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(54) **ELECTRONIC DEVICE, METHOD, AND STORAGE MEDIUM**

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(57) **ABSTRACT**

An electronic device connectable to a host device includes a housing including a cover, a connector, a button on an outer surface of the housing, a sensor attached to the cover, a storage device that stores first information indicating a plurality of protocols each for establishing communication with a device of a different device class, and a processor configured to perform a process of establishing communication with a host device connected to the connector using one of the protocols, and change said one of the protocols to another protocol to communicate with the host device upon receipt of an input operation through the button and a first signal from the sensor in a predetermined order.

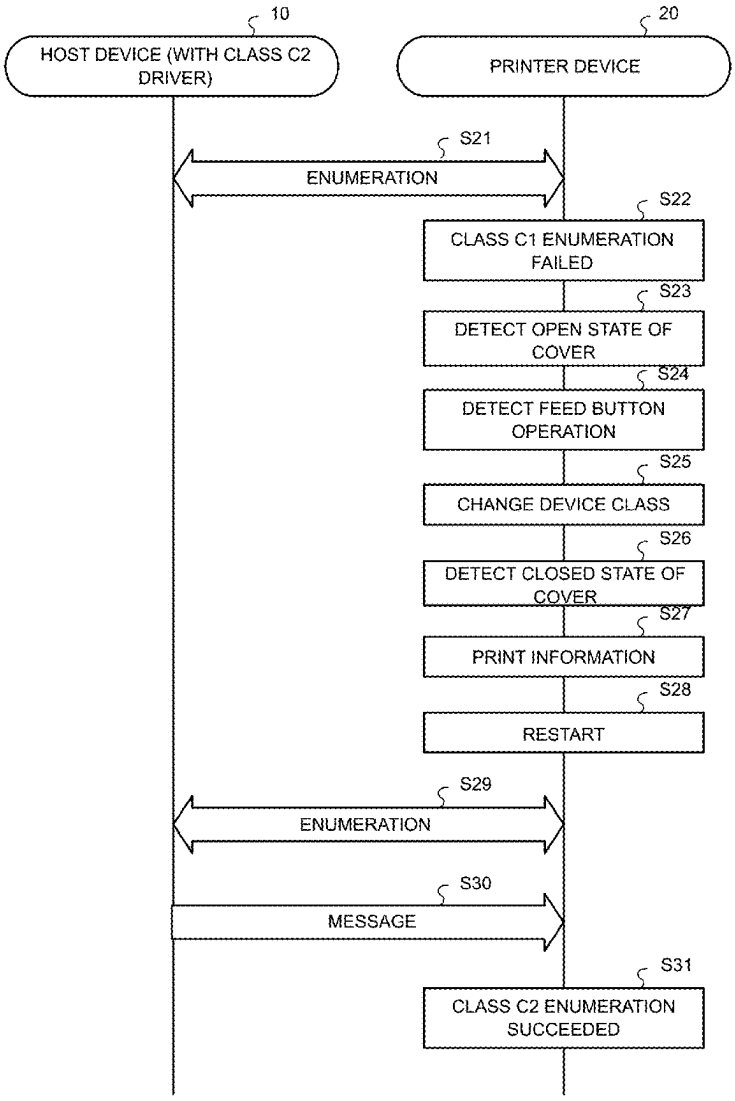


FIG. 1

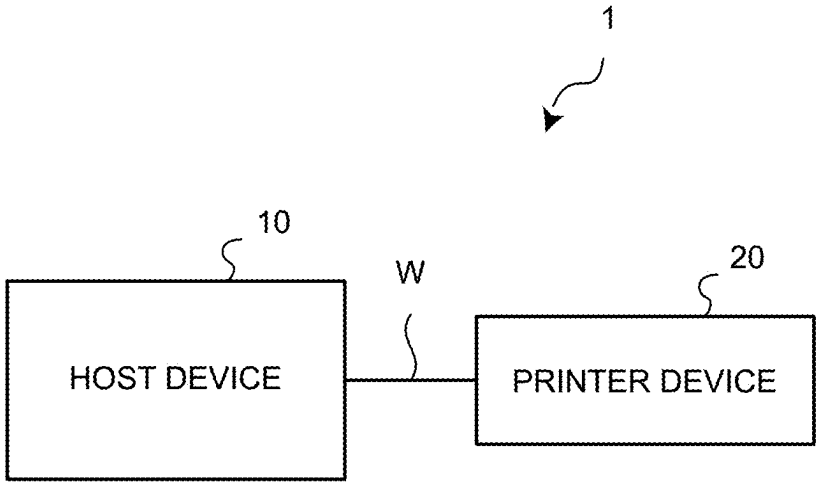


FIG. 2

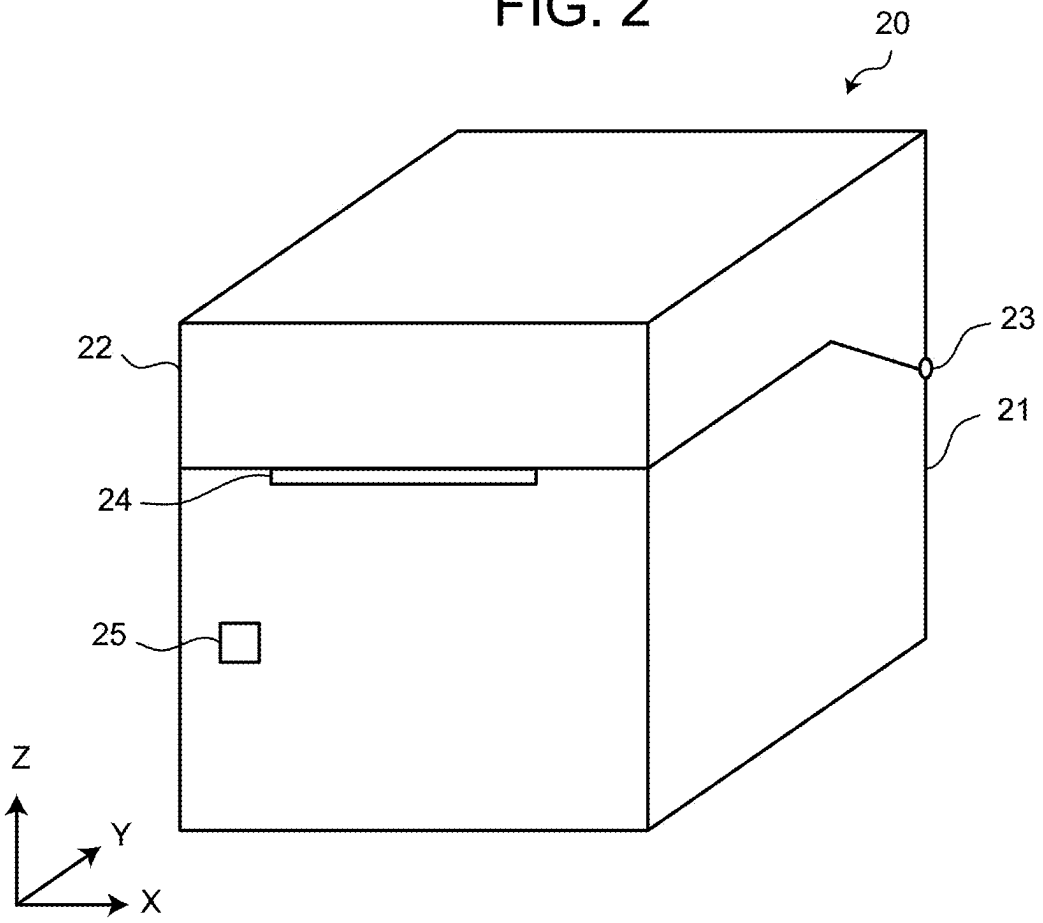


FIG. 3

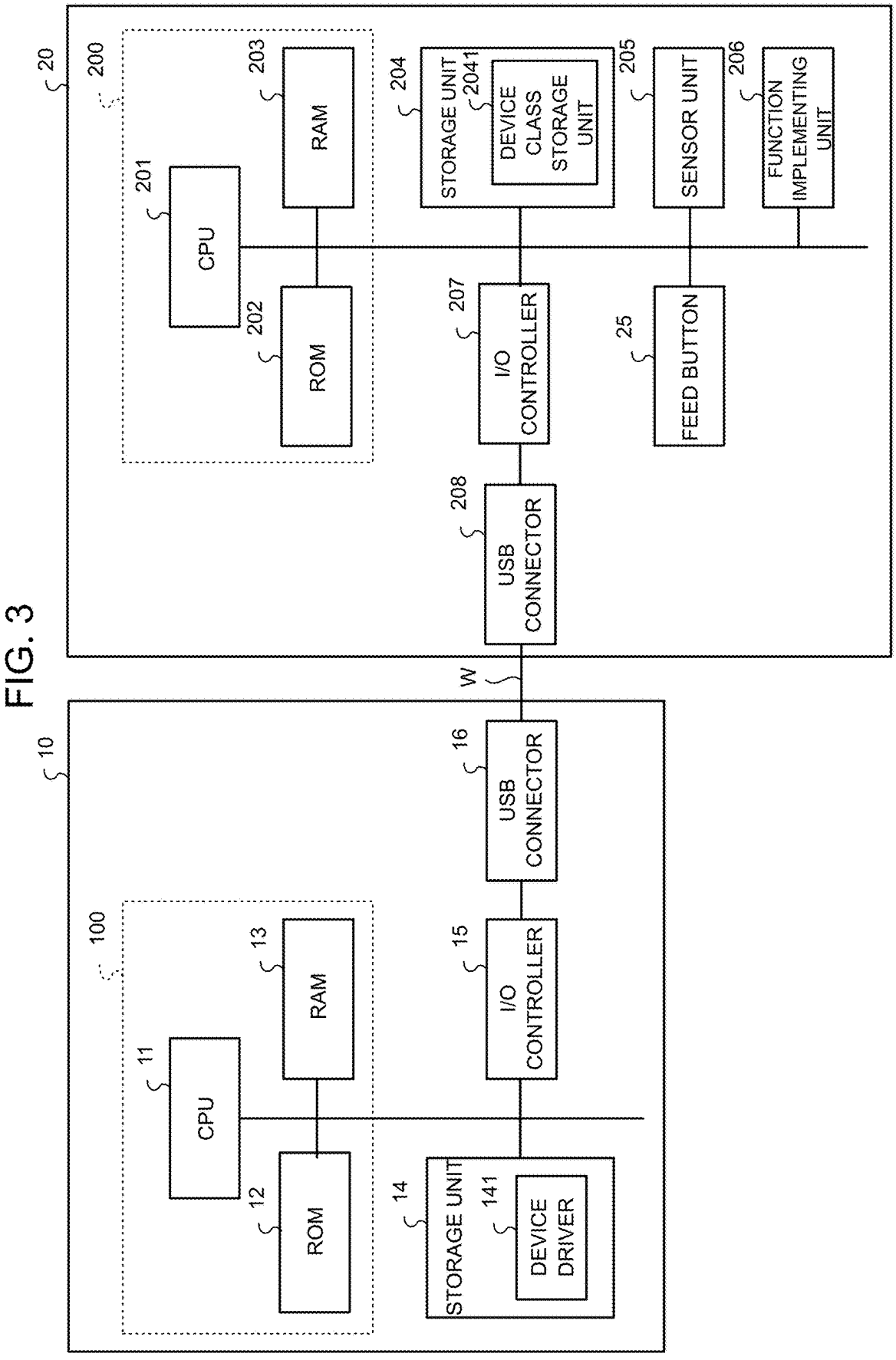

20
200
201
CPU
202
ROM
203
RAM
204
STORAGE UNIT
2041
DEVICE CLASS STORAGE UNIT
205
SENSOR UNIT
206
FUNCTION IMPLEMENTING UNIT
207
I/O CONTROLLER
25
FEED BUTTON
208
USB CONNECTOR
W
10
16
USB CONNECTOR
15
I/O CONTROLLER
100
11
CPU
12
ROM
13
RAM
14
STORAGE UNIT
141
DEVICE DRIVER

FIG. 4

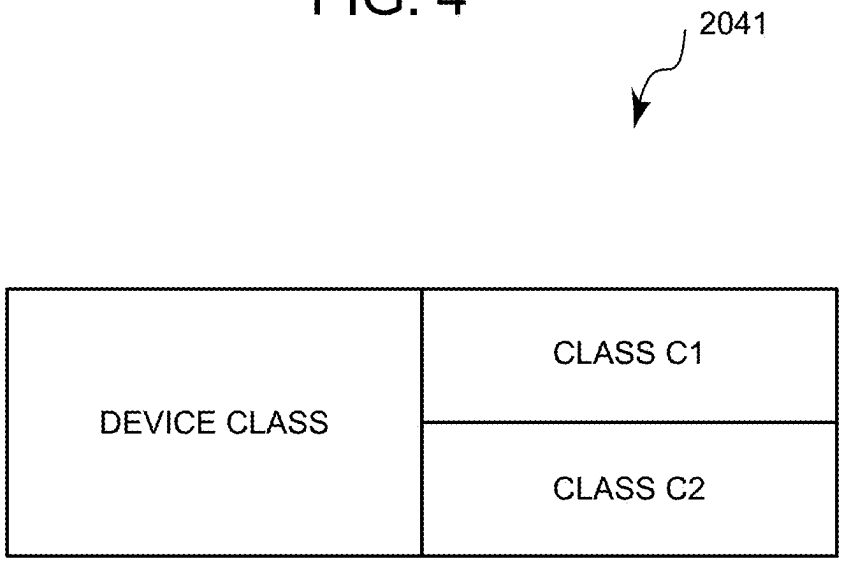

2041
DEVICE CLASS
CLASS C1
CLASS C2

FIG. 5

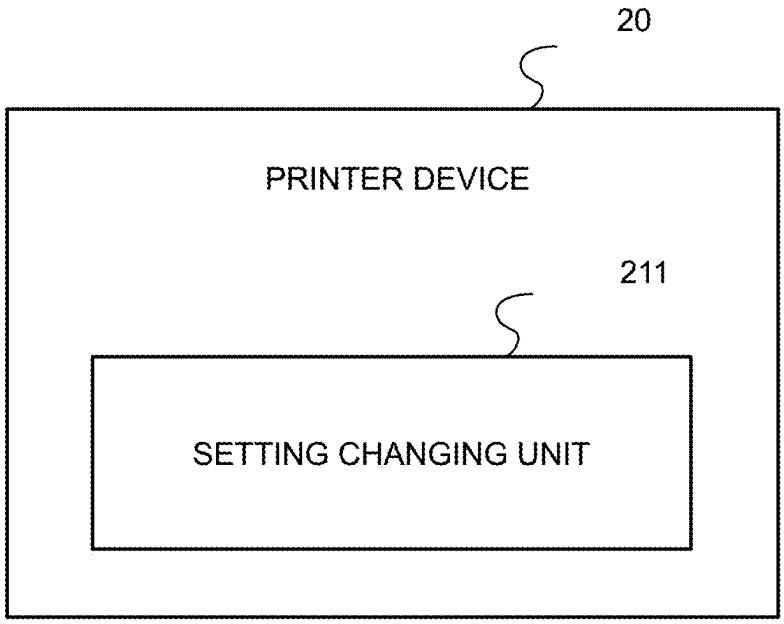

20
PRINTER DEVICE
211
SETTING CHANGING UNIT

FIG. 6

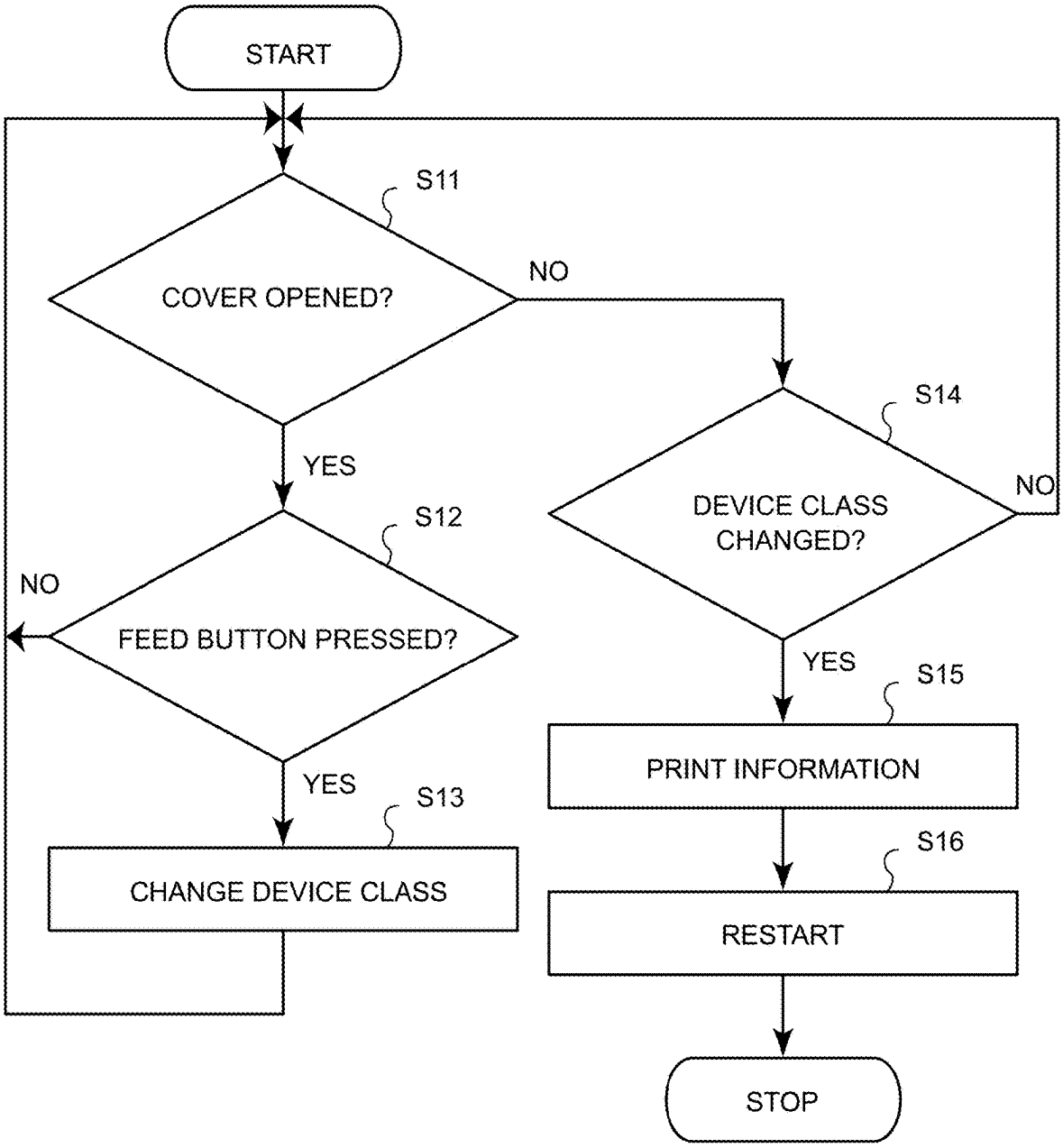
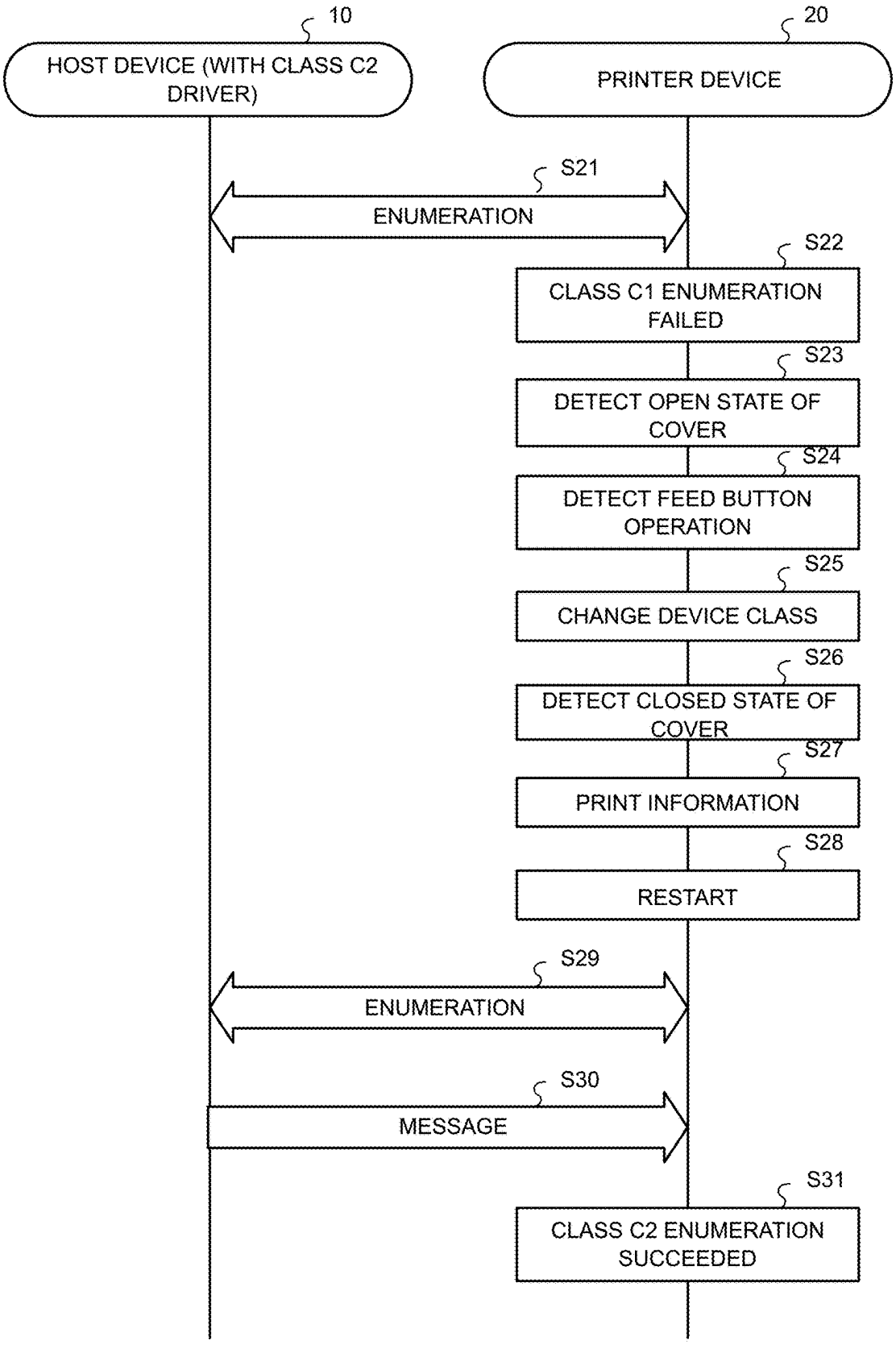

START
S11
COVER OPENED?
NO
YES
S12
FEED BUTTON PRESSED?
NO
YES
S13
CHANGE DEVICE CLASS
S14
DEVICE CLASS CHANGED?
NO
YES
S15
PRINT INFORMATION
S16
RESTART
STOP

FIG. 7


10
HOST DEVICE (WITH CLASS C2 DRIVER)
20
PRINTER DEVICE
S21
ENUMERATION
S22
CLASS C1 ENUMERATION FAILED
S23
DETECT OPEN STATE OF COVER
S24
DETECT FEED BUTTON OPERATION
S25
CHANGE DEVICE CLASS
S26
DETECT CLOSED STATE OF COVER
S27
PRINT INFORMATION
S28
RESTART
S29
ENUMERATION
S30
MESSAGE
S31
CLASS C2 ENUMERATION SUCCEEDED

ELECTRONIC DEVICE, METHOD, AND STORAGE MEDIUM

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This application is based upon and claims the benefit of priority from Japanese Patent Application No. 2024-018798, filed Feb. 9, 2024, the entire contents of which are incorporated herein by reference.

FIELD

[0002] Embodiments described herein relate generally to an electronic device, a method, and a storage medium.

BACKGROUND

[0003] Various electronic devices (or Universal Serial Bus (USB) devices) are connected via USB connectors to a host device, such as a Personal Computer (PC) or a Point-Of-Sale (POS) terminal. For example, a printer device, such as a thermal printer, is connected to a POS terminal.

[0004] A device driver corresponding to the device class of a connected USB device is installed in the host device so that the USB device can be used as a peripheral device. Specifically, a process, which is called enumeration, for establishing communication is performed between the host device and the USB device to enable the host device to use the USB device. Here, a printer device, such as a thermal printer, may have a simple configuration in which operation interfaces, such as operation buttons, are omitted as much as possible to reduce, for example, the size and costs of the printer device.

[0005] Meanwhile, there are cases where device drivers installable in a host device are limited for various reasons. For example, when device drivers of the host device do not match the device class indicating the type of a USB device to be connected, the host device cannot use the USB device.

[0006] Certain USB devices are configured such that a device class can be manually selected from multiple device classes and can operate in the selected device class. However, with a printer device having a simple configuration as described above, the device class cannot be easily changed, and the printer device needs to be improved in terms of user convenience.

SUMMARY OF THE INVENTION

[0007] An aspect of the present disclosure provides an electronic device, a method, and a storage medium that makes it more convenient to change device classes.

[0008] An aspect of the present disclosure provides an electronic device connectable to a host device, comprising: a housing including a cover; a connector; a button on an outer surface of the housing; a sensor attached to the cover; a storage device that stores first information indicating a plurality of protocols each for establishing communication with a device of a different device class; and a processor configured to: perform a process of establishing communication with a host device connected to the connector using one of the protocols, and change said one of the protocols to another protocol to communicate with the host device upon receipt of an input operation through the button and a first signal from the sensor in a predetermined order.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** is a diagram illustrating an example of a configuration of an information processing system according to an embodiment.

[0010] FIG. **2** is a perspective view schematically illustrating an external appearance of a printer device according to the embodiment.

[0011] FIG. **3** is a diagram illustrating hardware configurations of a host device and the printer device according to the embodiment.

[0012] FIG. **4** is a schematic diagram illustrating a data configuration of a device class storage unit according to the embodiment.

[0013] FIG. **5** is a diagram illustrating a functional configuration of the printer device.

[0014] FIG. **6** is a flowchart illustrating a process performed by the printer device.

[0015] FIG. **7** is a sequence diagram illustrating operations performed between the host device and the printer device.

DETAILED DESCRIPTION

[0016] Hereinafter, an electronic device, a method, and a storage medium according to an embodiment will be described with reference to the drawings. In the embodiment described below, a printer device is used as an example of the electronic device. However, the present disclosure is not limited to the embodiment described below.

[0017] FIG. **1** is a diagram illustrating a configuration of an information processing system according to the present embodiment. As illustrated in FIG. **1**, an information processing system **1** includes a host device **10** and a printer device **20**.

[0018] The host device **10** is an information processing device, such as a Personal Computer (PC) or a Point-of-Sale (POS) terminal.

[0019] On the other hand, the printer device **20** is an example of an electronic device and is an example of a USB device compliant with the Universal Serial Bus (USB) standard. The printer device **20** is, for example, a thermal printer.

[0020] FIG. **2** is a perspective view schematically illustrating an external appearance of the printer device **20**. In FIG. **2**, the width direction, the depth direction, and the height direction of the printer device **20** are represented by three axes (X, Y, Z) that are orthogonal to each other.

[0021] As illustrated in FIG. **2**, the printer device **20** includes a box-shaped housing **21**. A cover **22** is provided above the housing **21**. The cover **22** is rotatable in the upward direction around a hinge **23** provided on the back side (or a +Y direction side) of the housing **21**. By rotating the cover **22** upward, the inside of the housing **21** is exposed. Furthermore, a USB connector **208** (see FIG. **3**), which will be described later, is provided on the back side of the housing **21**.

[0022] The housing **21** houses roll paper R that is a print medium wound in a roll. In addition, the housing **21** houses a conveyance mechanism for conveying the roll paper R to a discharge port **24**, which will be described later, a printing mechanism for performing printing on the roll paper R, and a control mechanism for driving and controlling components (none of which is shown) included in the printer device **20**. The printing mechanism includes a platen and a thermal head and prints information, such as characters, on the roll

paper R passing between the platen and the thermal head by causing the thermal head to generate heat.

[0023] The discharge port **24** is formed on the front side (or the −Y side) of the housing **21**. The roll paper R, on which information is printed by the printing mechanism, is discharged from the discharge port **24**. Furthermore, a feed button **25** is provided on the front side of the housing **21**.

[0024] The feed button **25** is an example of an operation interface that is provided in the printer device **20** and receives a user operation. The feed button **25** is mainly used to instruct the printer device **20** to feed the roll paper R in the conveyance direction. When the printer device **20** receives an operation of pressing the feed button **25** in a state in which the cover **22** is closed, the printer device **20** controls the conveyance mechanism to convey the roll paper R toward the discharge port **24** by a length corresponding to the time for which the feed button **25** is pressed.

[0025] As described above, the printer device **20** according to the present embodiment has a simple configuration in which operation interfaces other than the feed button **25** are omitted for the purpose of compactness, cost reduction, and the like.

[0026] The printer device **20** is connected to the host device **10** via a USB cable W (see FIG. **1**). When the printer device **20** is connected to the host device **10**, a process, which is called enumeration, is executed to establish communication with the printer device **20**. When the enumeration is completed successfully, the host device **10** becomes ready to use the printer device **20**.

[0027] Note that the configuration of the printer device **20** is not limited to that illustrated in FIG. **2**. For example, the printer device **20** may include an indicator, such as an indicator lamp, for notifying an operation state of the printer device **20**.

[0028] Next, hardware configurations of the host device **10** and the printer device **20** will be described. FIG. **3** is a diagram illustrating examples of hardware configurations of the host device **10** and the printer device **20**.

[0029] As illustrated in FIG. **3**, the host device **10** includes a central processing unit (CPU) **11**, a read-only memory (ROM) **12**, and a random access memory (RAM) **13**. The CPU **11** is an example of a processor and controls the operation of the entire host device **10**. The ROM **12** stores various programs. The RAM **13** is used as a working memory into which various types of data are loaded.

[0030] The CPU **11**, the ROM **12**, and the RAM **13** are connected to each other via a bus or the like and constitute a control unit **100**. The CPU **11** operates according to programs stored in the ROM **12** and a storage unit **14** described later, and the control unit **100** thereby executes various processes.

[0031] The storage unit **14** is connected to the control unit **100** via a bus or the like. The storage unit **14** is an example of a storage device and implemented by a nonvolatile memory, such as a Hard Disk Drive (HDD) or a Solid State Drive (SSD), that retains stored data even when the power is turned off.

[0032] The storage unit **14** stores an Operating System (OS), various programs, setting information, and the like. The storage unit **14** also stores a device driver **141**. The device driver **141** is software (or a program) for controlling a USB device corresponding to a particular device class. The device class will be described later.

[0033] The device driver **141** may be a standard device driver that is incorporated in the OS. The device driver **141** may be a vendor-specific device driver (hereinafter, also referred to as a vendor driver) provided from a vendor of a USB device.

[0034] The device driver **141** may correspond to any appropriate device class. Examples of device classes may include a Mass Storage Class (MSC), an image (scanner) class, a printer class, and a vendor-specific device class. Also, both of a standard driver and a vendor driver may be installed as device drivers **141** for the same USB device. In this case, different device classes (or class codes) are assigned to the standard driver and the vendor driver, and one of them (for example, the vendor driver) is used preferentially.

[0035] An I/O controller **15** including a USB controller is connected to the control unit **100** via a bus or the like. A USB connector **16** is connected to the I/O controller **15**. The I/O controller **15** controls the transmission and reception of signals via the USB connector **16**.

[0036] On the other hand, as shown in FIG. **3**, the printer device **20** includes a CPU **201**, a ROM **202** and a RAM **203**. The CPU **201** is an example of a processor and controls the operation of the entire printer device **20**. The ROM **202** stores various programs. The RAM **203** is used as a working memory into which various types of data are loaded.

[0037] The CPU **201**, the ROM **202**, and the RAM **203** are connected to each other via a bus or the like and constitute a control unit **200**. The control unit **200** is an example of a processor. The CPU **201** operates in accordance with programs stored in the ROM **202** and a storage unit **204** described later, and the control unit **200** thereby executes various processes, such as enumeration with the host device **10**.

[0038] The storage unit **204**, a sensor unit **205**, a function implementing unit **206**, and the like are connected to the control unit **200** via a bus or the like. The storage unit **204** is implemented by a nonvolatile memory, such as a flash memory, that retains stored information even when the power is turned off.

[0039] The storage unit **204** stores an embedded OS, various programs, setting information, and the like. For example, the storage unit **204** stores setting information for setting a device class that is read from a device class storage unit **2041** described later when the printer device **20** is activated. The storage unit **204** also includes the device class storage unit **2041** that stores multiple device classes that can be used by the printer device **20**.

[0040] FIG. **4** is a schematic diagram illustrating a data configuration of the device class storage unit **2041**. As illustrated in FIG. **4**, the device class storage unit **2041** stores multiple device classes that can be used by the printer device **30**. Here, each device class indicates the type of USB devices that have similar features and functions. More specifically, the device classes are programs, such as firmware and device drivers, that define specifications of respective types of USB devices and protocols used to establish communication with the host device **10**.

[0041] The device class storage unit **2041** illustrated in FIG. **4** stores two device classes: a class C**1** and a class C**2**. Here, the class C**1** is, for example, a device class corresponding to a vendor driver of a vendor that manufactures the printer device **20**, and the class C**2** is a device class corresponding to a standard driver.

[0042] The number of device classes stored in the device class storage unit **2041** is not limited to the example shown in FIG. **4** and may be three or more. In addition, the device class storage unit **2041** may store identifiers, such as flags, indicating a device class to be used in the initial state and a device class currently in use (or a current device class) in association with the device classes and may also store priority levels in association with the device classes.

[0043] Returning to FIG. **3**, the sensor unit **205** is an example of a detector. The sensor unit **205** may correspond to various sensor devices included in the printer device **20**. Specifically, the sensor unit **205** includes an open/close sensor that detects the open state and the closed state of the cover **22**. The open/close sensor detects the open state or the closed state of the cover **22**, and outputs the detection result to the CPU **201**. That is, the open/close sensor detects operations on the printer device **20** other than the operation performed via the feed button **25**.

[0044] Here, when the open/close sensor detects the open state of the cover **22**, the conveyance of the roll paper R and printing are prohibited. In other words, the open/close sensor can detect a structural change (e.g., the open state of the cover **22**) of the printer device **20** that hinders the conveyance of the roll paper R performed when the feed button **25** is operated. Note that the method of detecting the open/closed state of the cover **22** is not limited to the example described above. As another example, a microswitch, a magnetic sensor, or the like may be used.

[0045] The sensor unit **205** may also include other sensor devices in addition to the open/close sensor. For example, the sensor unit **205** may include a sensor device that detects whether the roll paper R is attached to the housing **21**, a sensor device that identifies the type of the roll paper R, and the like. Furthermore, the sensor unit **205** may include a near-end sensor for detecting the end or the near-end of the roll paper R, a temperature sensor for detecting the temperature of the thermal head, and the like.

[0046] The function implementing unit **206** includes hardware components for implementing functions of the printer device **20**. For example, when the printer device **20** is a thermal printer, the function implementing unit **206** corresponds to the thermal head, the printing mechanism for controlling the thermal head, the conveyance mechanism for conveying a print medium, and the like.

[0047] In addition to the feed button **25**, an I/O controller **207** including a USB controller is connected to the control unit **200** via a bus or the like. The I/O controller **207** is connected to a USB connector **208** that is an example of a connector. The I/O controller **207** controls transmission and reception of signals via the USB connector **208**.

[0048] As shown in FIG. **3**, the host device **10** and the printer device **20** are electrically connected to each other by connecting the USB connector **16** of the host device **10** to the USB connector **208** of the printer device **20** via the USB cable W. When the printer device **20** is electrically connected to the host device **10** via the USB cable W, the host device **10** starts enumeration to establish communication with the printer device **20**.

[0049] Specifically, when the printer device **20** is connected to the host device **10**, the control unit **100** of the host device **10** acquires a class code indicating the device class from the printer device **20** via the I/O controller **15**, and thereby determines the device class of the connected printer device **20**. When the device class of the printer device **20** matches the device class of the device driver **141** installed in the host device **10**, the control unit **100** determines that the printer device **20** has been recognized. In this case, the control unit **100** cooperates with the device driver **141** to transmit a message, such as a command that conforms to the device class of the printer device **20**, to the printer device **20** and thereby establishes communication with the printer device **20**. As a result, the host device **10** is enabled to use the printer device **20** connected to the USB connector **16** as a peripheral device.

[0050] On the other hand, when the device class of the printer device **20** does not match the device class of the device driver **141**, the control unit **100** determines that the printer device **20** cannot be recognized and stops (ends) enumeration. When the enumeration is stopped, that is, when the enumeration fails, the host device **10** cannot control the printer device **20** and therefore cannot use the printer device **20** as a peripheral device.

[0051] When communication with the host device **10** cannot be established due to the mismatch of device classes, the printer device **20** may be operated using a desired device class by selecting the device class from among the multiple device classes included in the printer device **20**. However, when a printer device has a simple configuration including a minimum number of operation interfaces, the device class cannot be easily changed. For example, when a printer device has a simple configuration, it is necessary to connect a computer to the printer device and transmit a command from the computer to the printer device to change the device class.

[0052] In view of the above problem, the printer device **20** of the present embodiment has a function that makes it possible to easily change the device class. Next, a functional configuration of the printer device **20** will be described with reference to FIG. **5**.

[0053] FIG. **5** is a diagram illustrating an example of a functional configuration of the printer device **20**. As illustrated in FIG. **5**, the printer device **20** includes a setting changing unit **211** as a functional unit.

[0054] The setting changing unit **211** may be a software component implemented by the processor (for example, the CPU **201** or the control unit **200**) of the printer device **20** by executing a program stored in a memory (for example, the ROM **202** or the storage unit **204**). Alternatively, the setting changing unit **211** may be a hardware component implemented by a dedicated circuit included in the printer device **20**.

[0055] The setting changing unit **211** is an example of a changing unit, an output unit, and a restart unit. The setting changing unit **211** performs a process of changing a device class currently in use (which may also be referred to as a current device class) to another device class in response to a user operation. Specifically, when the setting changing unit **211** detects, in cooperation with the sensor unit **205**, a predetermined operation (hereinafter also referred to as a combination operation) that is a combination of the operation of the feed button **25** and another operation, the setting changing unit **211** performs a process of changing the current device class to another device class.

[0056] For example, when detecting that the feed button **25** has been pressed for a predetermined time (for example, 3 seconds) or longer after the cover **22** is opened, the setting changing unit **211** determines that an instruction to change the device class is received. In this case, the setting changing

unit **211** changes the setting such that one of device classes stored in the device class storage unit **2041** and different from the current device class is used at the next startup.

[0057] Here, when multiple device classes other than the current device class are stored in the device class storage unit **2041**, the setting changing unit **211** changes the setting such that one of the other device classes is used at the next startup. For example, the setting changing unit **211** may randomly select a device class to be used at the next startup. When the priority levels are set to the device classes, the setting changing unit **211** may select the device class to be used at the next startup based on the priority levels.

[0058] When detecting that the cover **22** is in the closed state after changing the device class to be used, the setting changing unit **211** controls the conveyance mechanism and the printing mechanism to print information including the changed device class. For example, the setting changing unit **211** causes the printing mechanism to print information (such as a device class name) for identifying the changed device class on the roll paper R, and causes the conveyance mechanism to discharge a portion of the roll paper R on which the information is printed from the discharge port **24**.

[0059] Thus, the user can confirm the changed device class by viewing the information printed on the portion of the roll paper R discharged from the discharge port **24**. Therefore, even when the printer device **20** has a simple configuration including no display device, the user can easily confirm the changed device class, and the user convenience is improved.

[0060] When the cover **22** is opened again and the feed button **25** is pressed for a predetermined time or longer after the information including the changed device class is printed, the setting changing unit **211** changes the device class again. Also, when the feed button **25** is pressed again for a predetermined time or longer after the pressing of the feed button **25** is stopped while the cover **22** is in the open state, the setting changing unit **211** changes the device class again.

[0061] Furthermore, the information printed and output by the setting changing unit **211** after changing the device class may also include items other than the changed device class. For example, the setting changing unit **211** may print and output the changed device class and the original device class (or the device class before being changed) so that they can be compared with each other. This enables the user to confirm the original and changed device classes by viewing the printed information discharged from the discharge port **24** and thereby makes it possible to improve the user convenience.

[0062] After changing the device class, the setting changing unit **211** restarts the printer device **20** to cause the printer device **20** to operate using the changed device class. For example, the setting changing unit **211** prints the information including the changed device class and then restarts the printer device **20**.

[0063] As a result, the printer device **20** becomes ready to use the changed device class. Specifically, the control unit **200** of the printer device **20** performs enumeration with the host device **10** connected to the USB connector **208** using the changed device class. In the enumeration, the control unit **200** transmits a class code indicating the changed device class to the host device **10** in response to a request from the host device **10**. Then, when a message conforming to the changed device class is transmitted from the host device **10**, the setting changing unit **211** establishes communication with the host device **10** based on the protocol defined in the device class. Thereafter, the printer device **20** operates as a peripheral device of the host device **10**.

[0064] The setting changing unit **211** may be configured not to print information indicating the changed device class. In this case, the setting changing unit **211** may restart the printer device **20** when the closed state of the cover **22** is detected.

[0065] Next, operations of the printer device **20** will be described. FIG. **6** is a flowchart illustrating a process executed by the printer device **20**. FIG. **6** illustrates an example of a process related to the changing of the device class. The processor (or the control unit **200**) of the printer device **20** may be configured to perform the steps of the process described below. That is, the setting changing unit **211** in the descriptions below may be replaced with the processor.

[0066] First, the setting changing unit **211** determines whether the cover **22** has been opened based on the detection result of the sensor unit **205** (step S**11**). When determining that the cover **22** has been opened (step S**11**: Yes), the setting changing unit **211** determines whether the feed button **25** has been pressed for a predetermined time or longer (step S**12**).

[0067] When determining that the feed button **25** has not been pressed for the predetermined time or longer (step S**12**: No), the setting changing unit **211** returns the process to step S**11**. When determining that the feed button **25** has been pressed for the predetermined time or longer (step S**12**: Yes), the setting changing unit **211** changes the setting so that a device class other than the current device class is used at the next startup (step S**13**), and returns the process to step S**11**. In order to record that the device class has been changed, the setting changing unit **211** may store, in, for example, the RAM **203**, flag information (hereinafter also referred to as a setting change flag) indicating that the device class has been changed.

[0068] On the other hand, when the setting changing unit **211** determines, at step S**11**, that the cover **22** is closed (step S**11**: No), the process proceeds to step S**14**.

[0069] At step S**14**, the setting changing unit **211** determines whether the device class has been changed, that is, whether step S**13** has been performed. For example, the setting changing unit **211** determines whether the device class has been changed based on the presence or absence of the setting change flag.

[0070] When the device class has not been changed (step S**14**: No), the setting changing unit **211** returns the process to step S**11**. When the feed button **25** is pressed during the loop of step S**11** (No) to step S**14** (No), the control unit **200** performs a process of conveying the roll paper R in the conveying direction. In addition, during the loop of step S**11** (No) to step S**14** (No), printing is performed on the roll paper R.

[0071] When determining that the device class has been changed (step S**14**: Yes), the setting changing unit **211** prints information including the changed device class (step S**15**). Then, the setting changing unit **211** restarts the printer device **20** (step S**16**) and ends the process.

[0072] Through the above process, the printer device **20** changes the device class used in the printer device **20** in response to a user operation. Then, the printer device **20** performs enumeration with the host device **10** using the changed device class.

[0073] Next, examples of operations performed between the host device **10** and the printer device **20** will be described with reference to FIG. **7**. FIG. **7** is a sequence diagram illustrating examples of operations performed between the host device **10** and the printer device **20**.

[0074] In FIG. **7**, it is assumed that the printer device **20** supports device classes "class C**1**" and "class C**2**" shown in FIG. **4** and is set to use "class C**1**" in the initial state. Also, it is assumed that the device driver **141** corresponding to "class C**2**" is installed in the host device **10**.

[0075] When the printer device **20** is connected to the host device **10** and receives a request from the host device **10**, the control unit **200** (or the processor) of the printer device **20** starts enumeration by, for example, transmitting a class code indicating "class C**1**" to the host device **10** (step S**21**).

[0076] In this case, the host device **10** determines that the class code "class C**1**" acquired from the printer device **20** does not match the device driver **141** installed in the host device **10** and determines that the printer device **20** is an unknown device that cannot be handled by the host device **10**. Therefore, the host device **10** ends the enumeration without transmitting a message conforming to "class C**1**" to the printer device **20**.

[0077] On the other hand, the control unit **200** of the printer device **20** waits for a message from the host device **10** after the enumeration is started at step S**21**. However, because the host device **10** has determined that the printer device **20** is an unknown device, communication with the host device **10** cannot be established. Therefore, the control unit **200** of the printer device **20** determines that the enumeration has failed (step S**22**). For example, the control unit **200** determines that the enumeration has failed when no message is received from the host device **10** within a waiting period after the enumeration is started.

[0078] When the enumeration fails, the control unit **200** may control the conveyance mechanism and the printing mechanism to print information indicating the failure of the enumeration. Also, when the printer device **20** includes an indicator, such as an indicator lamp, the control unit **200** may notify the failure of the enumeration via the indicator.

[0079] When the enumeration fails, in order to change the device class of the printer device **20**, the user opens the cover **22** and presses the feed button **25** for a predetermined time or longer as described above.

[0080] When determining that the cover **22** has been opened (step S**23**) and that the feed button **25** has been pressed for the predetermined time or longer (step S**24**), the setting changing unit **211** of the printer device **20** changes the current device class "class C**1**" to "class C**2**" (step S**25**).

[0081] Next, when the setting changing unit **211** of the printer device **20** determines that the cover **22** has been closed (step S**26**), information including the changed device class is printed (step S**27**). Then, the setting changing unit **211** restarts the printer device **20** (step S**28**).

[0082] After the printer device **20** is restarted, the host device **10** and the printer device **20** are reconnected to each other. After the reconnection, the control unit **200** of the printer device **20** transmits a class code indicating the changed device class "class C**2**" to the host device **10** in response to a request from the host device **10**, and starts enumeration (step S**29**).

[0083] In this case, the host device **10** determines that the class code "class C**2**" acquired from the printer device **20** matches the device driver **141** installed in the host device **10** and transmits a message conforming to "class C**2**" to the printer device **20** (step S**30**).

[0084] The control unit **200** of the printer device **20** waits for a message from the host device **10** after the enumeration is started at step S**29**. When a message is received within the waiting period, the control unit **200** of the printer device **20** determines that the enumeration has been successfully completed (step S**31**). In this case, communication between the host device **10** and the printer device **20** is established, and the host device **10** can perform printing using the printer device **20**.

[0085] Thus, with the printer device **20**, even when the current device class does not match the protocol (that is, the device driver **141**) of the host device **10**, the device class can be changed to match the protocol of the host device **10**.

[0086] As described above, the printer device **20** of the present embodiment includes the USB connector **208** connectable to the host device **10**, the feed button **25** that receives an operation from the user, the sensor unit **205** that detects an operation on the printer device **20** other than the operation performed using the feed button **25**, the device class storage unit **2041** that stores multiple device classes indicating protocols for establishing communication, the control unit **200** that executes a process of establishing communication with the host device **10** connected to the USB connector **208** by using one of the device classes stored in the device class storage unit **2041**, and the setting changing unit **211** that changes the device class used by the control unit **200** for the process in response to a combination of the operation performed using the feed button **25** and the operation detected by the sensor unit **205**.

[0087] Thus, the printer device **20** can change the device class in response to a combination of the operation performed using the feed button **25** and the opening operation of the cover **22**. Therefore, even with the printer device **20** having a simple configuration in which only the feed button **25** is provided as an operation interface, the user can easily change the device class, and the user convenience in changing the device class can be improved.

[0088] The above-described embodiment may be appropriately modified and implemented by changing some of the configurations or functions of the printer device **20**. Below, variations of the above-described embodiment will be described as other embodiments. Below, differences from the above-described embodiment will be mainly described, and detailed descriptions of features that are the same as those described above will be omitted. Furthermore, the variations described below may be implemented individually or in combination as appropriate.

(First Variation)

[0089] Although the above-described embodiment is described using the printer device **20**, the above-described embodiment may also be applied to any other type of electronic device, such as a scanner device, a cash register, an automatic change machine, or the like.

(Second Variation)

[0090] In the above-described embodiment, the device class is changed in response to a combination of an operation of opening the cover **22** and an operation of pressing the feed

button **25** for a predetermined time or longer. However, the combination of operations for changing the device class is not limited to this example.

[0091] For example, the setting changing unit **211** may be configured to change the device class when determining that the roll paper R has been taken out from the housing **21** based on a detection result of a sensor device that detects whether the roll paper R is placed in the housing **21** and also determining that the feed button **25** has been pressed for a predetermined time or longer. In this case, after changing the device class, the setting changing unit **211** prints information including the changed device class and restarts the printer device **20** upon determining that the roll paper R is placed in the housing **21** and the cover **22** is closed.

[0092] Furthermore, the combination operation may be appropriately changed according to the type and configuration of the electronic device. For example, in a printer device that prints information on a sheet of paper, an opening or closing operation of a tray storing sheets of paper may be a part of the combination operation.

(Third Variation)

[0093] In the above-described embodiment, the setting changing unit **211** is configured to change the device class in response to user operations. However, the present disclosure is not limited to this example, and the setting changing unit **211** may be configured to automatically change the device class.

[0094] For example, the setting changing unit **211** may be configured to automatically change the device class when no message is transmitted from the host device **10** within a predetermined time after enumeration with the host device **10** is started. In this case, the setting changing unit **211** may be configured to print information including the changed device class or may be configured to restart the printer device **20** without printing the information.

[0095] Thus, the printer device **20** may be configured to attempt enumeration with the host device **10** while automatically changing the device class until the changed device class matches the protocol (or the device driver **141**) of the host device **10**. With this configuration, the printer device **20** can automatically change the device class in accordance with the protocol of the host device **10**.

[0096] Furthermore, the printer device **20** (or the setting changing unit **211**) may be configured to switch between manual and automatic modes for changing the device class according to whether the host device **10** is connected to the printer device **20**. Specifically, when the host device **10** is connected to the printer device **20**, the setting changing unit **211** automatically changes the device class based on whether the message is transmitted from the host device **10** after enumeration with the host device **10** is started. On the other hand, when the host device **10** is not connected to the printer device **20**, the setting changing unit **211** changes the device class in response to the combination operation as described in the above embodiment.

[0097] As described above, the printer device **20** may be configured to switch between the manual and automatic modes for changing the device class according to the connection state of the host device **10**. This makes it possible to further improve the convenience of the user.

[0098] Programs to be executed by the devices of the above-described embodiments may be provided in a ROM or the like in advance. Also, programs to be executed by the devices of the above-described embodiments may be provided in a non-transitory computer-readable storage medium, such as a CD-ROM, a flexible disk (FD), a CD-R, or a Digital Versatile Disk (DVD), in an installable format or an executable format.

[0099] Also, programs to be executed by the devices of the above-described embodiments may be stored in a computer connected to a network, such as the Internet, and may be downloaded via the network. Furthermore, programs to be executed by the devices of the above-described embodiments may be provided or distributed via a network, such as the Internet.

[0100] 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 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 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 disclosure.

What is claimed is:

1. An electronic device connectable to a host device, the electronic device comprising:

a housing including a cover;

a connector;

a button on an outer surface of the housing;

a sensor attached to the cover;

a storage device that stores first information indicating a plurality of protocols each for establishing communication with a device of a different device class; and

a processor configured to:

perform a process of establishing communication with a host device connected to the connector using one of the protocols, and

change said one of the protocols to another protocol to communicate with the host device upon receipt of an input operation through the button and a first signal from the sensor in a predetermined order.

2. The electronic device according to claim **1**, wherein

the sensor outputs the first signal when the cover is opened.

3. The electronic device according to claim **2**, wherein

the electronic device is a printer configured to print on a print medium, and

the processor is configured to:

perform a process of feeding the print medium when the input operation is received through the button, and

change said one of the protocols to another protocol when the input operation is received for a predetermined time or longer after the first signal is received from the sensor.

4. The electronic device according to claim **3**, wherein

the sensor outputs a second signal when the cover is closed, and

the processor is configured to perform a process of printing second information indicating said another protocol upon receipt of the second signal after said one of the protocols is changed to another protocol.

5. The electronic device according to claim 4, wherein the second information further indicates said one of the protocols.

6. The electronic device according to claim 1, wherein the processor is configured to restart the electronic device after said one of the protocols is changed to another protocol.

7. The electronic device according to claim 6, wherein after the electronic device is restarted, the processor causes the connector to transmit a class code corresponding to said another protocol to the host device in response to a request from the host device and thereby start a process of establishing communication with the host device using said another protocol.

8. The electronic device according to claim 7, wherein the processor is configured to determine that the process of establishing communication has been successfully completed when a message is received from the host device within a waiting period after the process of establishing communication is started.

9. The electronic device according to claim 1, wherein the protocols are associated with priority levels by the first information, and the processor is configured to select another protocol based on the priority levels.

10. The electronic device according to claim 1, wherein the processor is configured to select another protocol randomly.

11. A method performed by an electronic device connectable to a host device and including:
a housing including a cover,
a connector,
a button on an outer surface of the housing, and
a sensor attached to the cover, the method comprising:
storing, in a storage device, first information indicating a plurality of protocols each for establishing communication with a device of a different device class;
performing a process of establishing communication with a host device connected to the connector using one of the protocols; and
changing said one of the protocols to another protocol to communicate with the host device upon receipt of an input operation through the button and a first signal from the sensor in a predetermined order.

12. The method according to claim 11, wherein the sensor outputs the first signal when the cover is opened.

13. The method according to claim 12, wherein the electronic device is a printer configured to print on a print medium,
the method further comprises:
performing a process of feeding the print medium when the input operation is received through the button, and
said one of the protocols is changed to another protocol when the input operation is received for a predetermined time or longer after the first signal is received from the sensor.

14. The method according to claim 13, wherein the sensor outputs a second signal when the cover is closed, and
the method further comprises:
performing a process of printing second information indicating said another protocol upon receipt of the second signal after said one of the protocols is changed to another protocol.

15. The method according to claim 14, wherein the second information further indicates said one of the protocols.

16. The method according to claim 11, further comprising:
restarting the electronic device after said one of the protocols is changed to another protocol.

17. The method according to claim 16, further comprising:
after the electronic device is restarted, transmitting a class code corresponding to said another protocol to the host device in response to a request from the host device and thereby starting a process of establishing communication with the host device using said another protocol.

18. The method according to claim 17, further comprising:
determining that the process of establishing communication has been successfully completed when a message is received from the host device within a waiting period after the process of establishing communication is started.

19. The method according to claim 11, wherein the protocols are associated with priority levels by the first information, and
the method further comprises:
selecting another protocol based on the priority levels.

20. A non-transitory computer-readable storage medium storing a program for causing a processor of an electronic device to perform a process, the electronic device including:
a housing including a cover,
a connector,
a button on an outer surface of the housing, and
a sensor attached to the cover, and
the process comprising:
storing, in a storage device, first information indicating a plurality of protocols each for establishing communication with a device of a different device class;
performing a process of establishing communication with a host device connected to the connector using one of the protocols; and
changing said one of the protocols to another protocol to communicate with the host device upon receipt of an input operation through the button and a first signal from the sensor in a predetermined order.

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