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(54) **IMAGE FORMING APPARATUS AND DATA COMMUNICATION METHOD OF IMAGE FORMING APPARATUS**

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(57) **ABSTRACT**

An image forming apparatus includes a short-range wireless communication device to communicate with a portable terminal via short-range wireless communication, a first wireless communication device to communicate with the portable terminal via a direct wireless connection, a second wireless communication device to communicate via a network connected to the image forming apparatus, and a control device. The control device includes an authentication unit that determines whether o a device within short-range wireless communication range has been authenticated. The control device sets up a connection for data communication via the network when the portable terminal has been authenticated and set up the direct wireless connection for data communication when the portable terminal has not been authenticated.

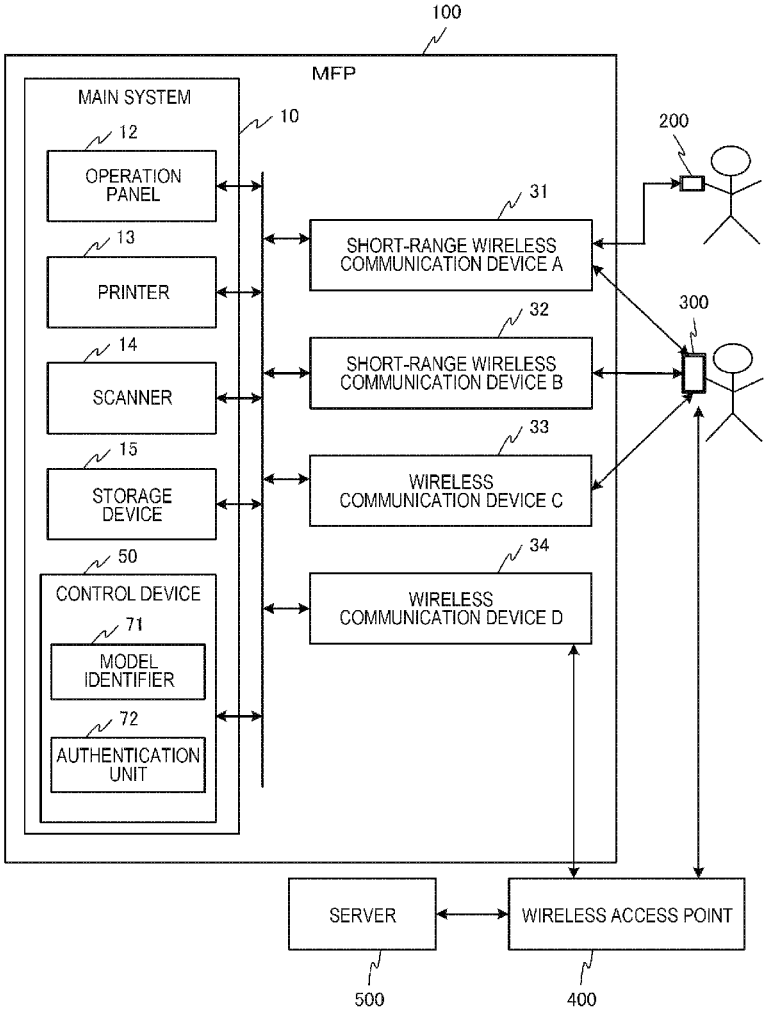

FIG. 1

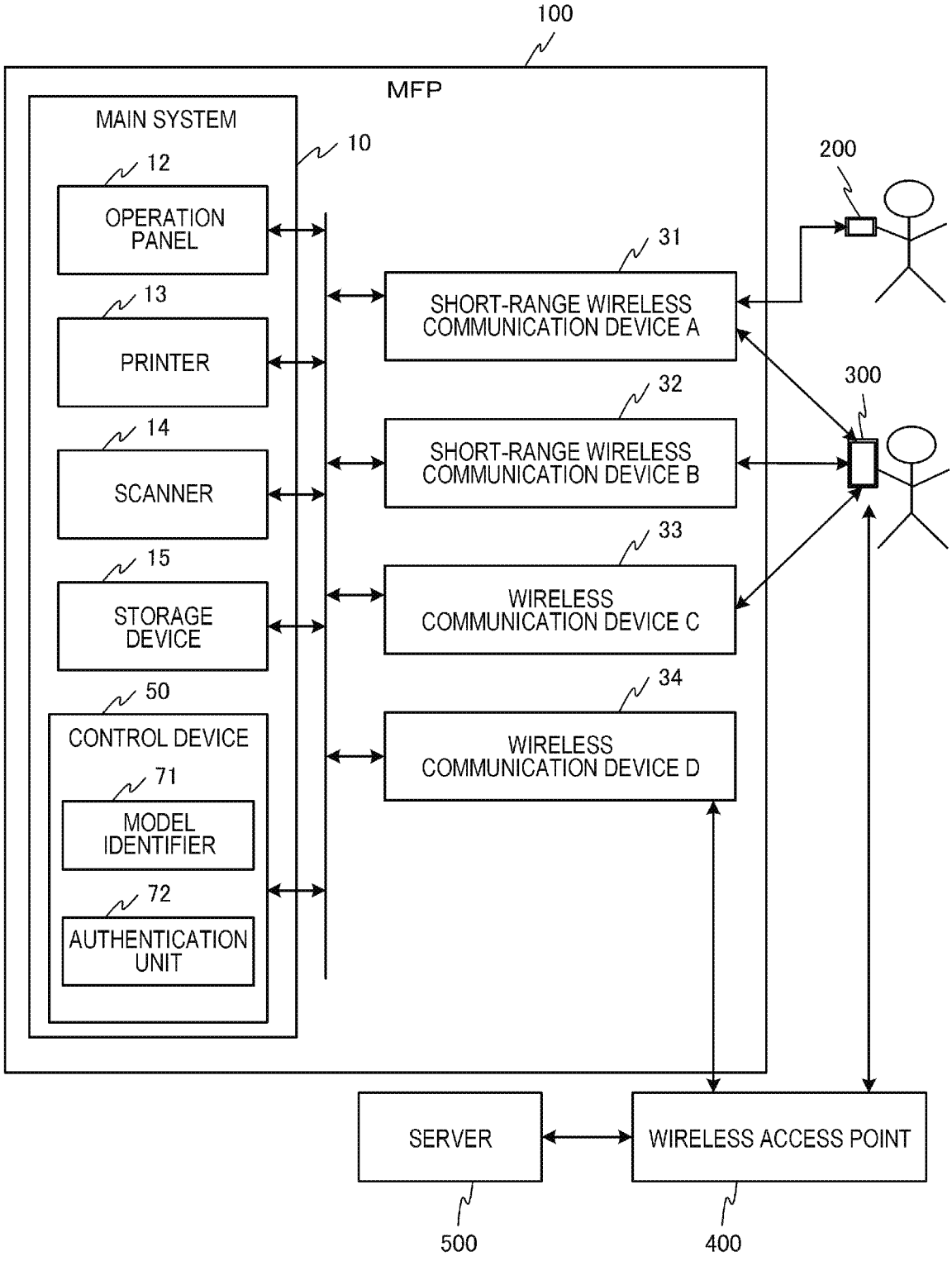
100
MFP
MAIN SYSTEM
10
12
OPERATION PANEL
13
PRINTER
14
SCANNER
15
STORAGE DEVICE
50
CONTROL DEVICE
71
MODEL IDENTIFIER
72
AUTHENTICATION UNIT
31
SHORT-RANGE WIRELESS COMMUNICATION DEVICE A
32
SHORT-RANGE WIRELESS COMMUNICATION DEVICE B
33
WIRELESS COMMUNICATION DEVICE C
34
WIRELESS COMMUNICATION DEVICE D
200
300
SERVER
500
WIRELESS ACCESS POINT
400

FIG. 2

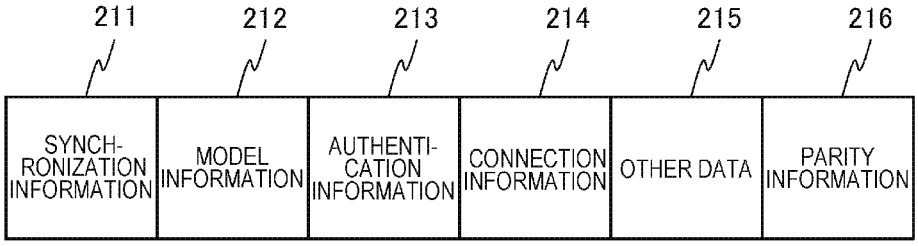
211
212
213
214
215
216
SYNCH-RONIZATION INFORMATION
MODEL INFORMATION
AUTHENTI-CATION INFORMATION
CONNECTION INFORMATION
OTHER DATA
PARITY INFORMATION

FIG. 3

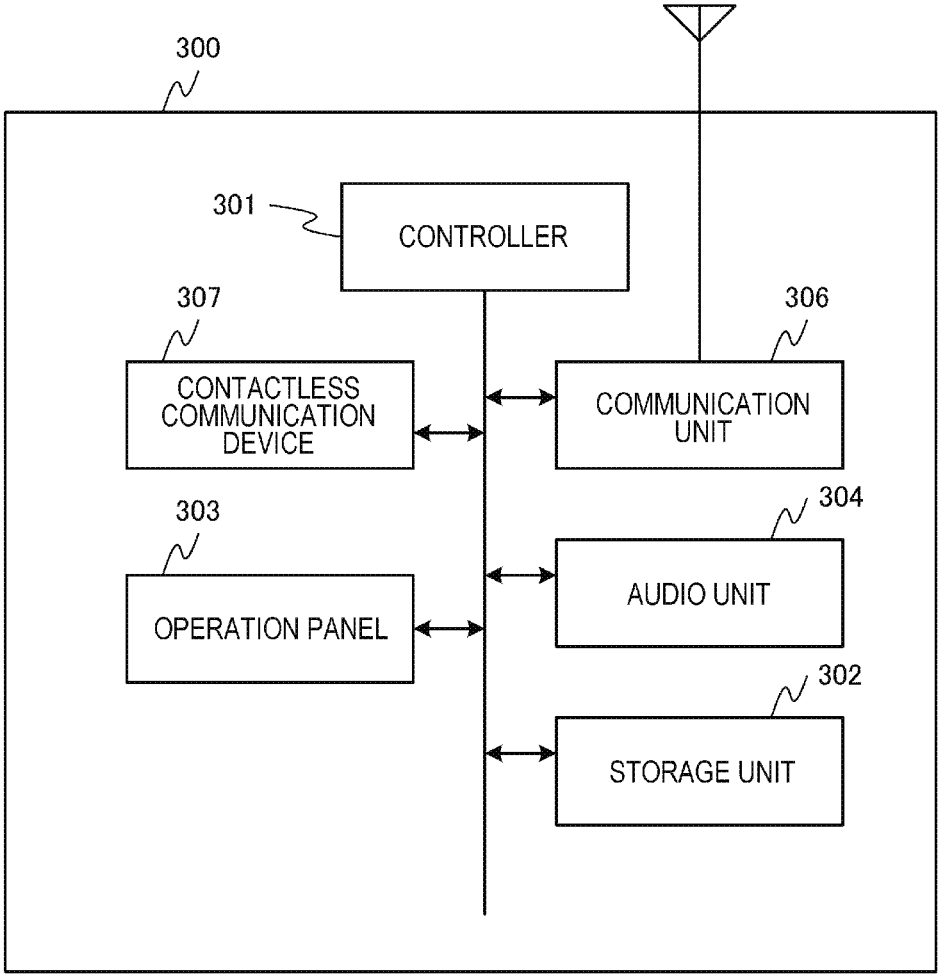
300
301
CONTROLLER
307
CONTACTLESS COMMUNICATION DEVICE
306
COMMUNICATION UNIT
303
OPERATION PANEL
304
AUDIO UNIT
302
STORAGE UNIT

FIG. 4

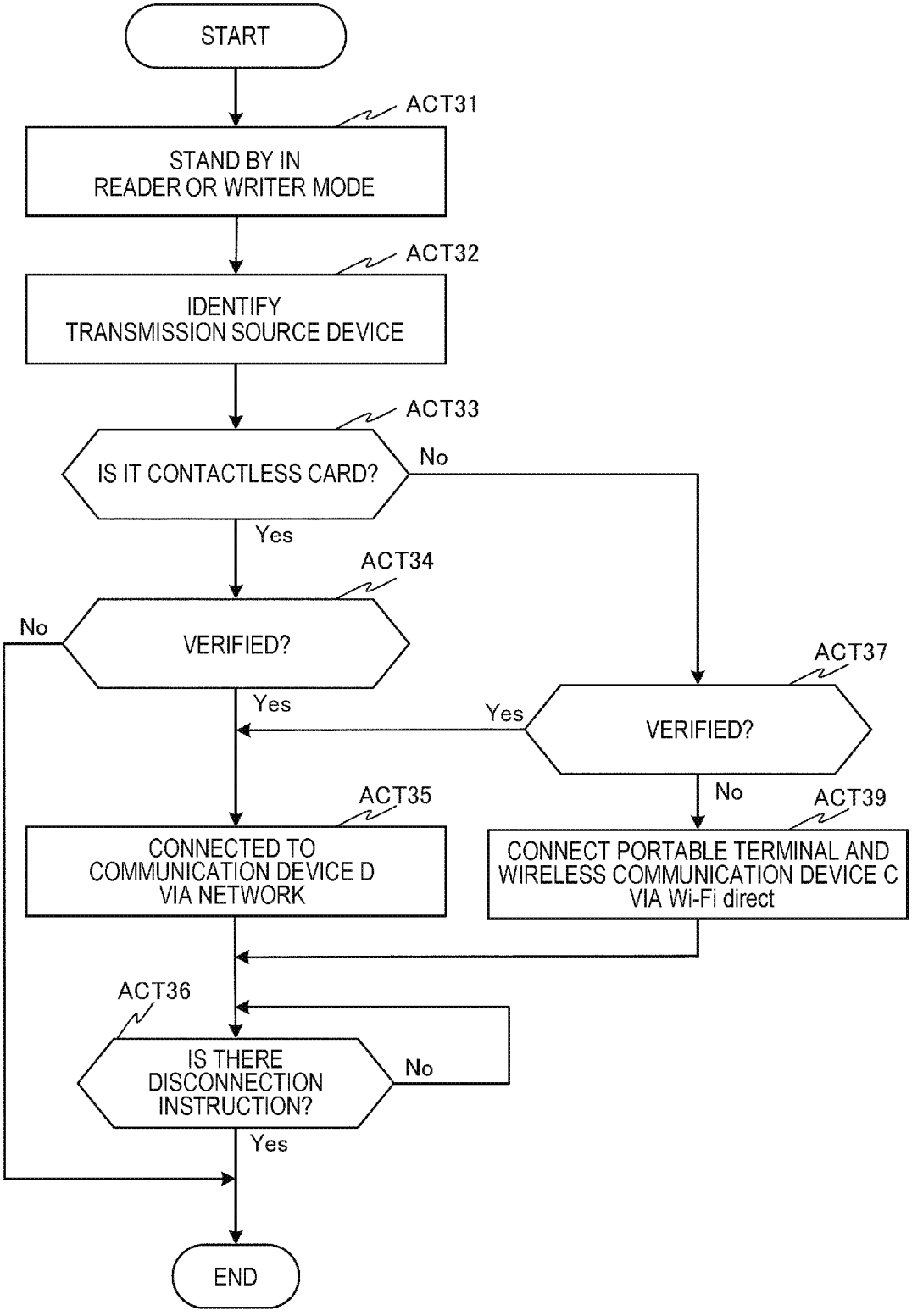
START
ACT31
STAND BY IN READER OR WRITER MODE
ACT32
IDENTIFY TRANSMISSION SOURCE DEVICE
ACT33
IS IT CONTACTLESS CARD?
No
Yes
ACT34
No
VERIFIED?
Yes
ACT37
Yes
VERIFIED?
No
ACT35
CONNECTED TO COMMUNICATION DEVICE D VIA NETWORK
ACT39
CONNECT PORTABLE TERMINAL AND WIRELESS COMMUNICATION DEVICE C VIA Wi-Fi direct
ACT36
IS THERE DISCONNECTION INSTRUCTION?
No
Yes
END

FIG. 5

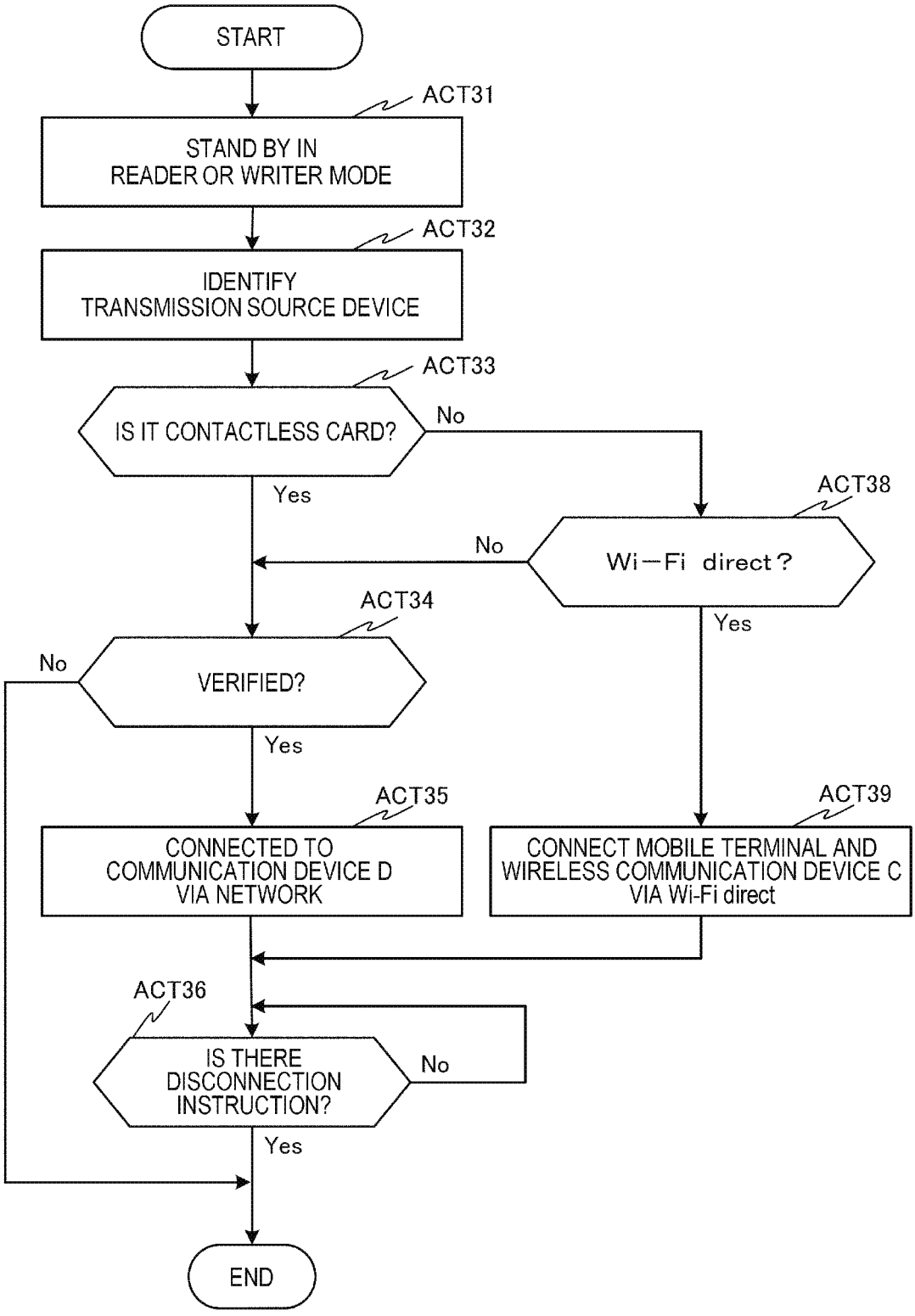
START
ACT31
STAND BY IN READER OR WRITER MODE
ACT32
IDENTIFY TRANSMISSION SOURCE DEVICE
ACT33
IS IT CONTACTLESS CARD?
No
Yes
ACT38
Wi−Fi direct?
No
Yes
ACT34
VERIFIED?
No
Yes
ACT35
CONNECTED TO COMMUNICATION DEVICE D VIA NETWORK
ACT39
CONNECT MOBILE TERMINAL AND WIRELESS COMMUNICATION DEVICE C VIA Wi-Fi direct
ACT36
IS THERE DISCONNECTION INSTRUCTION?
No
Yes
END

IMAGE FORMING APPARATUS AND DATA COMMUNICATION METHOD OF IMAGE FORMING APPARATUS

FIELD

[0001] Embodiments described herein relate generally to an image forming apparatus and a data communication method of an image forming apparatus.

BACKGROUND

[0002] In a meeting or conference with an external client, it would be convenient to print image data stored on client's own portable terminal, such as a smartphone or a tablet, by temporarily connecting the client's portable terminal to a multifunction peripheral that is connected to a secured internal network or the like. Accordingly, a multifunction peripheral that allows the client's portable terminal to use the internal network has been proposed.

[0003] In such an example, the multifunction peripheral may directly transmit connection information necessary for using the internal network to the portable terminal via near-field communication (NFC) or the like rather than via the internal network itself. A portable terminal that receives the connection information can then use the internal network for high-speed communication with the multifunction peripheral, as long as the necessary connection information is provided. Accordingly, an external client can easily print large image data files from his/her portable terminal via the multifunction peripheral.

[0004] However, in such a case, the image data stored on the client's portable terminal is transmitted via the internal network. As such, a non-managed, and thus perhaps unprotected or unsecured, portable terminal that is not normally permitted to access the internal network is temporarily connected to the internal network such that communication can be established therebetween. Such a connection by a non-managed device, even if temporary, poses a risk to the overall security of the internal network.

DESCRIPTION OF THE DRAWINGS

[0005] FIG. **1** is a block diagram illustrating a configuration example of a digital multifunction peripheral which is an image forming apparatus according to a first embodiment;

[0006] FIG. **2** is a diagram for explaining a signal configuration of a packet transmitted via short-range wireless communication according to the first embodiment;

[0007] FIG. **3** is a block diagram illustrating a configuration example of a portable terminal according to the first embodiment;

[0008] FIG. **4** is a flowchart illustrating an operation of a digital multifunction peripheral which is an image forming apparatus according to the first embodiment; and

[0009] FIG. **5** is a flowchart illustrating an operation of a digital multifunction peripheral which is an image forming apparatus according to a second embodiment.

DETAILED DESCRIPTION

[0010] An embodiment of the present disclosure addresses the use and security circumstances described above and enables use of a networked multifunction peripheral without comprising a security level of a secured internal network connected to the multifunction peripheral.

[0011] According to one embodiment, an image forming apparatus comprises: a short-range wireless communication device configured to communicate with a portable terminal via short-range wireless communication; a first wireless communication device configured to communicate with the portable terminal via a direct wireless connection with the portable terminal; a second wireless communication device configured to communicate with a designated communication device via a network connected to the image forming apparatus; and a control device. The control device includes an authentication unit that determines whether or not a device within range of the short-range wireless communication device has been authenticated. The control device is configured to set up a connection for data communication between the second wireless communication device and the designated communication device via the network when the portable terminal has been authenticated and set up the direct wireless connection for data communication between the first wireless communication device and the portable terminal when the portable terminal has not been authenticated.

First Embodiment

[0012] Hereinafter, a first embodiment will be described with reference to the drawings. FIG. **1** is a block diagram illustrating a configuration example of a digital multifunction peripheral (MFP) **100**, which is an image forming apparatus, and a communication system including the MFP **100**. As illustrated in FIG. **1**, the communication system includes the MFP **100**, a contactless card **200**, a portable terminal **300**, a wireless access point **400**, and a server **500**.

[0013] The MFP **100** is an image forming apparatus having a printing function, a copying function, a scanning function, and the like.

[0014] The contactless card **200** is a card capable of performing short-range wireless communication with the MFP **100** while in a non-contact state. Here, it is assumed that the contactless card **200** performs communication by a contactless communication method such as near-field communication (NFC). In this example, the portable terminal **300** is a smartphone, a cellular phone, a tablet terminal, or the like. The portable terminal **300** can perform short-range wireless communication with the MFP **100** via NFC, high-speed wireless communication with the MFP **100** via a Wi-Fi direct connection, and high-speed wireless communication with the MFP **100** via a wireless local area network (LAN) utilizing the wireless access point **400**. A Wi-Fi direct connection (also referred to for simplicity as "Wi-Fi direct") is a wireless communication scheme via which two different devices may directly communicate with each other wirelessly in a 1:1 manner without using a wireless access point (e.g., wireless access point **400** of the WLAN). The server **500** is a communication device that stores image data to be printed by the MFP **100**. The server **500** is, for example, a general-purpose personal computer. The MFP **100** and the server **500** are connected to an internal network. When the portable terminal **300** has undergone an authentication process, the portable terminal **300** may transmit image data to the MFP **100** via the wireless access point **400**.

MFP

[0015] Next, a configuration of the MFP **100**. As illustrated in FIG. **1**, the MFP **100** includes a main system **10**, a

storage device **15**, a short-range wireless communication device **31**, a short-range wireless communication device **32**, a wireless communication device **33**, and a wireless communication device **34**.

[0016] The main system **10** provides printing functions necessary for a digital multifunction peripheral. The main system **10** includes an operation panel **12**, a printer **13**, a scanner **14**, the storage device **15**, and a control device **50**.

[0017] The operation panel **12** includes a display device and an input device. The display device includes, for example, a liquid crystal display, an organic electroluminescence (EL) display, or the like. The input device includes, for example, a touch panel, a keyboard, a number keypad, and the like.

[0018] The printer **13** is an image forming apparatus that prints an image on a recording medium such as paper.

[0019] The scanner **14** includes an image pickup device such as a charge-coupled device (CCD) image sensor and an optical system which guides light from an original document to the image pickup device. The scanner **14** reads an image on the original document to provide image data corresponding to the scanned original document. For example, the scanner **14** obtains the image data by optically scanning the image printed on the original document.

[0020] The storage device **15** includes a rewritable nonvolatile memory. The storage device **15** stores image data and various programs such as an application program.

[0021] The short-range wireless communication device **31** is a wireless communication module that performs communication via NFC. The short-range wireless communication device **31** communicates with the contactless card **200** and the portable terminal **300**. The short-range wireless communication device **31** in this example operates in compliance with a standard defined by ISO/IEC 1443 or ISO/IEC 18092. For example, the short-range wireless communication device **31** receives model information, authentication information, and the like from the contactless card **200** and the portable terminal **300**, and transmits them to the control device **50**.

[0022] FIG. **2** illustrates an example of a signal configuration of a packet transmitted from the contactless card **200** and the portable terminal **300** via NFC. As illustrated in FIG. **2**, the packet includes synchronization information **211**, model information **212**, authentication information **213**, connection information **214**, other data **215**, and parity information **216**.

[0023] The synchronization information **211** is information identifying the position of a head of the packet received by the short-range wireless communication device **31** or the short-range wireless communication device **32**. The number of bits and a bit pattern for binary information (0 and 1) of the synchronization information **211** are prescribed according to a standard. The model information **212** is information specifying the type of a device. Here, the model information **212** specifies whether a device approaching the short-range wireless communication device **31** or the short-range wireless communication device **32** is the contactless card **200** or the portable terminal **300**. For example, the model information value "01" represents a contactless card, and the model information value "10" represents a portable terminal. The authentication information **213** is information for determining whether to allow communication with the MFP **100**. The authentication information **213** is, for example, information specifying a user, such as a user identification (ID) number or code. The connection information **214** is either information regarding connection to the server **500** that stores image data to be printed by the MFP **100** or information regarding connection to the portable terminal **300**. The connection information **214** includes connection information for providing communication between the MFP **100** and the portable terminal **300** via Wi-Fi direct or connection information for providing communication between the MFP **100** and the portable terminal **300** via the wireless access point **400**. The other data **215** is arbitrary information. The parity information **216** is information for checking whether there is an error in a received packet. The parity information **216** is generated, for example, based on a rule such as even parity. When a parity error is detected, the short-range wireless communication device **31** or the short-range wireless communication device **32** discards the information of the received packet.

[0024] The short-range wireless communication device **32** is a wireless communication module that communicates with the portable terminal **300** via NFC. The short-range wireless communication device **32** transmits the received model information **212** and the authentication information **213** to the control device **50** only when the received model information **212** is "10," representing a portable terminal. When the received model information **212** is "01," representing a contactless card, the short-range wireless communication device **32** does not process anything.

[0025] The wireless communication device **33** has a function of directly communicating with the portable terminal **300** by a wireless communication method at a communication speed that is faster than the communication speed of the short-range wireless communication method, while not being connected to a separate network. That is, the wireless communication device **33** directly communicates with the portable terminal **300** via Wi-Fi direct. A permissible distance of wireless communication via Wi-Fi direct is set to, for example, about 3 m. The permissible wireless communication distance can be determined in consideration of security and convenience. This wireless communicable distance can be adjusted by changing the transmission power of the wireless communication device **33** and the portable terminal **300**. The transmission power of the portable terminal **300** is generally set by application software installed in the portable terminal **300**.

[0026] The wireless communication device **34** communicates with the portable terminal **300** or the server **500** via a network by a wireless communication method that is at a communication speed faster than a communication speed of the short-range wireless communication method. The network in this instance is an internal, secured network. Specifically, the wireless communication device **34** performs data communication with the portable terminal **300** or the server **500** via the wireless access point **400**. The portable terminal **300** and the server **500** transmit image data to the MFP **100** via the wireless access point **400** according to a user's instructions.

[0027] The control device **50** may physically include a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), and the like. Various programs including an application program for the MFP **100** are recorded in the ROM. The CPU executes various processes by reading a program from the ROM. The RAM functions as a work area of the CPU.

[0028] Functionally, the control device **50** includes a model identifier **71** and an authentication unit **72**. The model identifier **71** determines whether a device approaching the MFP **100** is the contactless card **200** or the portable terminal **300** on the basis of the model information **212** obtained from the contactless card **200** or the portable terminal **300** approaching the MFP **100**. For example, the model identifier **71** identifies the device as a contactless card **200** when the model information **212** is "01", and identifies the device as a portable terminal **300** when the model information is "10".

[0029] The authentication unit **72** determines whether the authentication information **213** obtained from the contactless card **200** or the portable terminal **300** approaching the MFP **100** is registered authentication information. In particular, the authentication unit **72** determines whether the received authentication information **213** is registered authentication information by comparing the received authentication information **213** with the information stored in the storage device **15**.

[0030] When the authentication information **213** sent from the portable terminal **300** is registered authentication information, the control device **50** sets up a connection for data communication between the wireless communication device **34** and the server **500** via the internal network. When the authentication information **213** from the portable terminal **300** is not registered authentication information, the control device **50** sets up a connection for data communication between the wireless communication device **33** and the portable terminal **300** via Wi-Fi direct rather than via the internal network.

Contactless Card

[0031] The contactless card **200** performs contactless communication with the short-range wireless communication device **31** of the MFP **100** via NFC. The contactless card **200** operates in compliance with a standard defined in ISO/IEC 1443 or ISO/IEC 18092. A communication distance by NFC is about **10** cm in this instance. The contactless card **200** includes an antenna for short-range wireless communication, an integrated circuit (IC) for communication control, and the like. As illustrated in FIG. **2**, the contactless card **200** transmits model information **212**, authentication information **213**, and the like. For example, the contactless card **200** transmits "01" as the model information **212**.

Portable Terminal

[0032] FIG. **3** is a block diagram illustrating a configuration example of a portable terminal **300**. As illustrated in FIG. **3**, the portable terminal **300** includes a controller **301**, a storage unit **302**, an operation panel **303**, an audio unit **304**, a communication unit **306**, and a contactless communication device **307**.

[0033] The controller **301** includes a CPU, a ROM, a RAM, and the like. The CPU executes various functions by executing the application program stored in the ROM. The RAM is used as, for example, a work area of the CPU.

[0034] The storage unit **302** is a nonvolatile memory that stores various types of data. An application program for transmitting image data to the MFP **100** is stored in the storage unit **302**.

[0035] The operation panel **303** includes a display device and an input device. The display device includes, for example, a liquid crystal display, an organic electroluminescence (EL) display, or the like. The input device includes, for example, a touch panel, a keyboard, a number keypad, and the like.

[0036] The audio unit **304** is configured to receive sound input thereto or to output sound therefrom. The audio unit **304** includes a speaker, a receiver, a microphone and the like.

[0037] The communication unit **306** performs wireless communication via an antenna. The communication unit **306** has a communication function of allowing the portable terminal **300** to communicate with the MFP **100** via the internal network. In addition, the communication unit **306** has a communication function for allowing the portable terminal **300** to directly communicate with the MFP **100** via Wi-Fi direct rather than via the internal network. For example, the communication unit **306** transmits image data to be printed by the MFP **100**. When the image data is transmitted to the MFP **100** via Wi-Fi direct, the transmission power of the communication unit **306** is limited such that a maximum communication distance is about 3 m.

[0038] The contactless communication device **307** performs contactless communication with the short-range wireless communication device **31** of the MFP **100** via NFC. The contactless communication device **307** includes an antenna for short-range wireless communication, an IC for communication control, and the like. For example, as illustrated in FIG. **2**, the contactless communication device **307** transmits the model information **212**, the authentication information **213**, and the like. For example, the contactless communication device **307** transmits "10" as the model information **212**.

[0039] FIG. **4** is a flowchart illustrating an operation of the MFP **100**.

Contactless Card Case

[0040] First, a case in which the contactless card **200** is brought close to the short-range wireless communication device **31** will be described. The short-range wireless communication device **31** stands by in a reader or writer mode (ACT**31**). Specifically, the short-range wireless communication device **31** stands by for reception while transmitting a predetermined radio wave signal. The predetermined radio wave signal is in compliance with an NFC standard. The contactless card **200** operates in a card emulation mode, for example.

[0041] Upon receiving the predetermined radio wave signal transmitted from the short-range radio communication device **31**, the contactless card **200** transmits a packet (see e.g., FIG. **2**) including model information **212**, authentication information **213**, and the like to the short-range radio communication device **31** via NFC. In this instance, the value "01" is transmitted as the model information **212**. The short-range wireless communication device transmits the model information **212**, the authentication information **213**, and the like to the control device **50**. The control device **50** identifies the model of the transmission source on the basis of the model information **212** (ACT**32**). Here, the device approaching the short-range wireless communication device **31** is the contactless card **200** (ACT**33**: Yes), so the control device **50** receives "01" as the model information **212** and thus determines that the device approaching the MFP **100** is a contactless card **200**. The control device **50** proceeds to ACT**34**.

[0042] Next, the control device **50** determines whether the received authentication information **213** (for example, a user ID) has been registered previously (ACT**34**). In this instance, the control device **50** determines whether the user ID matches a user ID previously stored in the storage device **15**. When the control device **50** determines that the received authentication information **213** is not registered authentication information (ACT**34**: No), the control device **50** ends the processing.

[0043] On the other hand, when the control device **50** determines that the received authentication information **213** has been registered previously (ACT**34**: Yes), the control device **50** proceeds to ACT**35**.

[0044] The control device **50** sets up a connection for data communication between the server **500** and the wireless communication device **34** via the internal network on the basis of the received connection information **214** (ACT**35**). In this instance, the control device **50** sets an Internet protocol (IP) address of the server **500** in the wireless communication device **34**. A user may then use the functions of the application software to request the server **500** to transmit image data via the wireless communication device **34**. The wireless communication device **34** receives the image data transmitted from the server **500**. The control device **50** stores the image data received from the server **500** in the storage device **15**.

[0045] When the connection for data communication between the portable terminal **300** and the wireless communication device **34** has been set up, the control device **50** proceeds to ACT**36**. When an instruction to disconnect the communication is given by the user (ACT**36**: Yes), the control device **50** disconnects the data communication between the wireless communication device **34** and the server **500** and then ends the processing.

[0046] A case in which a contactless card **200** is brought close to the short-range wireless communication device **32** will now be described. The short-range wireless communication device **32** does not process anything when the model information **212** is a value "01" representing the contactless card **200**. Accordingly, processing in ACT**31** illustrated in FIG. **4** continues. Alternatively, when the control device **50** identifies that the model information **212** is the value "01" representing the contactless card **200**, the control device **50** ends the processing at ACT**32**.

Portable Terminal Case

[0047] Next, a case in which a portable terminal **300** is brought close to the short-range wireless communication device **31** will be described. It is assumed that an application program for communicating with the MFP **100** is installed in the portable terminal **300** and furthermore a user has started this application program.

[0048] The short-range wireless communication device **31** stands by in the reader or writer mode (ACT**31**). In this instance, the short-range wireless communication device **31** stands by in a reception mode while transmitting a predetermined radio wave signal. The predetermined radio wave signal is a radio wave that is in compliance with a NFC standard. The portable terminal **300** operates in a card emulation mode, or the like.

[0049] When the portable terminal **300** receives the predetermined radio wave signal transmitted from the short-range wireless communication device **31**, the portable terminal **300** transmits a packet (see e.g., FIG. **2**) including model information **212**, authentication information **213**, and the like to the short-range wireless communication device **31**. In this instance, a value "10" is transmitted as the model information **212**. The short-range wireless communication device **31** transmits the model information **212**, the authentication information **213**, and the like to the control device **50**. The control device **50** identifies the model of the transmission source on the basis of the model information **212** (ACT**32**). Here, since the device approaching the short-range wireless communication device **31** is the portable terminal **300** (ACT**33**: No), the control device **50** receives "10" as the model information **212**, determines that the device approaching the MFP **100** is a portable terminal **300**, and then proceeds to ACT **37**.

[0050] Next, the control device **50** determines whether the received authentication information **213** is authentication information that was registered previously (ACT **37**). When the control device **50** determines that the received authentication information **213** is authentication information that was registered previously (ACT **37**: Yes), the control device **50** proceeds to ACT**35**. When connection information for connecting the portable terminal **300** to the MFP **100** via the wireless access point **400** is included in the connection information **214**, the control device **50** connects the portable terminal **300** and the wireless communication device **34** via the internal network.

[0051] On the other hand, when the control device **50** determines that the authentication information **213** is not previously registered authentication information (ACT **37**: No), the control device **50** proceeds to ACT**39**.

[0052] The control device **50** will set up a connection for communication between the portable terminal **300** and the wireless communication device **33** that does not utilize the internal network (ACT**39**). In this instance, the control device **50** connects the portable terminal **300** and the wireless communication device **33** via Wi-Fi direct. A user may then request the portable terminal **300** to transmit the image data to the MFP **100** by using the functions of the application software. Upon receiving the request to transmit the image data via Wi-Fi direct, the portable terminal **300** switches mode from a card emulation mode to a peer-to-peer (P2P) mode. The P2P mode is also referred to as an inter-terminal communication mode. Communication between the wireless communication device **33** and the portable terminal **300** via Wi-Fi direct is a P2P mode communication. The portable terminal **300** will transmit the image data to the wireless communication device **33** via Wi-Fi direct.

[0053] When data communication is performed via Wi-Fi direct, the portable terminal **300** must be kept at a position within about 3 m or so from the wireless communication device **33**. The control device **50** stores data received from the portable terminal **300** in the storage device **15**.

[0054] Once the connection for data communication between the portable terminal **300** and the wireless communication device **33** is set up, the control device **50** proceeds to ACT**36**. When an instruction to disconnect the communication is given from the user (ACT**36**: Yes), the control device **50** disconnects the data communication between the wireless communication device **33** and the portable terminal **300**, and ends the processing.

[0055] Next, a case in which the portable terminal **300** is brought close to the short-range wireless communication device **32** will be described. The short-range wireless com-

munication device **32** stands by in the reader or writer mode (ACT**31**). The portable terminal **300** operates in a card emulation mode.

[0056] Upon receiving the predetermined radio wave signal transmitted from the short-range wireless communication device **32**, the portable terminal **300** transmits a packet (see e.g., FIG. **2**) including model information **212**, authentication information **213**, and the like to the short-range wireless communication device **32**. In this instance, the value "10" is transmitted as the model information **212**. The short-range wireless communication device transmits the model information **212**, the authentication information **213**, and the like to the control device **50**. The control device **50** identifies the model of the transmission source on the basis of the model information **212** (ACT**32**). Here, since the device approaching the short-range wireless communication device **32** is a portable terminal **300** (ACT**33**: No), the control device **50** receives "10" as the model information **212**, thus determines that the device approaching the MFP **100** is a portable terminal **300**, and then proceeds to ACT **37**. Subsequent processing is as described above.

[0057] Although a case in which the MFP **100** is an image forming apparatus has been described, in other examples, an internal network-connected image forming apparatus is not limited to a MFP type device and, in general, any type of internal network-connected apparatus may be used as long as it can exchange information with a portable terminal in the above described manners. For example, the internal networked-connected apparatus may be a settlement device, such as a point-of-sale (POS) terminal, which is configured to permit the purchase of a commodity, an informational terminal device, such as a kiosk terminal, which is installed at a street corner or a store, or the like.

[0058] Furthermore, a case in which the printer **13** is provided as an image forming apparatus has been described above, but it should be noted that printer **13** is not limited to any specific type of image forming apparatus. For example, printer **13** may be an electrophotographic image forming apparatus, an inkjet image forming apparatus, or a thermal image forming apparatus.

[0059] As described above, the MFP **100** according to the first embodiment may select between communication performed via an internal network or communication performed not via the internal network. In particular, the MFP **100** as described above has a function of directly communicating with the portable terminal **300** via Wi-Fi direct rather than via the internal network. Accordingly, when image data is to be transmitted to the MFP **100** from a portable terminal **300** that is not registered/authenticatable, the image data may still be transmitted to the MFP **100** by other than through the internal network (e.g., via Wi-Fi Direct), thereby enabling use of the MFP **100** by an unsecured terminal without lowering an overall security level of the internal network.

[0060] Furthermore, the MFP **100** according to the first embodiment is configured to communicate with external devices on the basis of model information received via short-range wireless communication. Accordingly, it is possible to limit a user's required efforts in setting a connection route for data communication.

Second Embodiment

[0061] In a second embodiment, a case in which a determination as to whether to connect a portable terminal **300** via Wi-Fi direct is made on the basis of connection information included in information received via NFC will be described.

[0062] As illustrated in FIG. **2**, connection information **214** is included in the packet to be transmitted via NFC. The connection information **214** is information that sets a communication route through which the MFP **100** obtains image data. In this instance, the connection information **214** specifies whether the transmission source for the image data will be the server **500** or the portable terminal **300**. For example, the connection information **214** may include connection information including an IP address of the wireless access point **400** and an IP address of the server **500**. In another case, the connection information **214** may include connection information including the IP address of the wireless access point **400** and an IP address of the portable terminal **300**. In another case, the connection information **214** may include connection information for directly communicating with the portable terminal **300** via Wi-Fi direct.

Contactless Card Case

[0063] First, a case in which a contactless card **200** is brought close to the short-range wireless communication device **31** will be described. The short-range wireless communication device **31** stands by in the reader or writer mode (ACT**31**). The short-range wireless communication device **31** stands by in the reception mode while transmitting a predetermined radio wave signal. The predetermined radio wave signal is a radio wave that is in compliance with an NFC standard. The contactless card **200** operates in a card emulation mode.

[0064] When the contactless card **200** receives the predetermined radio wave signal from the short-range wireless communication device **31**, the contactless card **200** transmits a packet (see e.g., FIG. **2**) including the model information **212**, the authentication information **213**, the connection information **214**, and the like to the short-range wireless communication device **31**. The short-range wireless communication device **31** transmits the model information **212**, the authentication information **213**, the connection information **214**, and the like to the control device **50**. The control device **50** identifies the model of the transmission source on the basis of the model information **212** (ACT**32**). Here, since the device approaching the short-range wireless communication device **31** is a contactless card **200** (ACT**33**: Yes), the control device **50** receives the value "01" as the model information **212** and thus determines that the device approaching the MFP **100** is a contactless card **200**. The control device **50** proceeds to ACT**34**.

[0065] Next, the control device **50** determines whether the received authentication information **213** (for example, a user ID) has been registered previously (ACT**34**). When the control device **50** determines that the received authentication information **213** has not been registered previously (ACT**34**: No), the control device **50** ends the processing. On the other hand, when the control device **50** determines that the received authentication information **213** has been registered previously (ACT**34**: Yes), the control device **50** proceeds to ACT**35**.

[0066] The control device **50** sets up a connection for data communication between the server **500** and the wireless communication device **34** via the network on the basis of the connection information **214** (ACT**35**). In this instance, the control device **50** sets the IP address of the server **500** in the

wireless communication device **34**. A user may use the functions of the application software to request the server **500** to transmit image data via the wireless communication device **34**. The wireless communication device **34** receives the image data transmitted from the server **500**. The control device **50** stores the image data received from the server **500** in the storage device **15**.

[0067] Once the connection for data communication between the portable terminal **300** and the wireless communication device **34** is set up, the control device **50** proceeds to ACT**36**. When an instruction to disconnect the communication is given from the user (ACT**36**: Yes), the control device **50** disconnects the data communication between the wireless communication device **34** and the server **500**, and ends the processing.

Portable Terminal Case

[0068] Next, a case in which a portable terminal **300** is brought close to the short-range wireless communication device **31** will be described. It is assumed that an application program for communicating with the MFP **100** is installed in the portable terminal **300**, and the application program has been started.

[0069] The short-range wireless communication device **31** stands by in the reader or writer mode (ACT**31**). The short-range wireless communication device **31** stands by in the reception mode while transmitting a predetermined radio wave signal. The predetermined radio wave signal is a radio wave that is in compliance with the NFC standard. The portable terminal **300** operates in a card emulation mode.

[0070] When receiving the predetermined radio wave signal from the short-range wireless communication device **31**, the portable terminal **300** transmits a packet (see e.g., FIG. **2**) including model information **212**, authentication information **213**, connection information **214**, and the like to the short-range wireless communication device **31**. The short-range wireless communication device **31** transmits the model information **212**, the authentication information **213**, the connection information **214**, and the like to the control device **50**. The control device **50** identifies the model of the transmission source on the basis of the model information **212** (ACT**32**). Here, since the device approaching the short-range wireless communication device **31** is a portable terminal **300** (ACT**33**: No), the control device **50** receives the value "10" as the model information **212**, thus determines that the device approaching the MFP **100** is a portable terminal **300**, and then proceeds to ACT**38**.

[0071] Next, the control device **50** checks information regarding a communication route to the portable terminal **300**, which has been included in the connection information **214** (ACT**38**). If the connection information **214** does not indicate communication with the portable terminal **300** is to be performed via Wi-Fi direct rather than via the network (ACT**38**: No), the control device **50** proceeds to ACT**34**.

[0072] On the other hand, if the connection information **214** indicates communication with the portable terminal **300** is to be performed via Wi-Fi direct rather than via the internal network (ACT**38**: Yes), the control device **50** proceeds to ACT**39**.

[0073] The control device **50** sets up a connection for data communication between the portable terminal **300** and the wireless communication device **33** that does not utilize the internal network (ACT**39**). In this instance, the control device **50** connects the portable terminal **300** and the wireless communication device **33** via Wi-Fi direct. A user may use the functions of the application software to request the portable terminal **300** to transmit image data via the wireless communication device **33**. Upon receiving a request to transmit the image data via Wi-Fi direct, the portable terminal **300** switches mode from a card emulation mode to a P2P mode. The portable terminal **300** then transmits the image data to the wireless communication device **33** via Wi-Fi direct. The control device **50** stores the data received from the portable terminal **300** in the storage device **15**.

[0074] Once the connection for data communication between the portable terminal **300** and the wireless communication device **33** is set up, the control device **50** proceeds to ACT**36**. When an instruction to disconnect the communication is given from the user (ACT**36**: Yes), the control device **50** disconnects the data communication between the wireless communication device **33** and the portable terminal **300**, and ends the processing.

First Modified Example

[0075] A case in which the decision to connect the portable terminal **300** via Wi-Fi direct is made on the basis of connection information **214** included in the packet transmitted from the portable terminal **300** via NFC has been described above in the second embodiment. However, the control device **50** of the MFP **100** according to a first modified example sets direct communication to be performed via Wi-Fi direct when no connection information **214** is included in the packet received from the portable terminal **300** via NFC. In this modified example, a communication route via Wi-Fi-direct rather than via the internal network may be set by default even if a particular portable terminal **300** is not configured to provide connection information **214** (or relevant portions of connection information **214**), thereby still enabling effective use of the MFP **100** by such a portable terminal **300** without lowering a security level of the internal network.

[0076] Thus, for the MFP **100** according to the first modified example, if the connection information **214** does not include information for connection to the server **500** via the internal network or connection to the server **500** via the wireless access point **400**, the control device **50** may set direct communication between the MFP **100** and the portable terminal **300** via Wi-Fi direct by default.

[0077] In the above examples, Wi-Fi direct has been described above as an example of communication between a MFP **100** and a portable terminal **300** which does not require connection to the internal, secured network. However, to the present disclosure is not limited to Wi-Fi direct for this type of communication. For example, wireless communication methods such as Bluetooth®, ultra-wide band (UWB) communication or the like may be used instead for communications of this type.

[0078] Furthermore, a case in which the wireless communication device **33** and the wireless communication device **34** are provided in different devices has been described above. However, the wireless communication device **33** and the wireless communication device **34** may be configured as one wireless communication device, and whether communication is to be performed via the network or via Wi-Fi direct (or other type) may be selected by switching between wireless communication modes of the one wireless communication device.

[0079] In addition, a case in which the short-range wireless communication device **31** and the short-range wireless communication device **32** operate in compliance with a standard defined in ISO/IEC 1443 or ISO/IEC 18092 has been described above. However, the standard utilized for short-range wireless communication is not limited thereto. For example, any industrial standard (as presently promulgated or later revised, proposed, or adopted) or any proprietary communication standard as determined by an individual manufacturer or the like may be applied for short-range wireless communication according to the present disclosure.

[0080] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the present disclosure. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions, and changes in the form of the embodiments described herein may be made without departing from the spirit of the present disclosure. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the present disclosure.

1. An image forming apparatus, comprising:

a short-range wireless communication device configured to communicate with a portable terminal via short-range wireless communication;

a first wireless communication device configured to communicate with the portable terminal via a direct wireless connection to the portable terminal;

a second wireless communication device configured to communicate with an authenticated portable terminal via a secured network; and

a control device configured to perform authentication processing of a portable terminal based on authentication information received via the short-range wireless communication device, to set up a connection for data communication between the second wireless communication device and the portable terminal via the secured network if the portable terminal has been successfully authenticated in the authentication processing, and to set up the direct wireless connection between the first wireless communication device and the portable terminal when the portable terminal has not been successfully authenticated in the authentication processing.

2. The image forming apparatus according to claim **1**, wherein the short-range wireless communication device is a near-field communication (NFC) device.

3. The image forming apparatus according to claim **1**, wherein the first wireless communication device is capable of directly communicating with the portable terminal via Wi-Fi direct.

4. The image forming apparatus according to claim **1**, wherein the second wireless communication device is connected to a wireless access point.

5. The image forming apparatus according to claim **1**, wherein, when authentication information received via short-range wireless communication does not include information permitting connection to the secured network, the control device sets up a connection for data communication between the first wireless communication device and the portable terminal via Wi-Fi direct rather than via the secured network.

6. The image forming apparatus according to claim **1**, wherein, when authentication information received through short-range wireless communication includes information permitting connection to the secured network, the control device sets up a connection for data communication between the second wireless communication device and the portable terminal via the secured network.

7. The image forming apparatus according to claim **6**, wherein the information permitting connection to the network includes an IP address.

8. The image forming apparatus according to claim **1**, wherein the control device is further configured to determine whether a contactless card or a portable terminal is approaching the short-range wireless communication device on the basis of model information specifying a device type received via short-range wireless communication.

9. (canceled)

10. The image forming apparatus according to claim **1**, further comprising:

a printer; and

a scanner.

11. An image forming apparatus, comprising:

a short-range wireless communication device configured to communicate with a contactless card or a portable terminal via short-range wireless communication;

a first wireless communication device configured to communicate with the portable terminal via a direct wireless connection to the portable terminal;

a second wireless communication device configured to communicate with the portable terminal via a secured network connection; and

a control device configured to:

determine whether a device within range of the short-range wireless communication device is a contactless card or a portable terminal according to model information provided via short-range wireless communication from the device within range of the short-range wireless communication device,

perform an authentication according to authentication information provided via short-range wireless communication when the device is determined to be a contactless card according to the model information, and establish communication between the portable terminal and the second wireless communication device via the secured network connection if the authentication is successful, and

perform an authentication according to authentication information provided via short-range wireless communication when the device is determined to be a portable terminal according to the model information, establish communication between the portable terminal and the second wireless communication device via the secured network connection if the authentication is successful, and establish communication between the portable terminal and the first wireless communication device via the direct wireless connection if the authentication is unsuccessful.

12. The image forming apparatus according to claim **11**, wherein the second wireless communication device is connected to a network via a wireless access point.

13. The image forming apparatus according to claim **11**, wherein the short-range wireless communication device is a near-field communication (NFC) device.

14. The image forming apparatus according to claim **13**, wherein the direct wireless connection is a Wi-Fi direct connection.

15. The image forming apparatus according to claim **11**, wherein the direct wireless connection is a Wi-Fi direct connection.

16. The image forming apparatus according to claim **11**, further comprising:

a printer; and

a scanner.

17. (canceled)

18. A image forming apparatus communication method, comprising:

performing an authentication process for authenticating a portable terminal within range of a short-range wireless communication device of the image forming apparatus according to information provided via short-range wireless communication from the portable terminal;

setting up a connection for data communication between the image forming apparatus and the portable terminal via a secured network only if the portable terminal has been successfully authenticated by the authentication process; and

if the portable terminal is not successfully authenticated by the authentication process, automatically setting up a connection for data communication between image forming apparatus and the portable terminal via a direct wireless connection.

19. The communication method according to claim **18**, wherein the short-range wireless communication is according to a near-field communication (NFC) standard.

20. The communication method according to claim **18**, wherein the direct wireless connection is a Wi-Fi direct connection.

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