14221**, and a second setting submodule **14222**;

the eighth receiving submodule **14218** is configured to receive, when the first terminal is a member of an existing group and the second terminal is not a member of an existing group, an indication sent by the second terminal that the second terminal requests to create a new group with the first terminal, where the indication is sent by the second terminal to the first terminal after the second terminal determines, according to a default setting of the second terminal, that the second terminal requests to create a new group with the first terminal, and determines that all MAC entities in the first terminal are used;

the first prompting submodule **14219** is configured to prompt a user using the first terminal whether to quit the existing group to which the first terminal belongs;

the first quitting submodule **14220** is configured to quit the existing group to which the first terminal belongs, after the user using the first terminal selects to quit the existing group to which the first terminal belongs;

the second setting submodule **14222** is configured to set, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, the Wi-Fi Direct configuration information of the new group to be created; and

the ninth establishing submodule **14221** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is set by the second setting submodule **14222**.

In still another implementation manner of this embodiment, the establishing module **142** may include: a ninth receiving submodule **14223** and a tenth establishing submodule **14224**;

the ninth receiving submodule **14223** is configured to receive, when both the first terminal and the second terminal are members of an existing group, the Wi-Fi Direct configuration information of the new group to be created, which is sent by the second terminal through the NFC connection; and

the tenth establishing submodule **14224** is configured to establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the new group to be created, which is received by the ninth receiving submodule **14223**; where

the Wi-Fi Direct configuration information of the new group to be created is sent by the second terminal to the first terminal after the second terminal selects one from unused MAC entities in the second terminal as a MAC entity to be used by the second terminal in the new group to be created, selects one from unused MAC entities in the first terminal, and sets the Wi-Fi Direct configuration information of the new group to be created, when the second terminal determines, according to the Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, that the first terminal and the second terminal do not belong to a same group and that both the first terminal and the second terminal include at least one unused MAC entity, and the second terminal determines, according to the group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a group owner; and the Wi-Fi Direct configuration information of the new group to be created further includes an address of the MAC entity selected by the second terminal from the first terminal.

In this embodiment, if only one of the first terminal and the second terminal is a group owner, the terminal being a group owner in the existing group must be a client in the new group, and the group owner intent of the terminal must be set to be smaller than the group owner intent of the peer end in the Wi-Fi Direct configuration information of the new group; if both the first terminal and the second terminal are group owners in the existing group, group owner intents of the two terminals in the configuration information of the new group may be set at random, as long as values of the group owner intents of the two terminals are set to be different.

In the foregoing embodiment, the first terminal and the second terminal exchange Wi-Fi Direct configuration information by using an NFC connection, and a device discovery procedure and a GO negotiation procedure are implicitly included in the exchange process, thereby sparing handshake procedures such as device discovery, GO negotiation, and WPS authentication information exchange that are performed by using radio signaling and defined in the Wi-Fi Direct protocol, and simplifying a Wi-Fi Direct connection establishment procedure. In addition, the Wi-Fi Direct protocol specifies that a client cannot actively discover a GO or a client of another group. In this scenario, a Wi-Fi Direct connection cannot be established by using radio signaling, but this restriction does not exist when the technical solution provided by this embodiment is used. As long as the first terminal and the second terminal are within an NFC communication range, the first terminal and the second terminal can exchange configuration information, and both can establish a Wi-Fi Direct connection between the first terminal and the second terminal.

FIG. **16** is a schematic structural diagram of still another embodiment of a terminal according to the present invention. The terminal **16** can be used as a first terminal, and as shown in FIG. **16**, the terminal **16** may include: at least one processor **161** and a memory **162**. The memory **162** is configured to store an executable program code, and the processor **161** is configured to run, by reading the executable program code stored in the memory **162**, a program corresponding to the executable program code so as to: receive Wi-Fi Direct configuration information of a second terminal, which is sent by the second terminal through an NFC connection between the first terminal and the second termi-

nal, where the Wi-Fi Direct configuration information of the second terminal includes group information of the second terminal; and establish a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the first terminal and the Wi-Fi Direct configuration information of the second terminal, if it is determined, according to group information of the first terminal and the group information of the second terminal, that neither the first terminal nor the second terminal is a member of an existing group; or establish, if it is determined, according to group information of the first terminal and the group information of the second terminal, that at least one of the first terminal and the second terminal is a member of an existing group, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group or a new group to be created.

During specific implementation, the foregoing terminal may further include a user interface **163** and a bus **164**. The processor **161**, the memory **162**, and the user interface **163** are all connected to the bus **164**.

In addition, when establishing a communication connection, the first terminal in this embodiment may establish a communication connection with the second terminal according to a procedure provided by a method embodiment of the present invention. Details are not repeated herein.

The foregoing terminal simplifies a Wi-Fi Direct connection establishment procedure. As long as the first terminal and the second terminal are within an NFC communication range, the first terminal and the second terminal can exchange configuration information, and both can establish a Wi-Fi Direct connection between the first terminal and the second terminal.

FIG. **17** is a schematic structural diagram of still another embodiment of a terminal according to the present invention. The terminal **17** can be used as a first terminal, and as shown in FIG. **17**, the terminal **17** may include: at least one processor **171** and a memory **172**. The memory **172** is configured to store an executable program code, and the processor **171** is configured to run, by reading the executable program code stored in the memory **172**, a program corresponding to the executable program code so as to: send Wi-Fi Direct configuration information of the first terminal to a second terminal through an NFC connection between the first terminal and the second terminal, where the Wi-Fi Direct configuration information of the first terminal includes group information of the first terminal; and establish a Wi-Fi Direct connection with the second terminal according to the Wi-Fi Direct configuration information of the first terminal and Wi-Fi Direct configuration information of the second terminal, if neither the first terminal nor the second terminal is a member of an existing group; or establish, if at least one of the first terminal and the second terminal is a member of an existing group, a Wi-Fi Direct connection with the second terminal according to Wi-Fi Direct configuration information of the existing group or a new group to be created.

During specific implementation, the foregoing terminal may further include a user interface **173** and a bus **174**. The processor **171**, the memory **172**, and the user interface **173** are all connected to the bus **174**.

In addition, when establishing a communication connection, the first terminal in this embodiment may establish a communication connection with the second terminal according to a procedure provided by a method embodiment of the present invention. Details are not repeated herein.

The foregoing terminal simplifies a Wi-Fi Direct connection establishment procedure. As long as the first terminal and the second terminal are within an NFC communication range, the first terminal and the second terminal can exchange configuration information, and both can establish a Wi-Fi Direct connection between the first terminal and the second terminal.

Persons skilled in the art can understand that the accompanying drawings are only schematic diagrams of exemplary embodiments and that the modules or procedures in the accompanying drawings may be not necessary for the implementation of the present invention.

Persons skilled in the art can understand the modules of the apparatuses in the embodiments may be disposed in the apparatuses as described in the embodiments or disposed in one or more apparatuses other than the apparatuses in the embodiments. The modules according to the above embodiments may be combined into one module, or further split into multiple submodules.

Finally, it should be noted that the foregoing embodiments are merely exemplary embodiments of the present invention and are not intended to limit the present invention. Although the present invention is described in detail with reference to the foregoing embodiments, persons of ordinary skill in the art should understand that they may still make modifications to the foregoing embodiments or make equivalent replacements to some technical features thereof, without departing from the scope of the present invention.

What is claimed is:

1. A method for establishing a communication connection, comprising:

sending, by a first terminal, **[**wireless fidelity (Wi-Fi)**]** *WI-FI* Direct configuration information of the first terminal to a second terminal **[**through a near field communication (NFC) connection between the first terminal and the second terminal**]**, wherein the **[**Wi-Fi**]** *WI-FI* Direct configuration information of the first terminal comprises *WI-FI point-to-point* (*P2P*) group information of the first terminal, the *WI-FI P2P* group information of the first terminal indicating: the first terminal being not a member of an existing *WI-FI P2P* group, the first terminal being a group owner of an existing *WI-FI P2P* group to which the first terminal belongs, or the first terminal being a client of an existing *WI-FI P2P* group to which the first terminal belongs;

receiving, by the first terminal, **[**Wi-Fi**]** *WI-FI* Direct configuration information of the second terminal from the second terminal **[**through the NFC connection between the first terminal and the second terminal**]**, wherein the **[**Wi-Fi**]** *WI-FI* Direct configuration information of the second terminal comprises *WI-FI P2P* group information of the second terminal, the *WI-FI P2P* group information of the second terminal indicating: the second terminal being not a member of an existing *WI-FI P2P* group, the second terminal being a group owner of an existing *WI-FI P2P* group to which the second terminal belongs, or the second terminal being a client of an existing *WI-FI P2P* group to which the second terminal belongs; and

establishing a **[**Wi-Fi**]** *WI-FI* Direct connection between the first terminal and the second terminal according to the **[**Wi-Fi**]** *WI-FI* Direct configuration information of the second terminal.

2. The method according to claim **1**, *wherein* if the first terminal **[**being not a member of an**]** *is not the member of the* existing *WI-FI P2P* group and the second terminal **[**being not a member of an**]** *is not the member of the* existing *WI-FI P2P* group, **[**wherein the**]** establishing **[**a Wi-Fi**]** *the WI-FI*

Direct connection between the first terminal and the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal comprises[:] establishing, by the first terminal, the [Wi-Fi] *WI-FI* Direct connection with the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal.

3. The method according to claim **1**, *wherein* if the first terminal [being not a member of an] *is not the member of the* existing *WI-FI P2P* group and the second terminal [being a] *is the* group owner of [an] *the* existing *WI-FI P2P* group to which the second terminal belongs, [wherein the Wi-Fi] *the WI-FI* Direct configuration information of the second terminal is [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group to which the second terminal belongs[; the establishing a], *and wherein establishing the* Wi-Fi Direct connection between the first terminal and the second terminal according to the Wi-Fi Direct configuration information of the second terminal comprises[:] joining, by the first terminal, the existing *WI-FI P2P* group to which the second terminal belongs according to the [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group.

4. The method according to claim **1**, *wherein* if the first terminal [being not a member of an] *is not the member of the* existing *WI-FI P2P* group and the second terminal [being a client of an] *is the client of the* existing *WI-FI P2P* group to which the second terminal belongs, [wherein the Wi-Fi] *the WI-FI* Direct configuration information of the second terminal further comprises description information of a group owner of the existing [group;

the establishing a Wi-Fi] *WI-FI P2P group, and wherein establishing the WI-FI* Direct connection between the first terminal and the second terminal according to the Wi-Fi Direct configuration information of the second terminal comprises[:] joining, by the first terminal, the existing *WI-FI P2P* group to which the second terminal belongs according to the [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group.

5. The method according to claim **2**, [the] *wherein* establishing, by the first terminal, the [Wi-Fi] *WI-FI* Direct connection with the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal comprises:

setting, by the first terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal, the [Wi-Fi] *WI-FI* Direct configuration information of a new *WI-FI P2P* group to be created;

sending, by the first terminal, the [Wi-Fi] *WI-FI* Direct configuration information of the new *WI-FI P2P* group to be created to the second terminal [through the NFC connection]; and

establishing, by the first terminal, the [Wi-Fi] *WI-FI* Direct connection with the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the new *WI-FI P2P* group to be created.

6. The method according to claim **4**, [before the] *wherein before* joining, by the first terminal, the existing *WI-FI P2P* group to which the second terminal belongs according to [Wi-Fi] *the WI-FI* Direct configuration information of the existing *WI-FI P2P* group, *the method* further comprises:

requesting, by the first terminal, the group owner of the existing *WI-FI P2P* group for the encryption information in the [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group according to the description information of the group owner of the existing *WI-FI P2P* group; *and*

receiving, by the first terminal, the encryption information in the [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group sent by the group owner.

7. A method for establishing a communication connection, comprising:

receiving, by a second terminal, [wireless fidelity (Wi-Fi)] *WI-FI* Direct configuration information of a first terminal from the first terminal[through a near field communication (NFC) connection between the second terminal and the first terminal], wherein the [Wi-Fi] *WI-FI* Direct configuration information of the first terminal comprises *WI-FI point-to-point* (*P2P*) group information of the first terminal, the *WI-FI P2P* group information of the first terminal indicating: the first terminal being not a member of an existing *WI-FI P2P* group, the first terminal being a group owner of an existing *WI-FI P2P* group to which the first terminal belongs, or the first terminal being a client of an existing *WI-FI P2P* group to which the first terminal belongs;

sending, by the second terminal, [Wi-Fi] *WI-FI* Direct configuration information of the second terminal to the first terminal [through the NFC connection between the second terminal and the first terminal], wherein the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal comprises *WI-FI P2P* group information of the second terminal, the *WI-FI P2P* group information of the second terminal indicating: the second terminal being not a member of an existing *WI-FI P2P* group, the second terminal being a group owner of an existing *WI-FI P2P* group to which the second terminal belongs, or the second terminal being a client of an existing *WI-FI P2P* group to which the second terminal belongs; and

establishing a [Wi-Fi] *WI-FI* Direct connection between the second terminal and the first terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the first terminal.

8. The method according to claim **7**, *wherein* if the first terminal [being not a member of an] *is not the member of the* existing *WI-FI P2P* group and the second terminal [being a group owner of an] *is the group owner of the* existing *WI-FI P2P* group to which the second terminal belongs, [wherein the Wi-Fi] *the WI-FI* Direct configuration information of the second terminal is [Wi-Fi] *the WI-FI* Direct configuration information of the existing *WI-FI P2P* group to which the second terminal belongs.

9. The method according to claim **7**, *wherein* if the first terminal [being not a member of an] *is not the member of the* existing *WI-FI P2P* group and the second terminal [being a client of an] *is the client of the* existing *WI-FI P2P* group to which the second terminal belongs, [wherein the Wi-Fi] *the WI-FI* Direct configuration information of the second terminal further comprises description information of a group owner of the existing *WI-FI P2P* group.

10. A terminal, wherein the terminal is a first terminal and the terminal comprises:

a memory[,] configured to store an executable program code; and

at least one processor[,] configured to run, by reading the executable program code stored in the memory, a program corresponding to the executable program code so as to perform the following steps:

[send wireless fidelity (Wi-Fi)] *sending WI-FI* Direct configuration information of the first terminal to a second terminal[through a near field communication (NFC) connection between the first terminal and the

second terminal], wherein the [Wi-Fi] *WI-FI* Direct configuration information of the first terminal comprises *WI-FI point-to-point* (*P2P*) group information of the first terminal, the *WI-FI P2P* group information of the first terminal indicating: the first terminal being not a member of an existing *WI-FI P2P* group, the first terminal being a group owner of an existing *WI-FI P2P* group to which the first terminal belongs, or the first terminal being a client of an existing *WI-FI P2P* group to which the first terminal belongs;

[receive Wi-Fi] *receiving* Direct configuration information of the second terminal from the second terminal [through the NFC connection between the first terminal and the second terminal], wherein the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal comprises *WI-FI P2P* group information of the second terminal, the *WI-FI P2P* group information of the second terminal indicating: the second terminal being not a member of an existing *WI-FI P2P* group, the second terminal being a group owner of an existing *WI-FI P2P* group to which the second terminal belongs, or the second terminal being a client of an existing *WI-FI P2P* group to which the second terminal belongs; and

[establish a Wi-Fi] *establishing a WI-FI* Direct connection between the first terminal and the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal.

11. The terminal according to claim **10**, *wherein* if the first terminal [being not a member of an] *is not the member of the* existing *WI-FI P2P* group and the second terminal [being not a member of an] *is not the member of the* existing *WI-FI P2P* group, [wherein the establish a Wi-Fi] *establishing the WI-FI* Direct connection between the first terminal and the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal comprises[: establish the Wi-Fi] *establishing the WI-FI* Direct connection with the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal.

12. The terminal according to claim **10**, *wherein* if the first terminal [being not a member of an] *is not the member of the* existing *WI-FI P2P* group and the second terminal [being a group owner of an] *is the group owner of the* existing *WI-FI P2P* group to which the second terminal belongs, [wherein the Wi-Fi] *the WI-FI* Direct configuration information of the second terminal is [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group to which the second terminal belongs[; the establish a Wi-Fi], *and wherein establishing the WI-FI* Direct connection between the first terminal and the second terminal according to the Wi-Fi Direct configuration information of the second terminal comprises[: join] *comprises joining* the existing *WI-FI P2P* group to which the second terminal belongs according to the [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group.

13. The terminal according to claim **10**, *wherein* if the first terminal [being not a member of an] *is not the member of the* existing *WI-FI P2P* group and the second terminal [being a client of an] *is the client of the* existing *WI-FI P2P* group to which the second terminal belongs, [wherein the Wi-Fi] *the WI-FI* Direct configuration information of the second terminal further comprises description information of a group owner of the existing [group; the establish a Wi-Fi] *WI-FI P2P group, and wherein establishing the WI-FI* Direct connection between the first terminal and the second terminal according to the Wi-Fi Direct configuration information of the second terminal comprises[: join] *comprises joining* the existing *WI-FI P2P* group to which the second terminal belongs according to the [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group.

14. The terminal according to claim **11**, [the establish the Wi-Fi] *wherein establishing the WI-FI* Direct connection with the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal comprises:

[set the Wi-Fi] *setting the WI-FI* Direct configuration information of the [a] new *WI-FI P2P* group to be created according to the [Wi-Fi] *WI-FI* Direct configuration information of the second terminal;

[send the Wi-Fi] *sending the WI-FI* Direct configuration information of the new *WI-FI P2P* group to be created to the second terminal[through the NFC connection]; and

[establish the Wi-Fi] *establishing the WI-FI* Direct connection with the second terminal according to the [Wi-Fi] *WI-FI* Direct configuration information of the new *WI-FI P2P* group to be created.

15. The terminal according to claim **13**, [before the join] *wherein before joining* the existing *WI-FI P2P* group to which the second terminal belongs according to [Wi-Fi] *the WI-FI* Direct configuration information of the existing *WI-FI P2P* group, [further comprises] *the steps further comprise*:

[request] *requesting* the group owner of the existing *WI-FI P2P* group for the encryption information in the [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group according to the description information of the group owner of the existing *WI-FI P2P* group; *and*

[receive] *receiving* the encryption information in the [Wi-Fi] *WI-FI* Direct configuration information of the existing *WI-FI P2P* group sent by the group owner.

16. A terminal, wherein the terminal is a second terminal and the terminal comprises:

a memory[,] configured to store an executable program code; and

at least one processor[,] configured to run, by reading the executable program code stored in the memory, a program corresponding to the executable program code so as to perform the following steps:

[receive wireless fidelity (Wi-Fi)] *receiving WI-FI* Direct configuration information of a first terminal from the first terminal [through a near field communication (NFC) connection between the second terminal and the first terminal], wherein the [Wi-Fi] *WI-FI* Direct configuration information of the first terminal comprises *WI-FI point-to-point* (*P2P*) group information of the first terminal, the *WI-FI P2P* group information of the first terminal indicating: the first terminal being not a member of an existing *WI-FI P2P* group, the first terminal being a group owner of an existing *WI-FI P2P* group to which the first terminal belongs, or the first terminal being a client of an existing *WI-FI P2P* group to which the first terminal belongs;

[send Wi-Fi] *sending WI-FI* Direct configuration information of the second terminal to the first terminal [through the NFC connection between the second terminal and the first terminal], wherein the Wi-Fi Direct configuration information of the second terminal comprises *WI-FI P2P* group information of the second terminal, the *WI-FI P2P* group information of the second terminal comprises: the second termi-

nal being not a member of an existing *WI-FI P2P* group, or the second terminal being a group owner of an existing *WI-FI P2P* group to which the second terminal belongs, or the second terminal being a client of an existing *WI-FI P2P* group to which the second terminal belongs; and

[establish a Wi-Fi**]** *establishing a WI-FI* Direct connection between the second terminal and the first terminal according to the Wi-Fi Direct configuration information of the first terminal.

17. The terminal according to claim **16**, *wherein* if the first terminal **[**being not a member of an**]** *is not the member of the* existing *WI-FI P2P* group and the second terminal **[**being a group owner of an**]** *is the group owner of the* existing *WI-FI P2P* group to which the second terminal belongs, **[**wherein the Wi-Fi**]** *the WI-FI* Direct configuration information of the second terminal is **[**Wi-Fi**]** *WI-FI* Direct configuration information of the existing *WI-FI P2P* group to which the second terminal belongs.

18. The terminal according to claim **16**, **[**if the first terminal being not a member of an**]** *wherein the first terminal is not the member of the* existing *WI-FI P2P* group and the second terminal **[**being a client of an**]** *is the client of the* existing *WI-FI P2P* group to which the second terminal belongs, **[**wherein the Wi-Fi**]** *the WI-FI* Direct configuration information of the second terminal further comprises description information of a group owner of the existing *WI-FI P2P* group.

19. A method for establishing a communication connection, comprising:

sending, by a first terminal, WI-FI Direct configuration information of the first terminal to a second terminal, wherein the WI-FI Direct configuration information of the first terminal comprises WI-FI point-to-point (P2P) group information of the first terminal, the WI-FI P2P group information of the first terminal indicating: the first terminal being not a member of any existing WI-FI P2P group, the first terminal being a group owner of an existing WI-FI P2P group to which the first terminal belongs, or the first terminal being a client of an existing WI-FI P2P group to which the first terminal belongs;

receiving, by the first terminal, WI-FI Direct configuration information of the second terminal from the second terminal, wherein the WI-FI Direct configuration information of the second terminal comprises WI-FI P2P group information of the second terminal, the WI-FI P2P group information of the second terminal indicating: the second terminal being not a member of any existing WI-FI P2P group, the second terminal being a group owner of an existing WI-FI P2P group to which the second terminal belongs, or the second terminal being a client of an existing WI-FI P2P group to which the second terminal belongs; and

determining that both the first terminal and the second terminal are not a member of any existing WI-FI P2P group and, based thereon, establishing, by the first terminal, a WI-FI Direct connection between the first terminal and the second terminal according to the WI-FI Direct configuration information of the second terminal.

20. A method for establishing a communication connection, comprising:

sending, by a first terminal, WI-FI Direct configuration information of the first terminal to a second terminal, wherein the WI-FI Direct configuration information of the first terminal comprises WI-FI point-to-point (P2P) group information of the first terminal, the WI-FI P2P group information of the first terminal indicating: the first terminal being not a member of any existing WI-FI P2P group, the first terminal being a group owner of an existing WI-FI P2P group to which the first terminal belongs, or the first terminal being a client of an existing WI-FI P2P group to which the first terminal belongs;

receiving, by the first terminal, WI-FI Direct configuration information of the second terminal from the second terminal, wherein the WI-FI Direct configuration information of the second terminal comprises WI-FI P2P group information of the second terminal, the WI-FI P2P group information of the second terminal indicating: the second terminal being not a member of any existing WI-FI P2P group, the second terminal being a group owner of an existing WI-FI P2P group to which the second terminal belongs, or the second terminal being a client of an existing WI-FI P2P group to which the second terminal belongs; and

determining that the first terminal is not a member of any existing WI-FI P2P group and the second terminal is a group owner of the existing WI-FI P2P group to which the second terminal belongs and, based thereon, joining, by the first terminal, the existing WI-FI P2P group to which the second terminal belongs.

21. A method for establishing a communication connection, comprising:

sending, by a first terminal, WI-FI Direct configuration information of the first terminal to a second terminal, wherein the WI-FI Direct configuration information of the first terminal comprises WI-FI point-to-point (P2) group information of the first terminal, the WI-FI P2P group information of the first terminal indicating: the first terminal being not a member of any existing WI-FI P2P group, the first terminal being a group owner of an existing WI-FI P2P group to which the first terminal belongs, or the first terminal being a client of an existing WI-FI P2P group to which the first terminal belongs;

receiving, by the first terminal, WI-FI Direct configuration information of the second terminal from the second terminal, wherein the WI-FI Direct configuration information of the second terminal comprises WI-FI P2P group information of the second terminal, the WI-FI P2P group information of the second terminal indicating: the second terminal being not a member of any existing WI-FI P2P group, the second terminal being a group owner of an existing WI-FI P2P group to which the second terminal belongs, or the second terminal being a client of an existing WI-FI P2P group to which the second terminal belongs; and

determining that the first terminal is not a member of any existing WI-FI P2P group and the second terminal is a group client of the existing WI-FI P2P group to which the second terminal belongs and, based thereon,

obtaining, by the first terminal, description information of the existing WI-FI P2P group to which the second terminal belongs comprised in the Wi-Fi Direct configuration information of the second terminal;

obtaining, by the first terminal, a group owner of the existing WI-FI P2P group to which the second terminal belongs according to the description information of the existing WI-FI P2P group to which the second terminal belongs; and

joining, by the first terminal, the existing WI-FI P2P group to which the second terminal belongs.

22. The method according to claim 19, wherein establishing, by the first terminal, the WI-FI Direct connection with the second terminal according to the WI-FI Direct configuration information of the second terminal comprises:

setting, by the first terminal according to the WI-FI Direct configuration information of the second terminal, WI-FI Direct configuration information of a new WI-FI P2P group to be created;

sending, by the first terminal, the WI-FI Direct configuration information of the new WI-FI P2P group to be created to the second terminal; and

establishing, by the first terminal, the WI-FI Direct connection with the second terminal according to the WI-FI Direct configuration information of the new WI-FI P2P group to be created.

23. The method according to claim 21, wherein before joining, by the first terminal, the existing WI-FI P2P group to which the second terminal belongs, the method further comprises:

requesting, by the first terminal, the group owner of the existing WI-FI P2P group to which the second terminal belongs for encryption information; and

receiving, by the first terminal, the encryption information from the group owner of the existing WI-FI P2P group to which the second terminal belongs.

24. A terminal, comprising:

a memory configured to store an executable program code; and

at least one processor configured to run, by reading the executable program code stored in the memory, a program corresponding to the executable program code so as to perform the following steps:

sending WI-FI Direct configuration information of the terminal to another terminal, wherein the WI-FI Direct configuration information of the terminal comprises WI-FI point-to-point (P2P) group information of the terminal, the WI-FI P2P group information of the terminal indicating: the terminal being not a member of any existing WI-FI P2P group, the terminal being a group owner of an existing WI-FI P2P group to which the terminal belongs, or the terminal being a client of an existing WI-FI P2P group to which the terminal belongs;

receiving WI-FI Direct configuration information of the other terminal from the other terminal, wherein the WI-FI Direct configuration information of the other terminal comprises WI-FI P2P group information of the other terminal, the WI-FI P2P group information of the other terminal indicating: the other terminal being not a member of any existing WI-FI P2P group, the other terminal being a group owner of an existing WI-FI P2P group to which the other terminal belongs, or the other terminal being a client of an existing WI-FI P2P group to which the other terminal belongs; and

determining that both the terminal and the other terminal are not a member of any existing WI-FI P2P group and, based thereon, establish a WI-FI Direct connection between the terminal and the other terminal according to the WI-FI Direct configuration information of the other terminal.

25. A terminal, comprising:

a memory, configured to store an executable program code; and

at least one processor, configured to run, by reading the executable program code stored in the memory, a program corresponding to the executable program code so as to perform the following steps:

sending WI-FI Direct configuration information of the terminal to another terminal, wherein the WI-FI Direct configuration information of the terminal comprises WI-FI point-to-point (P2P) group information of the terminal, the WI-FI P2P group information of the terminal indicating: the terminal being not a member of any existing WI-FI P2P group, the terminal being a group owner of an existing WI-FI P2P group to which the terminal belongs, or the terminal being a client of an existing WI-FI P2P group to which the terminal belongs;

receiving WI-FI Direct configuration information of the other terminal from the other terminal, wherein the WI-FI Direct configuration information of the other terminal comprises WI-FI P2P group information of the other terminal, the WI-FI P2P group information of the other terminal indicating: the other terminal being not a member of any existing WI-FI P2P group, the other terminal being a group owner of an existing WI-FI P2P group to which the other terminal belongs, or the other terminal being a client of an existing WI-FI P2P group to which the other terminal belongs; and

determining that the terminal is not a member of any existing WI-FI P2P group and the other terminal is a group owner of the existing WI-FI P2P group to which the other terminal belongs and, based thereon, joining the existing WI-FI P2P group to which the other terminal belongs.

26. A terminal, comprising:

a memory configured to store an executable program code; and

at least one processor configured to run, by reading the executable program code stored in the memory, a program corresponding to the executable program code so as to perform the following steps:

sending WI-FI Direct configuration information of the terminal to another terminal, wherein the WI-FI Direct configuration information of the terminal comprises WI-FI point-to-point (P2P) group information of the terminal, the WI-FI P2P group information of the terminal indicating: the terminal being not a member of any existing WI-FI P2P group, the terminal being a group owner of an existing WI-FI P2P group to which the terminal belongs, or the terminal being a client of an existing WI-FI P2P group to which the terminal belongs;

receiving WI-FI Direct configuration information of the other terminal from the other terminal, wherein the WI-FI Direct configuration information of the other terminal comprises WI-FI P2P group information of the other terminal, the WI-FI P2P group information of the other terminal indicating: the other terminal being not a member of any existing WI-FI P2P group, the other terminal being a group owner of an existing WI-FI P2P group to which the other terminal belongs, or the other terminal being a client of an existing WI-FI P2P group to which the other terminal belongs;

determining that the terminal is not a member of any existing WI-FI P2P group and the other terminal is a group client of the existing WI-FI P2P group to which the other terminal belongs and, based thereon,

obtaining description information of the existing WI-FI P2P group to which the other terminal belongs

comprised in the WI-FI Direct configuration information of the other terminal;

obtaining a group owner of the existing WI-FI P2P group to which the other terminal belongs according to the description information of the existing WI-FI P2P group to which the other terminal belongs; and

joining the existing WI-FI P2P group to which the other terminal belongs.

27. The terminal according to claim 24, wherein establishing the WI-FI Direct connection with the other terminal according to the Wi-Fi Direct configuration information of the other terminal comprises:

setting WI-FI Direct configuration information of a new WI-FI P2P group to be created according to the WI-FI Direct configuration information of the other terminal;

sending the WI-FI Direct configuration information of the new WI-FI P2P group to be created to the other terminal through; and

establishing the Wi-Fi Direct connection with the other terminal according to the WI-FI Direct configuration information of the new WI-FI P2P group to be created.

28. The terminal according to claim 26, wherein before joining the existing WI-FI P2P group to which the other terminal belongs according to WI-FI Direct configuration information of the existing WI-FI P2P group, the at least one processor is further configured to perform the following steps:

requesting the group owner of the existing WI-FI P2P group to which the other terminal belongs for encryption information; and

receiving the encryption information from the group owner of the existing WI-FI P2P group to which the other terminal belongs.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : RE48,986 E
APPLICATION NO. : 15/981509
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INVENTOR(S) : Guoqing Li and Zhihao Jin

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Claim 10, Column 51, Line 11: "receiving Direct" should read "receiving WI-FI Direct"

Claim 13, Column 52, Line 1: "comprises[: join] comprises joining" should read "[comprises: join] comprises joining"

Signed and Sealed this
Twenty-fourth Day of May, 2022

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office