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(54) **Title**: INFORMATION PROCESSING APPARATUS, INFORMATION PROCESSING METHOD, AND PROGRAM

[Fig. 31]

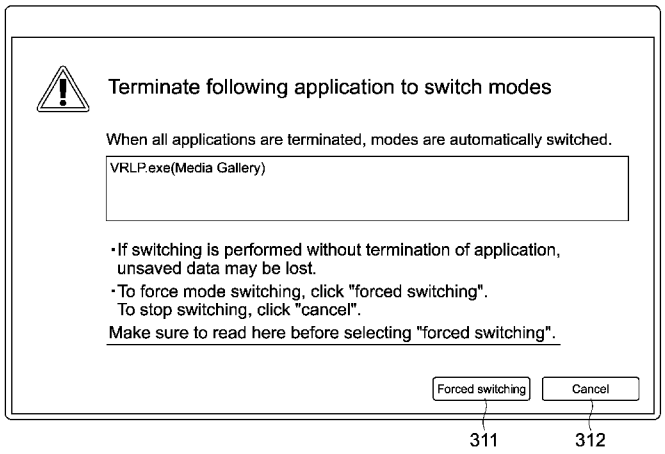

FIG.31

(57) **Abstract**: An information processing apparatus includes first and second graphics chips that generate first and second image signals, respectively, a switch, a storage that stores an application, a display that displays one of the first and second image signals, a connector connected with an external display, and a controller. The switch performs switching to operate one of the first and second graphics chips. The controller controls the switch to execute a first mode in which the first graphics chip is operated all the time, a second mode in which the second graphics chip is operated all the time, and a third mode in which switching between operations of the first and second graphics chips is performed, judges whether a trouble is caused in an application operation, and controls the display to display an application name when the trouble is caused.

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Description

Title of Invention: INFORMATION PROCESSING APPARATUS, INFORMATION PROCESSING METHOD, AND PROGRAM

Technical Field

[0001] The present invention relates to an information processing apparatus including a plurality of graphics chips having different graphics performances, and to an information processing method and a program for an information processing apparatus.

Background Art

[0002] In related art, there is an information processing apparatus on which two graphics chips having different graphics performances are mounted and which implements reduction in power consumption and improvement in graphics performance by switching the operations of the chips (see, for example, Patent Literature 1)).

[0003] In the information processing apparatus disclosed in Patent Literature 1, the switching of the two graphics chips is performed with a mechanical switch that is manually operable by a user.

Citation List

Patent Literature

[0004] PTL 1: Japanese Patent Application Laid-open No. 2007-179225

Summary of Invention

[0005] However, in the case where a user manually switches the graphics chips as in the information processing apparatus disclosed in Patent Literature 1, a safety problem may arise. Specifically, for example, if a user switches the graphics chips during execution of a specific application in the information processing apparatus, a trouble may be caused in the operation of the application.

[0006] Further, it takes time and effort for a user to judge which graphics chip is proper as occasion demands in consideration of a trouble that may be caused in the operation of the application and manually switch the graphics chips. Further, this may prevent the effective utilization of the two graphics chips having different graphics performances.

[0007] In view of the above-mentioned circumstances, it is desirable to provide an information processing apparatus, an information processing method, and a program capable of safely and easily switching two graphics chips having different graphics performances in accordance with a use purpose of a user.

[0008] According to an embodiment of the present invention, there is provided an information processing apparatus including a first graphics chip, a second graphics chip, a switch, a storage, a display, a connector, and a controller. The first graphics chip generates a first image signal. The first graphics chip has a first graphics performance.

The second graphics chip generates a second image signal. The second graphics chip has a second graphics performance that is higher than the first graphics performance. The switch performs switching to cause one of the first graphics chip and the second graphics chip to operate. The storage stores an application with a name of the application, which is executed during an operation of the one of the first graphics chip and the second graphics chip. The display displays one of the first image signal and the second image signal. The connector is connected with an external display to output the second image signal to the external display. The controller controls the switch to execute a first mode in which the first graphics chip is operated all the time, a second mode in which the second graphics chip is operated all the time, and a third mode in which switching between an operation of the first graphics chip and an operation of the second graphics chip is performed in accordance with whether the external display is connected to the connector, judges whether a trouble is caused in an operation of the application in execution due to the switching between the operations of the first and second graphics chips, and controls the display to display a name of the application when judging that the trouble is caused.

[0009] In this structure, in addition to the first mode and the second mode, the third mode is prepared in which the first and second graphics chips are automatically switched in accordance with the connection condition of the external display to the connector. As a result, the information processing apparatus can safely and easily switch the two graphics chips having different graphics performances in accordance with a use purpose of a user. Further, in the case where the trouble is caused in the operation of the application due to the mode switching, the information processing apparatus displays the name of the application, and therefore can further assure the safety for the user. Here, the first graphics chip is embedded in a chip set on which the controller is mounted, for example. The second graphics chip is externally provided to the chip set. Further, the connector is an image output interface such as an HDMI (high-definition multimedia interface) and a DVI (digital visual interface).

[0010] In the third mode, the controller may perform the switching between the operation of the first graphics chip and the operation of the second graphics chip in a case where the application is terminated after the name of the application is displayed.

[0011] Thus, by performing the switching of the graphics chip in response to the termination of the application, the information processing apparatus can prevent the trouble from being caused in the application by the switching.

[0012] The information processing apparatus may further include a power supply to supply power to the information processing apparatus from one of an AC adapter and a battery. In this case, in the third mode, the controller may cause the first graphics chip to operate in a case where the external display is not connected to the connector, and

the power is supplied from the battery, and cause the second graphics chip to operate in a case where the external display is connected to the connector, and in a case where the external display is not connected to the connector, and the power is supplied from the AC adapter.

[0013] Thus, depending on a condition of whether the AC adapter or the battery supplies power to the information processing apparatus, in addition to the connection condition of the external display, the information processing apparatus can more safely selects the graphics chip in the third mode.

[0014] The information processing apparatus may further include an operation input unit to receive an operation input by a user. In this case, when judging that the trouble is caused during execution of the third mode, the controller may display, on the display, an operation dialog including a message that urges switching to one of the first mode and the second mode, and display the name of the application in a case where an operation for the switching is input from the operation input unit on the operation dialog. Further, the controller may perform the switching between the operation of the first graphics chip and the operation of the second graphics chip in a case where the application is terminated after the operation dialog is displayed and before the operation of the switching is input.

[0015] Thus, by displaying the operation dialog, without displaying the name of the application, the information processing apparatus can give the user an opportunity to terminate the application in which the trouble is caused by the switching.

[0016] The controller may detect a first electric power value of electric power supplied from the power supply before the switching between the operation of the first graphics chip and the operation of the second graphics chip and a second electric power value of electric power supplied from the power supply after the switching, and may display information that indicates the first electric power value and the second electric power value on the display.

[0017] Thus, the information processing apparatus informs the user of the degree of the increase or decrease in power consumption as a result of the switching of the graphics chips, and thus can let the user know an optimal use mode of the graphics chips.

[0018] According to another embodiment of the present invention, there is provided an information processing method for an information processing apparatus including a first graphics chip having a first graphics performance and a second graphics chip having a second graphics performance that is higher than the first graphics performance. In the information processing method, executed are a first mode in which the first graphics chip is operated all the time, a second mode in which the second graphics chip is operated all the time, and a third mode in which switching between an operation of the first graphics chip and an operation of the second graphics chip is performed in ac-

cordance with whether an external display is connected to the information processing apparatus. It is judged whether a trouble is caused in an operation of an application in execution due to the switching between the operations of the first and second graphics chips. When judging that the trouble is caused, a name of the application in which the trouble is caused is displayed.

[0019] According to another embodiment of the present invention, there is provided a program for causing an information processing apparatus including a first graphics chip including a first graphics chip having a first graphics performance and a second graphics chip having a second graphics performance that is higher than the first graphics performance to execute an executing, a judging, and a displaying. In the executing, a first mode in which the first graphics chip is operated all the time, a second mode in which the second graphics chip is operated all the time, and a third mode in which switching between an operation of the first graphics chip and an operation of the second graphics chip is performed in accordance with whether an external display is connected to the information processing apparatus are executed. In the judging, it is judged whether a trouble is caused in an operation of an application in execution due to the switching between the operations of the first and second graphics chips. In the displaying, a name of the application is displayed when judging that the trouble is caused.

[0020] As described above, according to the embodiments of the present invention, it is possible to safely and easily switch the two graphics chips having different graphics performances in accordance with the use purpose of the user.

Brief Description of Drawings

[0021] [fig.1]Fig. 1 is a perspective view showing a PC according to an embodiment of the present invention in the state of being opened.

[fig.2]Fig. 2 is a left side view of the PC according to the embodiment of the present invention.

[fig.3]Fig. 3 is a block diagram showing the hardware structure of the PC according to the embodiment of the present invention.

[fig.4]Fig. 4 is a diagram showing a lighted state of an LED display in accordance with a switch position of a mode selection switch according to the embodiment of the present invention.

[fig.5]Fig. 5 is a flowchart showing the operation flow of the PC in the case where an AUTO mode is selected with the mode selection switch in the embodiment of the present invention.

[fig.6]Fig. 6 is a flowchart showing the operation flow of the PC in the case where the AUTO mode is selected with the mode selection switch in the embodiment of the

present invention.

[fig.7]Fig. 7 is a flowchart showing the operation flow of the PC in the case where a STAMINA mode is selected with the mode selection switch in the embodiment of the present invention.

[fig.8]Fig. 8 is a flowchart showing the operation flow of the PC in the case where a SPEED mode is selected with the mode selection switch in the embodiment of the present invention.

[fig.9]Fig. 9 is a flowchart showing the operation flow of the PC in the case where both an HDMI connection and a DVI connection are released in the AUTO mode in the embodiment of the present invention.

[fig.10]Fig. 10 is a flowchart showing the operation flow of the PC in the case where the external monitor is connected to the HDMI connector or the DVI connector in the AUTO mode in the embodiment of the present invention.

[fig.11]Fig. 11 is a flowchart showing the operation flow of the PC in the case where the external monitor is connected to the HDMI connector or the DVI connector in the STAMINA mode in the embodiment of the present invention.

[fig.12]Fig. 12 is a flowchart showing the operation flow of the PC in the case where the AC adapter connected in the AUTO mode is removed in the embodiment of the present invention.

[fig.13]Fig. 13 is a flowchart showing the operation flow of the PC in the case where the AC adapter that is not connected in the AUTO mode is connected in the embodiment of the present invention.

[fig.14]Fig. 14 is a flowchart showing the switching operation flow of the PC to the STAMINA mode in the embodiment of the present invention.

[fig.15]Fig. 15 is a flowchart showing the switching operation flow of the PC to the SPEED mode in the embodiment of the present invention.

[fig.16]Fig. 16 is a diagram showing the process flow of blocks in a detection process of the switching with the mode selection switch in the embodiment of the present invention.

[fig.17]Fig. 17 is a diagram showing the process flow of blocks in a detection process of a current switch position for the mode selection switch in the embodiment of the present invention.

[fig.18]Fig. 18 is a diagram showing the process flow of blocks in a detection process of the connection between the external monitor and the HDMI connector or the DVI connector in the embodiment of the present invention.

[fig.19]Fig. 19 is a diagram showing the process flow of blocks at the time when the graphics chips are switched in the embodiment of the present invention.

[fig.20]Fig. 20 is a diagram showing an example of a message that indicates a

completion of a power supply setting for the AUTO mode and the STAMINA mode in the embodiment of the present invention.

[fig.21]Fig. 21 is a diagram showing an example of a message that indicates the completion of the power supply setting for the AUTO mode and the SPEED mode in the embodiment of the present invention.

[fig.22]Fig. 22 is a diagram showing an example of a dialog for confirming with a user whether it is possible to perform switching to the AUTO and STAMINA modes by the PC in the embodiment of the present invention.

[fig.23]Fig. 23 is a diagram showing an example of a dialog for confirming with the user whether it is possible to perform switching to the AUTO and SPEED modes by the PC in the embodiment of the present invention.

[fig.24]Fig. 24 is a diagram showing an example of a message that indicates a completion of a power supply setting for the STAMINA mode in the embodiment of the present invention.

[fig.25]Fig. 25 is a diagram showing an example of a dialog for confirming with the user whether it is possible to perform switching to the STAMINA mode by the PC in the embodiment of the present invention.

[fig.26]Fig. 26 is a diagram showing an example of a message that indicates a completion of a power supply setting for the SPEED mode in the embodiment of the present invention.

[fig.27]Fig. 27 is a diagram showing an example of a dialog for confirming with the user whether it is possible to perform switching to the SPEED mode by the PC in the embodiment of the present invention.

[fig.28]Fig. 28 is a diagram showing an example of a dialog for urging the user to perform the switching to the SPEED mode by the PC in the embodiment of the present invention.

[fig.29]Fig. 29 is a diagram showing an example of a dialog for urging the user to perform the switching to the STAMINA mode by the PC in the case where the application is run that may cause a trouble due to a mode switching in the embodiment of the present invention.

[fig.30]Fig. 30 is a diagram showing an example of a dialog for urging the user to perform the switching to the SPEED mode by the PC in the case where the application is run that may cause the trouble due to the mode switching in the embodiment of the present invention.

[fig.31]Fig. 31 is a diagram showing an example of a dialog for indicating, by the PC, a name of the application that may cause the trouble due to the mode switching in the embodiment of the present invention.

Description of Embodiments

[0022] Hereinafter, an embodiment of the present invention will be described with reference to the drawings.

[0023] (External structure of PC)

Fig. 1 is a perspective view showing a PC according to an embodiment of the present invention in the state of being opened. Fig. 2 is a left side view of the PC.

[0024] As shown in Figs. 1 and 2, a PC 100 is a notebook PC, and includes a main body unit 2 and a display 3. The main body unit 2 and the display 3 are relatively rotatably connected with each other with hinges 4. The display 3 includes an LCD (liquid crystal display) 3a in a region where the display 3 is caused to face the main body unit 2 when being closed to the main body unit 2.

[0025] The main body 2 includes, in a region where the main body 2 faces the display 3 when the display 3 is closed thereto, an operation input unit 2a such as a keyboard and a touch pad, a palm rest member 2b, a non-contact IC (integrated circuit) card antenna 2c, and a slide mode selection switch 7. On the palm rest member 2b, a user puts the wrist when performing an input operation. The main body unit 2 further includes, on a side surface thereof, a power supply switch 2d, an external display connector 2e, a USB (universal serial bus) connector 2f, a disk insertion and removal opening 2g for a disk drive (not shown), a microphone input terminal 2h, a headphone connector 2i, and an HDMI connector 2j. To the HDMI connector 2j, an external monitor such as a TV is connected through an HDMI cable, and an image signal generated by the PC 100 is output in conformity with an HDMI standard. To the main body 2, a DVI connector (not shown) is also provided that is used for outputting an image signal to an external monitor through a DVI cable in conformity with a DVI standard.

[0026] The main body 2 further includes a casing 30 that is constituted of a top case 32 and a bottom case 10. To the top case 32, the operation input unit 2a and the like are provided.

[0027] The mode selection switch 7 is used to switch three modes (described later) of the PC 100, and is formed so that a movable portion can be moved among three switching positions corresponding to the three modes along a triangular shape of a guide unit.

[0028] In the vicinity of each of three corners of the mode selection switch 7, three LED (light emitting diode) displays 8 are provided that notify the user of a mode in execution out of the three modes in accordance with a switch position of the mode selection switch 7. The LED displays 8 will be described later in detail.

[0029] (Hardware structure of PC)

Fig. 3 is a block diagram showing the hardware structure of the PC 100. As shown in Fig. 3, in addition to the structures shown in Figs. 1 and 2, the PC 100 includes a CPU

(central processing unit) 11, a chip set 12, an embedded graphics chip 15, an external graphics chip 20, an EC (embedded controller) 16, a switching circuit 22, a selector 23, a DVI connector 2k, an HDD (hard disk drive) 21, a nonvolatile memory 25, a power supply circuit 26, a battery 27, a DC jack 28, and a wattmeter 29.

[0030] The chip set 12 manages the transmission and reception of data between devices in the PC 100, and is constituted of a north bridge 13 and a south bridge 14.

[0031] In the north bridge 13, the embedded graphics chip 15, a memory controller (not shown), and the like are embedded. The north bridge 13 is connected with the CPU 11 and the external graphics chip 20. The south bridge 14 has a connection interface with peripheral devices such as the HDD 21, the nonvolatile memory 25, and the EC 16.

[0032] The embedded graphics chip 15 and the external graphics chip 20 each perform a drawing process based on data received from the CPU 11, and output a generated image signal to the switching circuit 22 to display an image on the LCD 3a and the external monitor. In this embodiment, the external graphics chip 20 has a higher graphics performance than the embedded graphics chip 15.

[0033] The embedded graphics chip 15 has a lower graphics performance than the external graphics chip 20. However, the power consumption of the embedded graphics chip 15 is smaller than that of the external graphics chip 20. On the other hand, the external graphics chip 20 has the higher graphics performance in terms of a 3-D process, a high-resolution drawing process, and the like, but involves high power consumption to drive the external graphics chip 20 itself and the peripheral devices thereof, with the result that an electrical load with respect to the entire system of the PC 100 is increased.

[0034] In accordance with the switching of the modes with the mode selection switch 7, the PC 100 manually or automatically selects one of the embedded graphics chip 15 and the external graphics chip 20 that have the different graphics performances and thus can perform the drawing process (this will be described later in detail).

[0035] The HDD 21 stores, in a built-in hard disk, data or various programs such as utility software for executing the mode switching process in this embodiment, a graphics driver necessary for the operation for various graphics chips, and FEP.sys. Here, the PC 100 may be provided with a flash memory instead of the HDD 21.

[0036] The nonvolatile memory 25 is a ROM (read only memory), an EEPROM (electrically erasable and programmable read only memory), a flash memory, or the like, and stores data or programs such as BIOS and firmware.

[0037] The EC 16 has functions such as a KBC (keyboard controller), an ACPI/EC, and a PIC (programmable IO controller). The KBC controls a keyboard as the operation input unit 2a. The ACPI/EC manages the power supply in accordance with an ACPI (advanced configuration and power interface), which is a standard that relates to

electrical control. The PIC provides an interface with the utility software.

[0038] With the KBC, the EC 16 can detect the operation of the operation input unit 2a by the user, and can notify a high-order system such as an OS (operating system) of information called scan code. In addition, the EC 16 includes an interface for performing communication with a system such as the BIOS and the OS (described later) with the PIC, and can transmit and receive a command or data. Further, the EC 16 is connected with the mode selection switch 7 and the LED display 8.

[0039] The switching circuit 22 switches an image signal outputted from one of the embedded graphics chip 15 and the external graphics chip 20, and outputs the signal to the LDC 3a, the HDMI connector 2j, and the DVI connector 2k. In accordance with the selection of the graphics chip in each of the modes, the EC 16 outputs an image switching signal to the switching circuit 22, and controls the switching of the image signal outputted from the graphics chips. The image signal outputted to the HDMI connector 2j and the DVI connector 2k is then outputted to the external monitor through the HDMI cable and the DVI cable, respectively.

[0040] The power supply circuit 26 is connected with one of the battery 27, such as a lithium ion battery, and the DC jack 28 for inputting commercial power through an AC adapter 5, and supplies the power to the respective units of the PC 100 therethrough.

[0041] The wattmeter 22 is connected to the battery 27 and the DC jack 28, measures an electric power value (current value) of electric power supplied therefrom, and transmits the measurement value to the CPU 11. The measurement value is used in a display process of the power consumption before and after the mode switching, which will be described later in detail.

[0042] (Details of mode selection switch and LED display)

Next, the mode selection switch 7 and the LED display 8 will be described in detail. Fig. 4 is a diagram showing a lighted state of the LED display 8 in accordance with the switch position of the mode selection switch 7.

[0043] In this embodiment, the PC 100 has three operation modes of a STAMINA mode, a SPEED mode, and an AUTO mode. In the STAMINA mode, the drawing process is performed all the time by the embedded graphics chip 15 in consideration of electric power saving, that is, in consideration of lasting driving of the battery 27 as long as possible. In the SPEED mode, the drawing process is performed all the time by the external graphics chip 20. Importance is placed on a drawing process performance. In the AUTO mode, an appropriate graphics chip is determined based on a use condition of the PC 100, and the graphics chip determined performs the drawing process.

[0044] In other words, in the AUTO mode, switching is performed between the STAMINA mode and the SPEED mode when necessary. The PC 100 executes one of those three modes by switching. Thus, one of the embedded graphics chip 15 and the external

graphics chip 20 performs the drawing process.

[0045] As shown in Fig. 4, in the AUTO mode, a movable portion 7a of the mode selection switch 7 is disposed at the upper right portion, and an LED display 8c of "AUTO" is lighted. Further, in the AUTO mode, depending on the graphics chip currently selected by the PC 100, that is, depending on a mode in execution, SPEED mode or STAMINA mode, one of LED displays 8a and 8b is lighted too. The color of a light source of the LED displays 8a and 8b is set to be different from the color of a light source of the LED display 8c.

[0046] In addition, in the case where the manual switching (not the AUTO mode) is selected, and the SPEED mode is selected, the movable portion 7a is disposed on the upper left portion. In the case where the STAMINA mode is selected, the movable portion 7a is disposed on the lower left. Further, one of the LED displays 8a and 8b corresponding to the SPEED mode and the STAMINA mode, respectively, is lighted.

[0047] (PC operation)

Subsequently, a description will be given on mode switching operations in the PC structured as described above. In the following, the CPU 11 will be described as a main operation subject, but the operations are performed in cooperation with various kinds of hardware and software as described later.

[0048] (Operation at time of changing switch)

First, a description will be given on an operation of the PC 100 in the case where the user selects a position corresponding to each of the modes with the mode selection switch 7.

[0049] Figs. 5 and 6 are flowcharts showing the operations of the PC 100 in the case where the AUTO mode is selected with the mode selection switch 7.

[0050] As shown in Fig. 5, when the AUTO mode is selected with the mode selection switch 7 (Step 51), the CPU 11 judges whether the external monitor is connected to the HDMI connector 2j or the DVI connector 2k (Step 52).

[0051] Here, in this embodiment, in the case where the external monitor is connected to the HDMI connector 2j or the DVI connector 2k, the PC 100 is capable of operating only in the SPEED mode in the hardware design.

[0052] In Step 52, when judging that the external monitor is connected (Yes), the CPU 11 judges whether a current mode is the STAMINA mode or not (Step 53). When judging that the current mode is the STAMINA mode (Yes), the CPU 11 performs the subsequent switching process of (B) of Fig. 6 (Step 54).

[0053] In Step 53, when judging that the current mode is not the STAMINA mode (No), the CPU 11 changes only a setting of a power supply option (Step 55), because the current mode is the SPEED mode, and it is unnecessary to switch the graphics chips. Then, the CPU 11 displays a message (message (2)) indicating a setting completion and

terminates the process (Step 56).

[0054] Here, the power supply option is held by the OS of the PC 100 for each mode, and is used to perform an appropriate power supply setting in accordance with the selection of the graphic chip, that is, depending on whether the drawing process performance or the electric power saving is emphasized. Therefore, in Step 55, the power supply option is the setting in which the drawing process performance is emphasized. Fig. 21 is a diagram showing an example of the message (2) that indicates the completion of the power supply setting for the AUTO mode and the SPEED mode.

[0055] In Step 53, when judging that the current mode is the STAMINA mode, as shown in (B) of Fig. 6, the CPU 11 indicates a dialog (message (4)) for confirming with the user whether the STAMINA mode can be switched to the SPEED mode (Step 70).

[0056] Fig. 23 is a diagram showing an example of the dialog (message (4)). As shown in Fig. 23, on the dialog, an OK button 231 for permitting the switching to the SPEED mode is displayed.

[0057] Then, the CPU 11 judges whether the mode selection switch 7 is returned to the state prior to the switching to the AUTO mode (Step 71). When judging that the mode selection switch 7 is returned (Yes), the CPU 11 deletes the dialog and terminates the process (Step 72). That is, by returning the mode selection switch 7, the mode switching process is canceled.

[0058] When the mode selection switch 7 is not returned (No), the CPU 11 judges whether the OK button 231 in the dialog is clicked or not (Step 73). When judging that the OK button 231 is clicked (Yes), the CPU 11 performs a switching operation to the SPEED mode (Step 74). The switching operation to the SPEED mode will be described later in detail.

[0059] Returning to Fig. 5, in Step 52, when the CPU 11 judges that the external monitor is not connected (No), the CPU 11 judges whether the AC adapter 5 is connected to the DC jack 28 (Step 57). When judging that the AC adapter 5 is connected (Yes), the CPU 11 performs the same processes as the processes of Steps 53 to 56 (Steps 58 to 60). That is, even if the external monitor is not connected to the HDMI connector 2j or the DVI connector 2k, in the case where the AC adapter 5 is connected to the DC jack 28, and it is unnecessary to take into consideration the drive time period of the battery 27, the CPU 11 performs the SPEED mode to emphasize the drawing process performance.

[0060] In Step 57, when judging that the AC adapter 5 is not connected (No), the CPU 11 judges whether the current mode is the SPEED mode or not (Step 61). When judging that the current mode is the SPEED mode (Yes), the CPU 11 subsequently performs a switching process of (A) of Fig. 6 (Step 62).

[0061] In Step 61, when judging that the current mode is not the SPEED mode (No), that is,

judging that the current mode is the STAMINA mode, the CPU 11 changes only a setting of a power supply option (Step 63), because it is unnecessary to switch the modes. Then, the CPU 11 displays a message (message (1)) indicating a setting completion and terminates the process (Step 64).

[0062] That is, in this case, the CPU 11 sets an appropriate power supply option to maintain the operation by the battery 27 as much as possible with the low power consumption. Fig. 20 is a diagram showing an example of the message (1) that indicates the completion of the power supply option setting for the AUTO mode and the STAMINA mode.

[0063] In Step 61, when judging that the current mode is the SPEED mode, as shown in (A) of Fig. 6, the CPU 11 indicates a dialog (message (3)) for confirming with the user whether the SPEED mode can be switched to the STAMINA mode (Step 65). Fig. 22 is a diagram showing an example of the dialog (message (3)). As shown in Fig. 22, on the dialog, an OK button 221 for permitting the switching to the STAMINA mode is indicated.

[0064] The subsequent operations are the same as the processes of Steps 71 to 74 in (B) of Fig. 6 except that the STAMINA mode and the SPEED mode are reversed (Steps 66 to 69). That is, when the switching with the mode selection switch 7 is not canceled, and the OK button 221 on the dialog is clicked, the CPU 11 performs the switching operation to the STAMINA mode. The switching operation to the STAMINA mode will be described later in detail.

[0065] Fig. 7 is a flowchart showing the operation flow of the PC 100 in the case where the switching to the STAMINA mode is performed with the mode selection switch 7.

[0066] As shown in Fig. 7, in the case where the STAMINA mode is selected with the mode selection switch 7 (Step 81), the CPU 11 judges whether the current mode is the AUTO mode and the STAMINA mode (Step 82). When judging that the current mode is the AUTO mode and the STAMINA mode (Yes), the CPU 11 just changes the setting of the power supply option because the mode switching is unnecessary (Step 83), and displays a message indicating a setting completion (message (5)), to terminate the operation (Step 84). Fig. 24 is a diagram showing an example of the message (5) that indicates the setting completion of the power supply option for the STAMINA mode. In this case, the electric power saving is emphasized.

[0067] In Step 82, when judging that the current mode is not the AUTO mode and the STAMINA mode (No), the CPU 11 displays a dialog (message (6)) for confirming with the user whether the current mode may be switched to the STAMINA mode (Step 85). Fig. 25 is a diagram showing an example of the dialog (message (6)). As shown in Fig. 25, on the dialog, an OK button 251 for permitting the switching to the STAMINA mode is displayed.

[0068] The subsequent operation is the same as the processes of Steps 66 to 69 of (A) of Fig. 6 (Steps 86 to 89). That is, in the case where the switching with the mode selection switch 7 is not canceled, and the OK button 251 on the dialog is clicked, the CPU 11 switches the current mode to the STAMINA mode.

[0069] Fig. 8 is a flowchart showing the operation flow of the PC 100 in the case where the switching to SPEED mode is performed with the mode selection switch 7. The operation flow of this case is different from that shown in Fig. 7 only in the mode. That is, the SPEED mode is involved in the operation shown in Fig. 8, while the STAMINA mode is involved in the operation shown in Fig. 7. Fig. 26 is a diagram showing an example of a message (7) that indicates the setting completion of the power supply option for the SPEED mode. In this case, the drawing process performance is emphasized. Fig. 27 is a diagram showing an example of a dialog (message (8)) for confirming with the user whether the switching to the SPEED mode may be performed. As shown in Fig. 27, on the dialog, an OK button 271 for permitting the switching to the SPEED mode is displayed.

[0070] (Operation at time when various events occur in respective modes)

Subsequently, in the aforementioned modes, the operations of the PC 100 in the case where events occur that require the switching of the modes will be described.

[0071] Fig. 9 is a flowchart showing the operation flow of the PC 100 in the case where both the HDMI connection and the DVI connection are released (the cables are removed from both the HDMI connector 2j and the DVI connector 2k) in the AUTO mode.

[0072] As shown in Fig. 9, when both the HDMI connection and the DVI connection are released (Step 101), the CPU 11 judges whether the AC adapter 5 is connected to the DC jack 28 (Step 102).

[0073] When judging that the AC adapter 5 is connected (Yes), the CPU 11 terminates the process because the mode switching is unnecessary (Step 103).

[0074] When judging that the AC adapter 5 is not connected (No), the CPU 11 displays a dialog (message (3)) for confirming with the user whether the switching to the STAMINA mode may be performed as shown in Fig. 22 because the current mode is the AUTO and SPEED modes (Step 104).

[0075] Subsequently, the CPU 11 judges whether the external monitor is connected to the HDMI connector 2j or the DVI connector 2k again (Step 105). In the case where the connection to the HDMI connector 2j or the DVI connector 2k is performed (Yes), the CPU 11 deletes the dialog and terminates the process (Step 106). That is, the user can cancel the mode switching process by inserting the HDMI cable or the DVI cable to the HDMI connector 2j or the DVI connector 2k again.

[0076] In the case where the external monitor is not connected to the HDMI connector 2j or the DVI connector 2k again (No), the CPU 11 judges whether the OK button 221 on

the dialog is clicked or not (Step 107). When judging that the OK button 221 is clicked (Yes), the CPU 11 switches the current mode to the STAMINA mode (Step 108).

[0077] Fig. 10 is a flowchart showing the operation flow of the PC in the case where the external monitor is connected to the HDMI connector 2j or the DVI connector 2k in the AUTO mode.

[0078] As shown in Fig. 10, when the external monitor is connected to the HDMI connector 2j or the DVI connector 2k (Step 111), the CPU 11 judges whether another external monitor is already connected to the remaining connector (Step 112). When judging that another external monitor is connected to the remaining connector (Yes), the CPU 11 terminates the process, because the current mode is the AUTO and SPEED modes, and the mode switching is unnecessary (Step 113).

[0079] When judging that another external monitor is not connected to the remaining connector (No), the CPU 11 judges whether the AC adapter 5 is connected to the DC jack 28 or not (Step 114). When the CPU 11 judges that the AC adapter 5 is connected (Yes), the CPU 11 terminates the process, because the current mode is the AUTO and SPEED modes, and the mode switching is unnecessary (Step 115).

[0080] When judging that the AC adapter 5 is not connected (No), as shown in Fig. 23, the CPU 11 displays the dialog (message (4)) for confirming with the user whether the switching to the SPEED mode may be performed or not (Step 116).

[0081] Then, the CPU 11 judges whether the HDMI cable or the DVI cable that is connected to the HDMI connector 2j or the DVI connector 2k in Step 111 is removed or not (whether the connection with the external monitor is released or not) (Step 117). When judging that the cable is removed (Yes), the CPU 11 deletes the dialog and terminates the process (Step 118). That is, the user can cancel the mode switching process by removing the HDMI cable or the DVI cable that is once inserted.

[0082] When judging that the cable is not removed from the HDMI connector 2j or the DVI connector 2k (No), the CPU 11 judges whether the OK button 231 is clicked or not on the dialog (Step 119). When judging that the OK button 231 is clicked (Yes), the CPU 11 switches the current mode to the SPEED mode (Step 120).

[0083] Fig. 11 is a flowchart showing the operation flow of the PC in the case where the external monitor is connected to the HDMI connector 2j or the DVI connector 2k in the STAMINA mode manually set.

[0084] As shown in Fig. 11, when the external monitor is connected to the HDMI connector 2j or the DVI connector 2k in the STAMINA mode, the CPU 11 displays a dialog (message (9)) for urging the switching to the SPEED mode (Step 122). Fig. 28 is a diagram showing an example of the dialog (message (9)). As shown in Fig. 28, in the dialog, a "close" button 281 is displayed along with a message that urges the user to switch the current mode to the SPEED mode with the mode selection switch 7.

[0085] Subsequently, the CPU 11 judges whether the "close" button 281 is clicked or not on the dialog (Step 123). In the case where the "close" button 281 is clicked (Yes), the CPU 11 deletes the dialog and terminates the process (Step 124).

[0086] Then, the CPU 11 judges whether the user performs the switching to the SPEED mode or the AUTO mode with the mode selection switch 7 (Step 125). When the switching is performed with the mode selection switch 7 (Yes), the CPU 11 operates to switch the current mode to the SPEED mode (Step 126).

[0087] Fig. 12 is a flowchart showing the operation flow of the PC in the case where the AC adapter 5 connected in the AUTO mode is removed.

[0088] As shown in Fig. 12, when the AC adapter 5 is removed (Step 131), the CPU 11 judges whether the external monitor is connected to the HDMI connector 2j or the DVI connector 2k (Step 132). When judging that the external monitor is connected to the HDMI connector 2j or the DVI connector 2k (Yes), the CPU 11 terminates the process, because the current mode is the SPEED mode, and the mode switching is unnecessary (Step 133).

[0089] When judging that the external monitor is not connected to the HDMI connector 2j or the DVI connector 2k (No), as shown in Fig. 22, the CPU 11 displays the dialog (message (3)) for confirming with the user whether the switching to the STAMINA mode may be performed or not (Step 134).

[0090] Subsequently, the CPU 11 judges whether the AC adapter is connected again (Step 135). In the case where the AC adapter is connected again (Yes), the CPU 11 deletes the dialog and terminates the process (Step 136).

[0091] In the case where the AC adapter 5 is not connected (No), the CPU 11 judges whether the OK button 221 is clicked on the dialog (Step 137). When judging that the OK button 221 is clicked (Yes), the CPU 11 operates to switch the current mode to the STAMINA mode (Step 138).

[0092] Fig. 13 is a flowchart showing the operation flow of the PC in the case where the AC adapter 5 that is not connected in the AUTO mode is connected.

[0093] As shown in Fig. 13, when the AC adapter 5 is connected (Step 141), the CPU 11 judges whether the external monitor is connected to the HDMI connector 2j or the DVI connector 2k (Step 142). When judging that the external monitor is connected to the HDMI connector 2j or the DVI connector 2k (Yes), the CPU terminates the process, because the current mode is the SPEED mode, and the mode switching is unnecessary (Step 143).

[0094] When judging that the external monitor is not connected to the HDMI connector 2j or the DVI connector 2k (No), the CPU 11 displays the dialog (message (4)) for confirming with the user whether the switching to the SPEED mode may be performed as shown in Fig. 23 (Step 144).

[0095] Subsequently, the CPU 11 judges whether the AC adapter 5 that has been connected once is removed or not (Step 145). In the case where the AC adapter 5 is removed (Yes), the CPU 11 deletes the dialog and terminates the process (Step 146).

[0096] In the case where the AC adapter 5 is not removed (No), the CPU 11 judges whether the OK button 231 is clicked on the dialog (Step 147). When judging that the OK button 231 is clicked (Yes), the CPU 11 operates to switch the current mode to the SPEED mode (Step 148).

[0097] (Details of switching operation to STAMINA mode)

Next, the details of the switching operation to the STAMINA mode will be described. Fig. 14 is a flowchart showing the switching operation flow to the STAMINA mode. The operation of Fig. 14 includes an operation during the AUTO mode and an operation during the SPEED mode manually selected.

[0098] As shown in Fig. 14, when a switching process to the STAMINA mode is generated (Step 151), the CPU 11 judges whether an application that may cause a trouble in the switching is run or not (Step 152). Here, the application that may cause a trouble in the switching refers to a reproduction application for a movie, a DVD, or the like, a game application, or the like, in particular, an application that uses the external graphics chip 20. For example, a mailer, a document creation application, a table creation application, or the like does not cause a trouble, even if the switching is performed during the execution of the application.

[0099] When judging that the application that may cause a trouble in the switching is run (Yes), the CPU 11 judges whether the current mode is the AUTO mode or not (Step 153). When judging that the current mode is the AUTO mode (Yes), the CPU 11 displays a message (message (10)) that urges the switching to the STAMINA mode (Step 154).

[0100] Fig. 29 is a diagram showing an example of the message (10) that urges the switching. As shown in Fig. 29, the message indicates that the drive time period of the battery 27 is shortened in the current mode and indicates that the message concerned only has to be clicked to perform switching to the STAMINA mode.

[0101] Subsequently, the CPU 11 judges whether the message concerned is clicked (Step 155). When judging that the message is clicked (Yes), the CPU 11 displays the name of the application that may cause a trouble in the switching (Step 157). In the case where there is a plurality of applications that may cause a trouble in the switching, the names of those applications are displayed.

[0102] Fig. 31 is a diagram showing an example of a dialog that shows the name of the application. As shown in Fig. 31, in addition to the name of the application that may cause a trouble in the switching, a message that urges the termination of the application, a forced switching button 311, and a cancel button 312 are displayed on the

dialog. The forced switching button 311 is used to give an instruction that the mode switching is forced to be performed with knowledge of a trouble. The cancel button 312 is used to cancel the switching.

[0103] Subsequently, the CPU 11 judges whether the forced switching button 311 is clicked on the dialog (Step 158). When judging that the forced switching button 311 is clicked (Yes), the CPU 11 obtains a power consumption value at that time by using the wattmeter 29 (Step 160).

[0104] Then, the CPU 11 performs the switching process to the STAMINA mode, that is, a switching process from the external graphics chip 20 to the embedded graphics chip 15 (Step 161), and changes the setting of the power supply option (Step 162).

[0105] Then, the CPU 11 obtains the power consumption value after the switching of the mode by using the wattmeter 29 (Step 163).

[0106] Subsequently, the CPU 11 displays the message (1) that indicates the completion of the mode switching, and displays the obtained power consumption values before and after the switching (Step 164).

[0107] In Step 153, when judging that the current mode is not the AUTO mode (No), that is, the SPEED mode manually selected, the CPU 11 subsequently performs a process of Step 157. In this case, the message displayed at the time of the final completion of the switching is the message (5).

[0108] In addition, in the case where the message is not clicked in Step 155 (No), and in the case where the forced switching button 311 is not clicked in Step 158 (No), the CPU 11 judges whether the applications that may cause a trouble in the switching are entirely terminated (Steps 156 and 159). When judging that the applications are terminated, the CPU 11 then performs the process of Step 160.

[0109] As described above, the CPU 11 displays the name of the application that may cause a trouble in the mode switching to thereby alert the user, with the result that the data of the application in execution can be prevented from being damaged or erased, and the mode switching can be performed safely. Further, in the AUTO mode, the CPU 11 displays the message for urging the switching before displaying the name of the application that may cause a trouble, which can give the user an opportunity to terminate the application by him/herself.

[0110] (Details of switching operation to SPEED mode)

Fig. 15 is a flowchart showing the switching operation to the SPEED mode. The process shown in Fig. 15 is different, only in the mode, from the switching process to the STAMINA mode that is shown in Fig. 14. That is, the SPEED mode is involved in the process shown in Fig. 15, while the STAMINA mode is involved in the process shown in Fig. 14, so a description thereof will be omitted. Fig. 30 is a diagram showing an example of a message (message (11)) that urges the switching that is displayed

during the AUTO mode in the switching process to the SPEED mode. As shown in Fig. 30, the message indicates that it may be impossible to use the HDMI connector 2j or the DVI connector 2k in the current mode and indicates that the message only has to be clicked to perform switching to the SPEED mode. In addition, in Fig. 15, the message that is finally displayed in the case where the mode is switched in execution of the AUTO mode is the message (2), and the message that is finally displayed in the case where the mode is switched during the execution of the STAMINA mode manually selected is the message (6).

[0111] (Process of blocks at time when various operations are performed)

Next, a description will be given on the flow of a signal among blocks of the software and the hardware of the PC 100 in the processes described above.

[0112] Fig. 16 is a diagram showing the process flow of blocks in a detection process of the switching with the mode selection switch 7. Figs. 16 to 19 show, as common blocks, utility software 201, an FEP.sys 202, a system BIOS 203, the EC 16, the mode selection switch 7, the switching circuit 22, the LED display 8, a graphics driver 204, the embedded graphics chip 15, the external graphics chip 20, the HDMI connector 2j, and the DVI connector 2k.

[0113] As shown in Fig. 16, in the case where the switching is performed with the mode selection switch 7, the switching is transmitted from the mode selection switch 7 to the EC 16 ((1) in Fig. 16), and then transmitted to the utility software 201 through the system BIOS 203 and the FEP.sys 202 ((2) to (4) in Fig. 16). Thus, the utility software 201 can display the various dialogs (messages) described above.

[0114] Fig. 17 is a diagram showing the process flow of blocks in a detection process of a current switch position for the mode selection switch 7.

[0115] As shown in Fig. 17, the utility software 201 inquires of the EC 16 through the FEP.sys 202 and the system BIOS 203 as to the current switch position in the mode selection switch 7 ((1) to (3) in Fig. 17). In response to the inquiry, the EC 16 detects the current switch position from the mode selection switch 7 ((4) in Fig. 17), and transmits a result of the detection to the utility software 201 through the system BIOS 203 and the FEP.sys 202 ((5) to (7) in Fig. 17).

[0116] Fig. 18 is a diagram showing the process flow of blocks in a detection process of the connection between the external monitor and the HDMI connector 2j or the DVI connector 2k.

[0117] As shown in Fig. 18, in the case where the connection to the HDMI connector 2j or the DVI connector 2k is conducted, the fact is transmitted to the embedded graphics chip 15 or the external graphics chip 20 ((1) in Fig. 18), and further transmitted to the graphics driver 204 ((2) in Fig. 18). The graphics driver 204 transmits the connection to the system BIOS 203 ((3) in Fig. 18), and the system BIOS 203 transmits the

connection to the utility software 201 through the FEP.sys 202 ((4) and (5) in Fig. 18).

[0118] Fig. 19 is a diagram showing the process flow of blocks at the time when the graphics chips are switched.

[0119] As shown in Fig. 19, for example, when an event of clicking the OK button on the dialog is generated, the utility software 201 transmits an instruction for switching the graphic chips to the graphics driver through the FEP.sys 202 and the system BIOS 203 ((1) to (3) in Fig. 19).

[0120] The graphics driver 204 performs initialization of the embedded graphics chip 15 or the external graphics chip 20 or turns on and off of the power thereof ((4) in Fig. 19), for example, and transmits an instruction for switching the graphics chips to the EC 16 through the system BIOS 203 ((4) and (5) in Fig. 19). Based on the instruction, the EC 16 causes the switching circuit 22 to switch the graphics chips ((6) in Fig. 19).

[0121] Then, the graphics driver 204 transmits the completion of the switching process of the graphics chips to the system BIOS 203 ((7) in Fig. 19). The system BIOS 203 notifies the utility software 201 of the completion through the FEP.sys 202 ((8) and (9) in Fig. 19). Thus, the utility software 201 displays the message that indicates the setting completion of the power supply option.

[0122] On the other hand, the system BIOS 203 also notifies the EC 16 of the completion. Based on the notification, the EC 16 causes the LED display 8 in accordance with the switched mode to light up.

[0123] (Conclusion)

As described above, according to this embodiment, the PC 100 prepares the AUTO mode in addition to the STAMINA and SPEED modes, and therefore can automatically switch the embedded graphics chip 15 and the external graphics chip 20 in accordance with the connection condition to the external monitor with the HDMI or the DVI or a connection condition of the AC adapter 5. Thus, the PC 100 can switch the two graphics chips safely and easily in accordance with the use purpose of the user. Further, if the switching of the modes may cause a trouble in the operation of the application, the PC 100 displays the name of the application and urges the termination of the application. Therefore, the PC 100 can further assure the user of the safety.

[0124] (Modified example)

The present invention is not limited to the above embodiment, and can be variously modified without departing from the gist of the present invention.

[0125] In the above embodiment, the PC 100 can perform the forced switching even after the name of the application that may cause a trouble due to the mode switching is displayed, but such a forced switching may be completely inhibited.

[0126] Further, in the case where the application that may cause a trouble due to the mode switching is present, the PC 100 may display a screen for urging an immediate ter-

mination of the application, or automatically store the task of the application and automatically terminate the application.

[0127] The present application contains subject matter related to that disclosed in Japanese Priority Patent Application JP 2010-001606 filed in the Japan Patent Office on January, 7, 2010, the entire content of which is hereby incorporated by reference.

Reference Signs List

[0128] 2a operation input unit
2j HDMI connector
2k DVI connector
3 display
3a LCD
5 AC adapter
7 mode selection switch
8 (8a, 8b, 8c) LED display
11 CPU
15 embedded graphics chip
16 EC
20 external graphics chip
21 HDD
22 switching circuit
26 power supply circuit
27 battery
28 DC jack
100 PC
201 utility software
204 graphics driver
221, 231, 251, 271 OK button
311 forced switching button

Claims

[Claim 1] An information processing apparatus, comprising:
a first graphics chip to generate a first image signal, the first graphics chip having a first graphics performance;
a second graphics chip to generate a second image signal, the second graphics chip having a second graphics performance that is higher than the first graphics performance;
a switch to perform switching to cause one of the first graphics chip and the second graphics chip to operate;
a storage to store an application with a name of the application, the application being executed during an operation of the one of the first graphics chip and the second graphics chip;
a display to display one of the first image signal and the second image signal;
a connector connected with an external display to output the second image signal to the external display; and
a controller to control the switch to execute a first mode in which the first graphics chip is operated all the time, a second mode in which the second graphics chip is operated all the time, and a third mode in which switching between an operation of the first graphics chip and an operation of the second graphics chip is performed in accordance with whether the external display is connected to the connector, judge whether a trouble is caused in an operation of the application in execution due to the switching between the operations of the first and second graphics chips, and control the display to display the name of the application when judging that the trouble is caused.

[Claim 2] The information processing apparatus according to claim 1,
wherein, in the third mode, the controller performs the switching between the operation of the first graphics chip and the operation of the second graphics chip in a case where the application is terminated after the name of the application is displayed.

[Claim 3] The information processing apparatus according to claim 2, further comprising:
a power supply to supply power to the information processing apparatus from one of an AC adapter and a battery,
wherein, in the third mode, the controller
causes the first graphics chip to operate in a case where the external

display is not connected to the connector, and the power is supplied from the battery, and

causes the second graphics chip to operate in a case where the external display is connected to the connector, and in a case where the external display is not connected to the connector and the power is supplied from the AC adapter.

[Claim 4] The information processing apparatus according to claim 2, further comprising:

an operation input unit to receive an operation input by a user,

wherein, when judging that the trouble is caused during execution of the third mode, the controller displays, on the display, an operation dialog including a message that urges switching to one of the first mode and the second mode, displays the name of the application in a case where an operation for the switching is input from the operation input unit on the operation dialog, and performs the switching between the operation of the first graphics chip and the operation of the second graphics chip in a case where the application is terminated after the operation dialog is displayed and before the operation of the switching is input.

[Claim 5] The information processing apparatus according to claim 3,

wherein the controller detects a first electric power value of electric power supplied from the power supply before the switching between the operation of the first graphics chip and the operation of the second graphics chip and a second electric power value of electric power supplied from the power supply after the switching, and displays information that indicates the first electric power value and the second electric power value on the display.

[Claim 6] An information processing method for an information processing apparatus including a first graphics chip having a first graphics performance and a second graphics chip having a second graphics performance that is higher than the first graphics performance, comprising:

executing a first mode in which the first graphics chip is operated all the time, a second mode in which the second graphics chip is operated all the time, and a third mode in which switching between an operation of the first graphics chip and an operation of the second graphics chip is performed in accordance with whether an external display is connected to the information processing apparatus;

judging whether a trouble is caused in an operation of an application in

execution due to the switching between the operations of the first and second graphics chips; and

displaying a name of the application when judging that the trouble is caused.

[Claim 7] A program for causing an information processing apparatus including a first graphics chip having a first graphics performance and a second graphics chip having a second graphics performance that is higher than the first graphics performance to execute:

executing a first mode in which the first graphics chip is operated all the time, a second mode in which the second graphics chip is operated all the time, and a third mode in which switching between an operation of the first graphics chip and an operation of the second graphics chip is performed in accordance with whether an external display is connected to the information processing apparatus;

judging whether a trouble is caused in an operation of an application in execution due to the switching between the operations of the first and second graphics chips; and

displaying a name of the application when judging that the trouble is caused.

[Fig. 1]

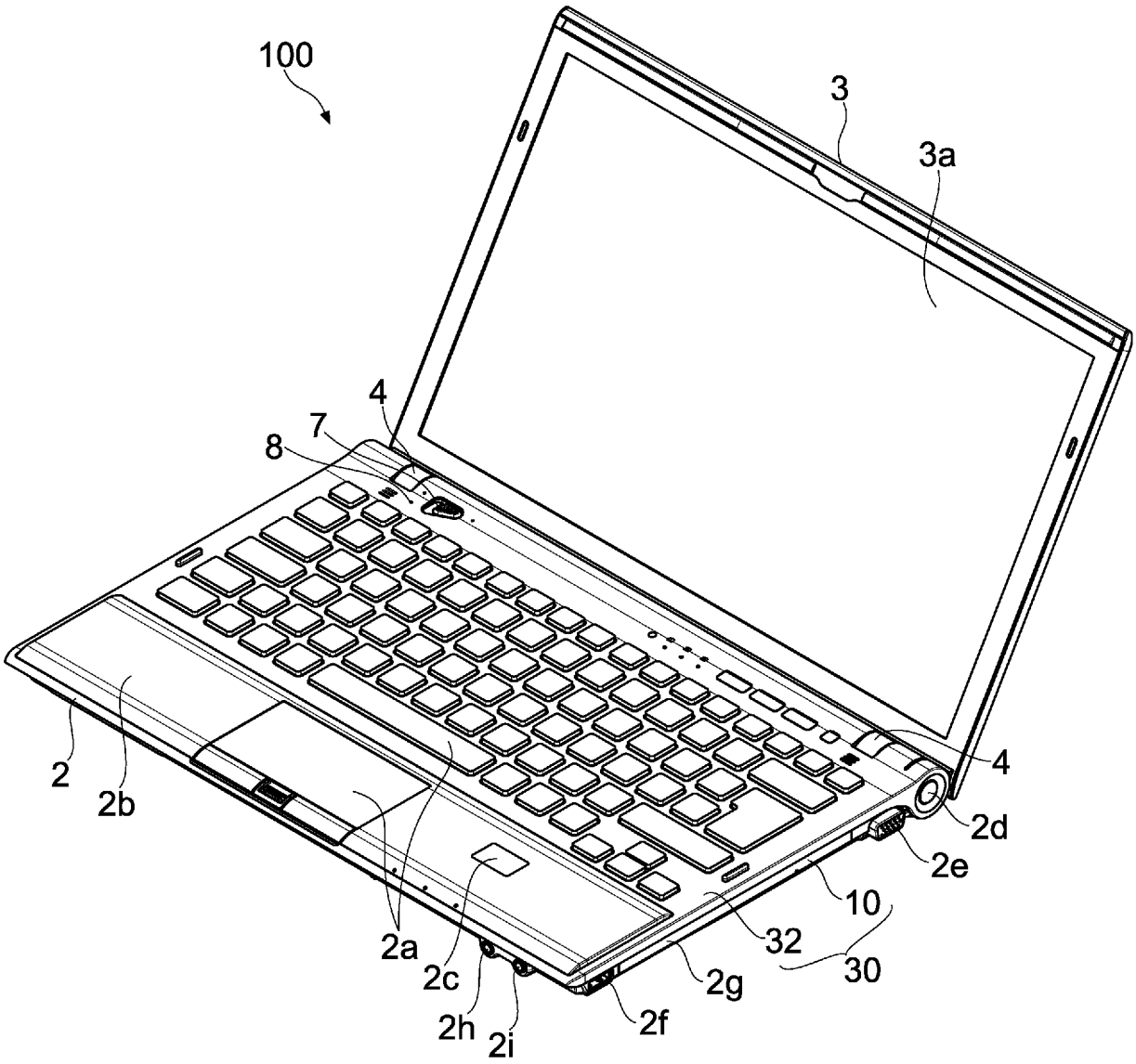

FIG.1

[Fig. 2]

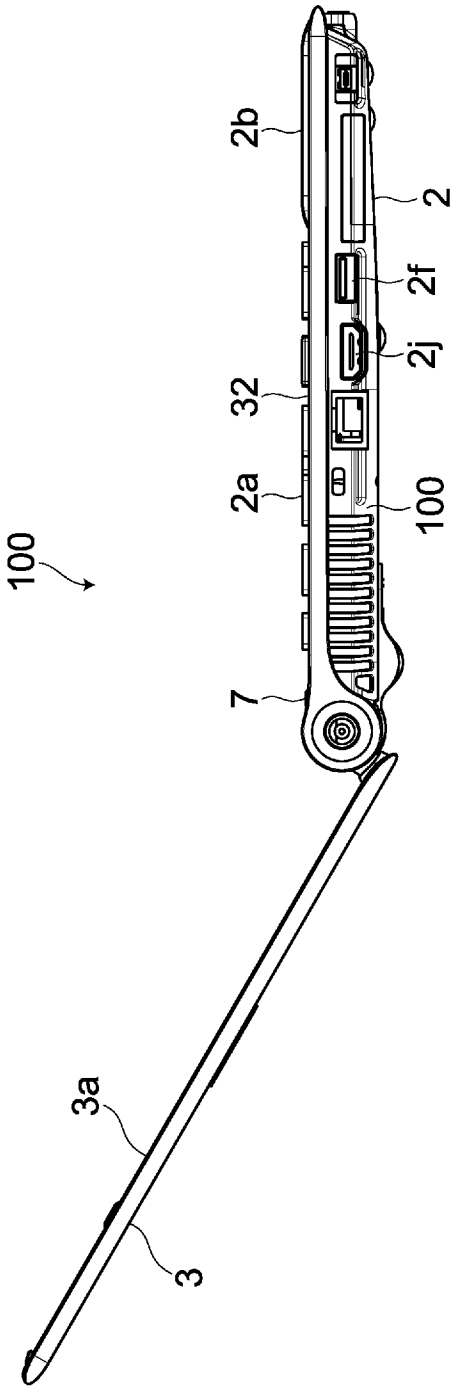

FIG.2

[Fig. 3]

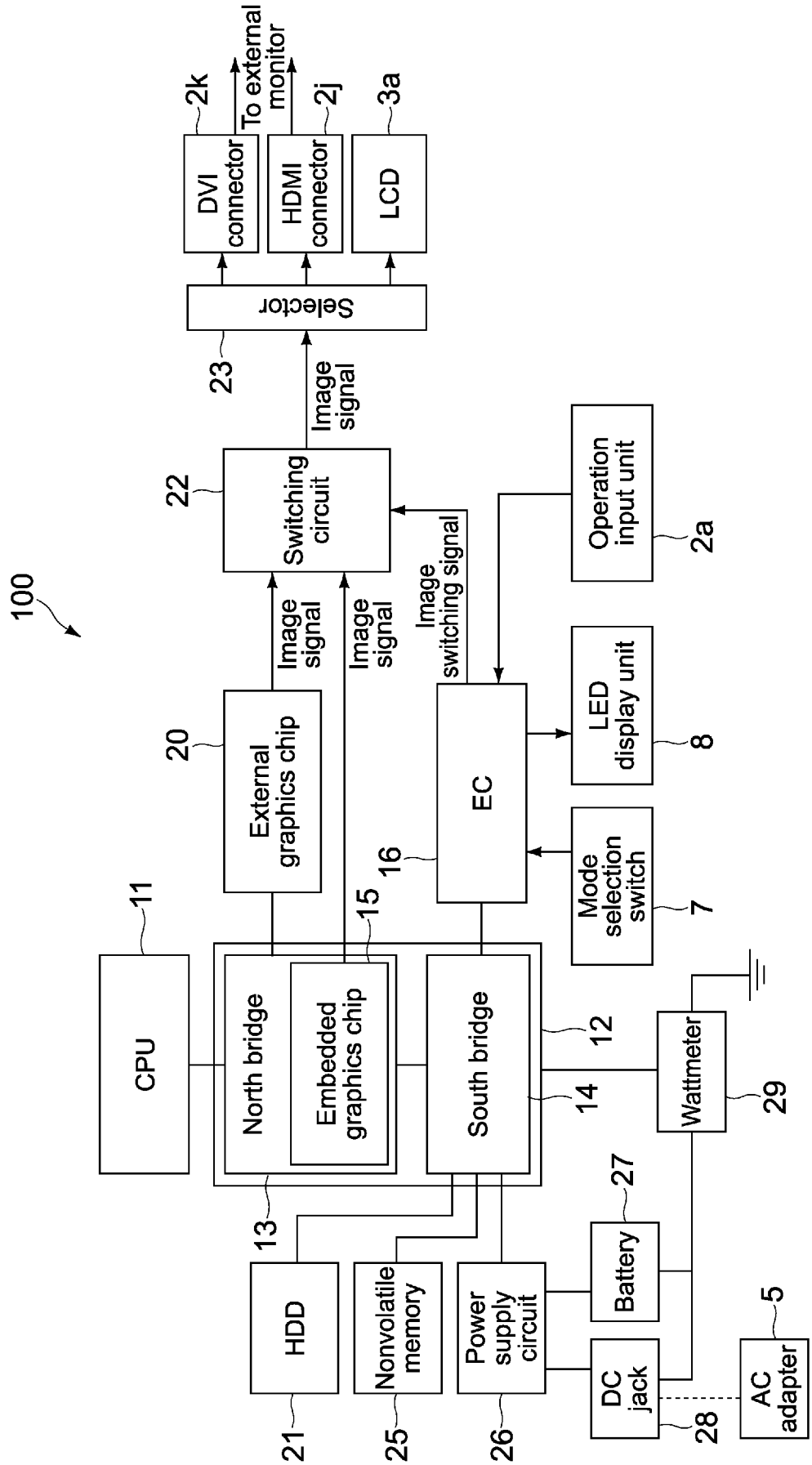
100
CPU
11
North bridge
Embedded graphics chip
15
13
South bridge
12
14
External graphics chip
20
Image signal
Image signal
Switching circuit
22
Image signal
23
Selector
DVI connector
2k
To external monitor
HDMI connector
2j
LCD
3a
EC
16
Image switching signal
Operation input unit
2a
LED display unit
8
Mode selection switch
7
Wattmeter
29
HDD
21
Nonvolatile memory
25
Power supply circuit
26
Battery
27
DC jack
28
AC adapter
5

FIG.3

[Fig. 4]

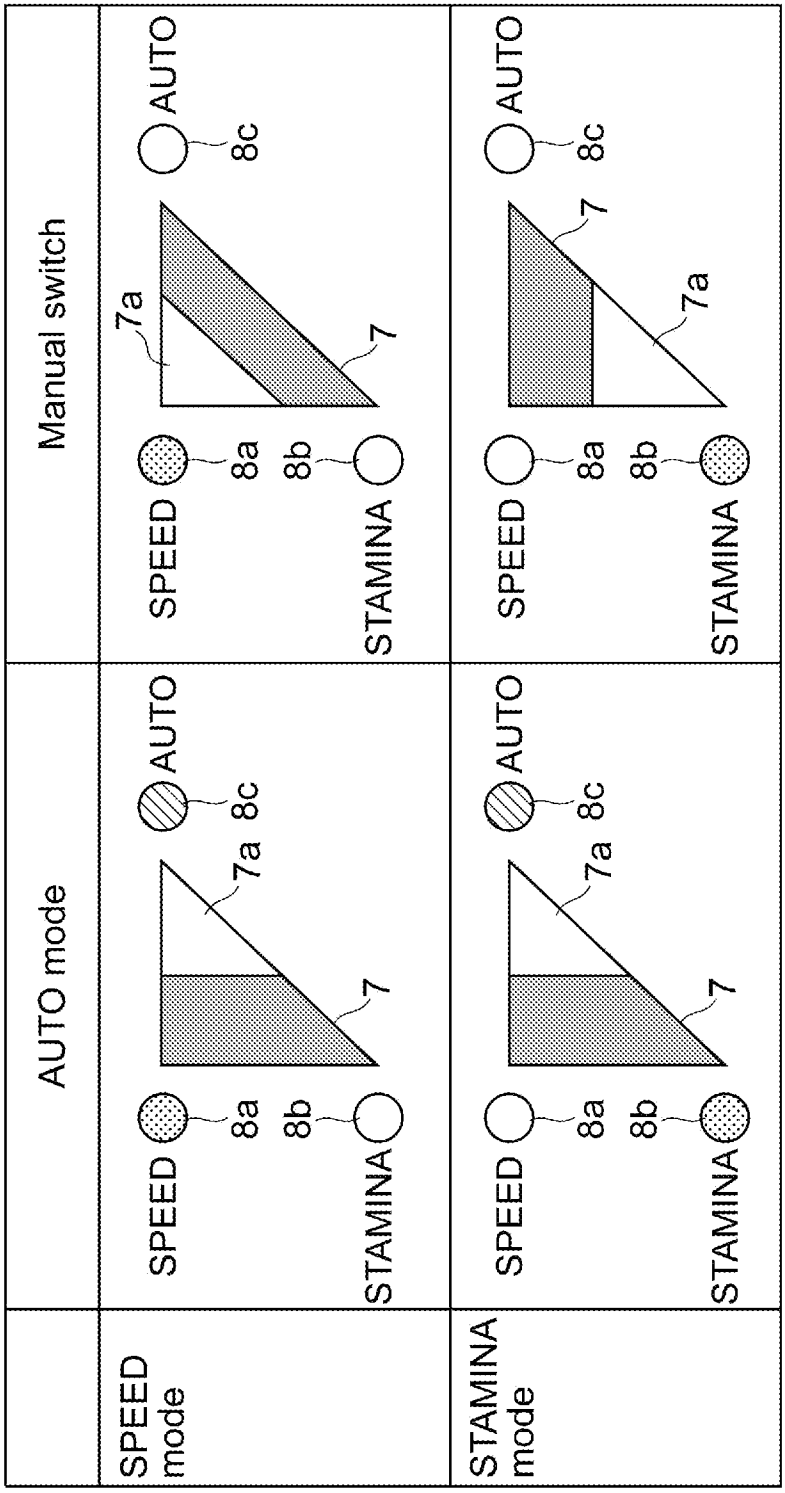
AUTO mode
Manual switch
SPEED mode
STAMINA mode
SPEED
STAMINA
AUTO
8a
8b
8c
7
7a

FIG.4

[Fig. 5]

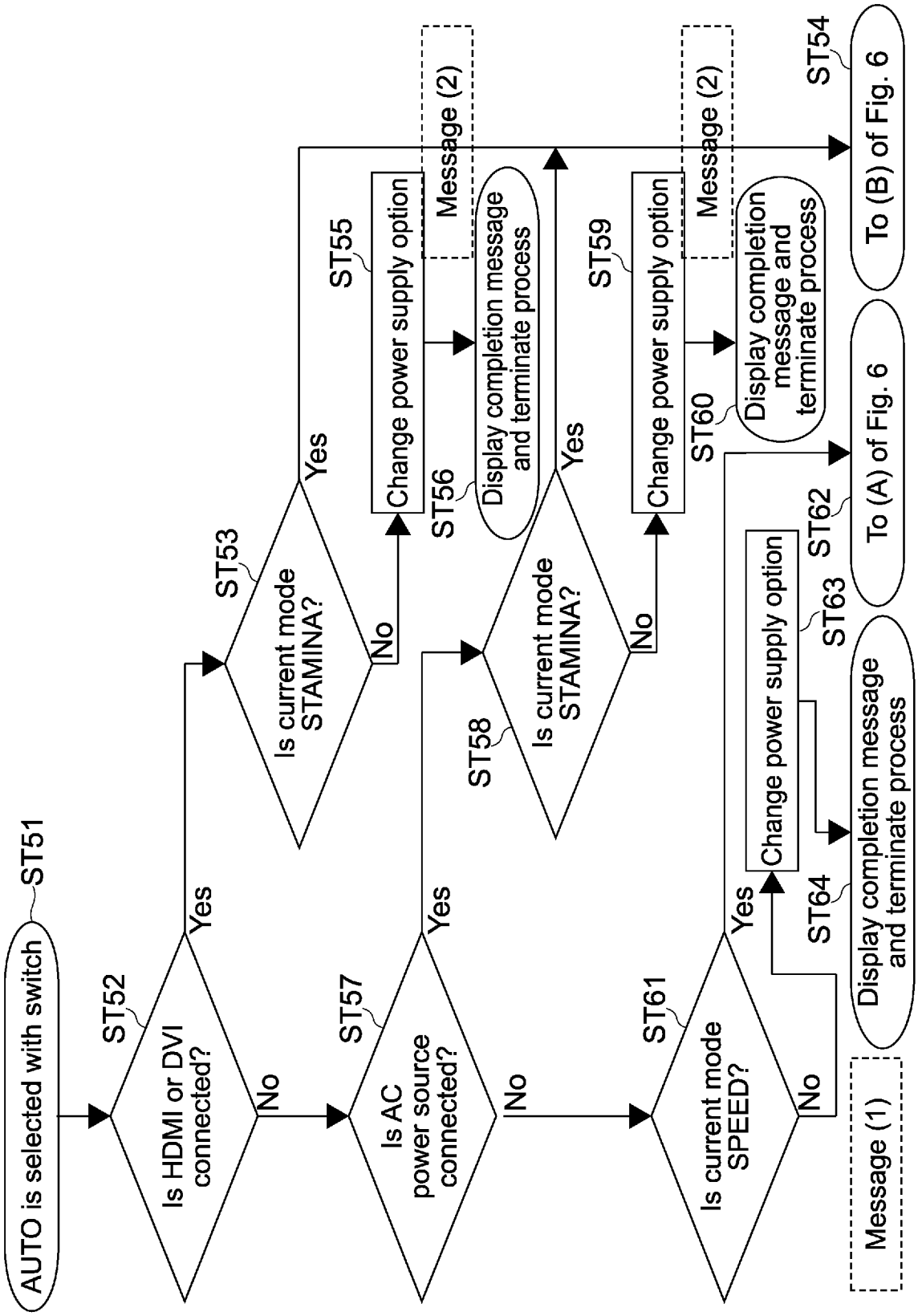
AUTO is selected with switch
ST51
Is HDMI or DVI connected?
ST52
Yes
No
Is current mode STAMINA?
ST53
Yes
No
Change power supply option
ST55
Message (2)
Display completion message and terminate process
ST56
Is AC power source connected?
ST57
Yes
No
Is current mode STAMINA?
ST58
Yes
No
Change power supply option
ST59
Message (2)
Display completion message and terminate process
ST60
Is current mode SPEED?
ST61
Yes
No
Change power supply option
ST62
Message (1)
Display completion message and terminate process
ST63
ST64
To (A) of Fig. 6
To (B) of Fig. 6
ST54

FIG.5

[Fig. 6]

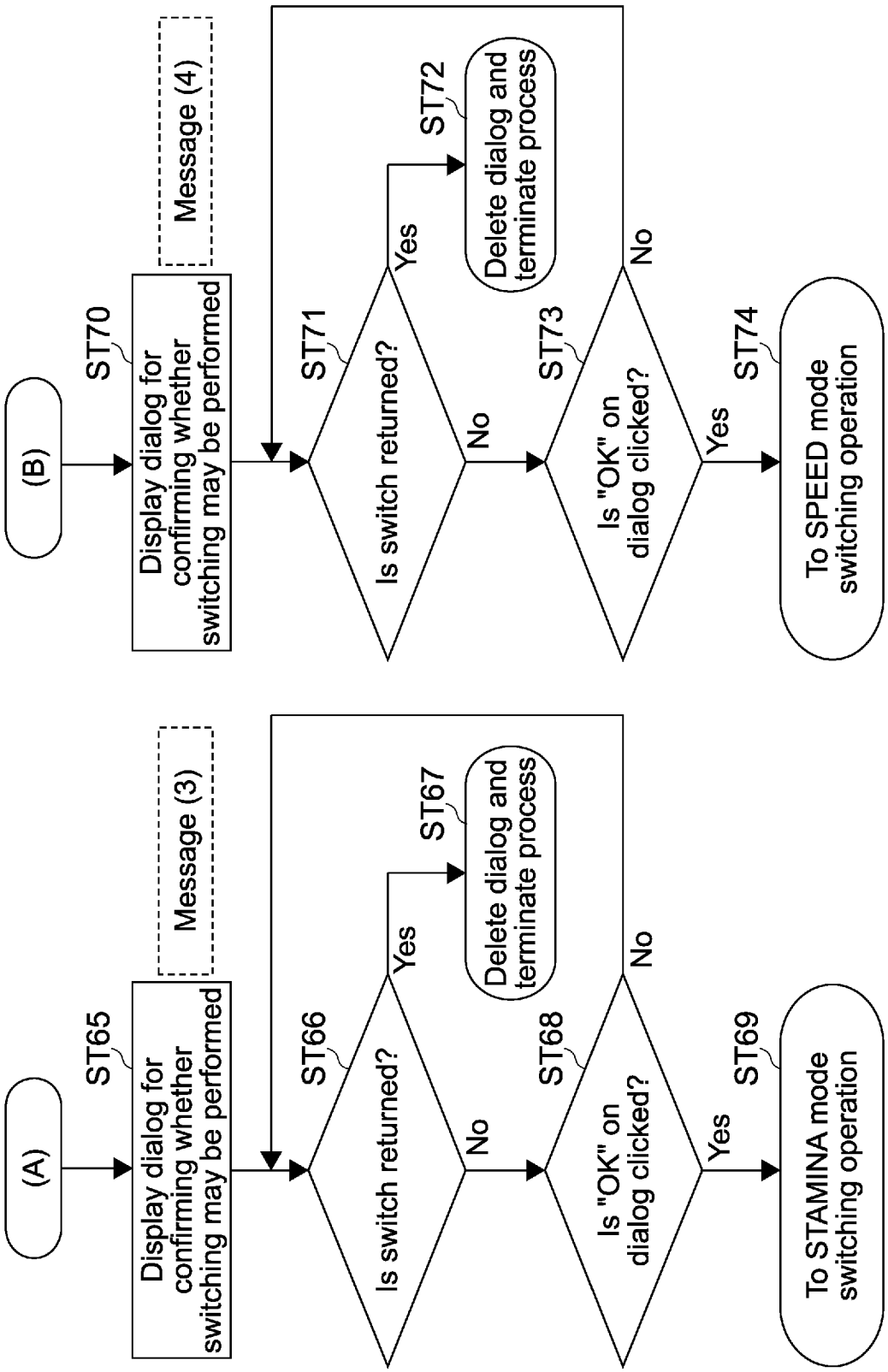
(A)
ST65
Display dialog for confirming whether switching may be performed
Message (3)
ST66
Is switch returned?
Yes
ST67
Delete dialog and terminate process
No
ST68
Is "OK" on dialog clicked?
No
Yes
ST69
To STAMINA mode switching operation
(B)
ST70
Display dialog for confirming whether switching may be performed
Message (4)
ST71
Is switch returned?
Yes
ST72
Delete dialog and terminate process
No
ST73
Is "OK" on dialog clicked?
No
Yes
ST74
To SPEED mode switching operation

FIG.6

[Fig. 7]

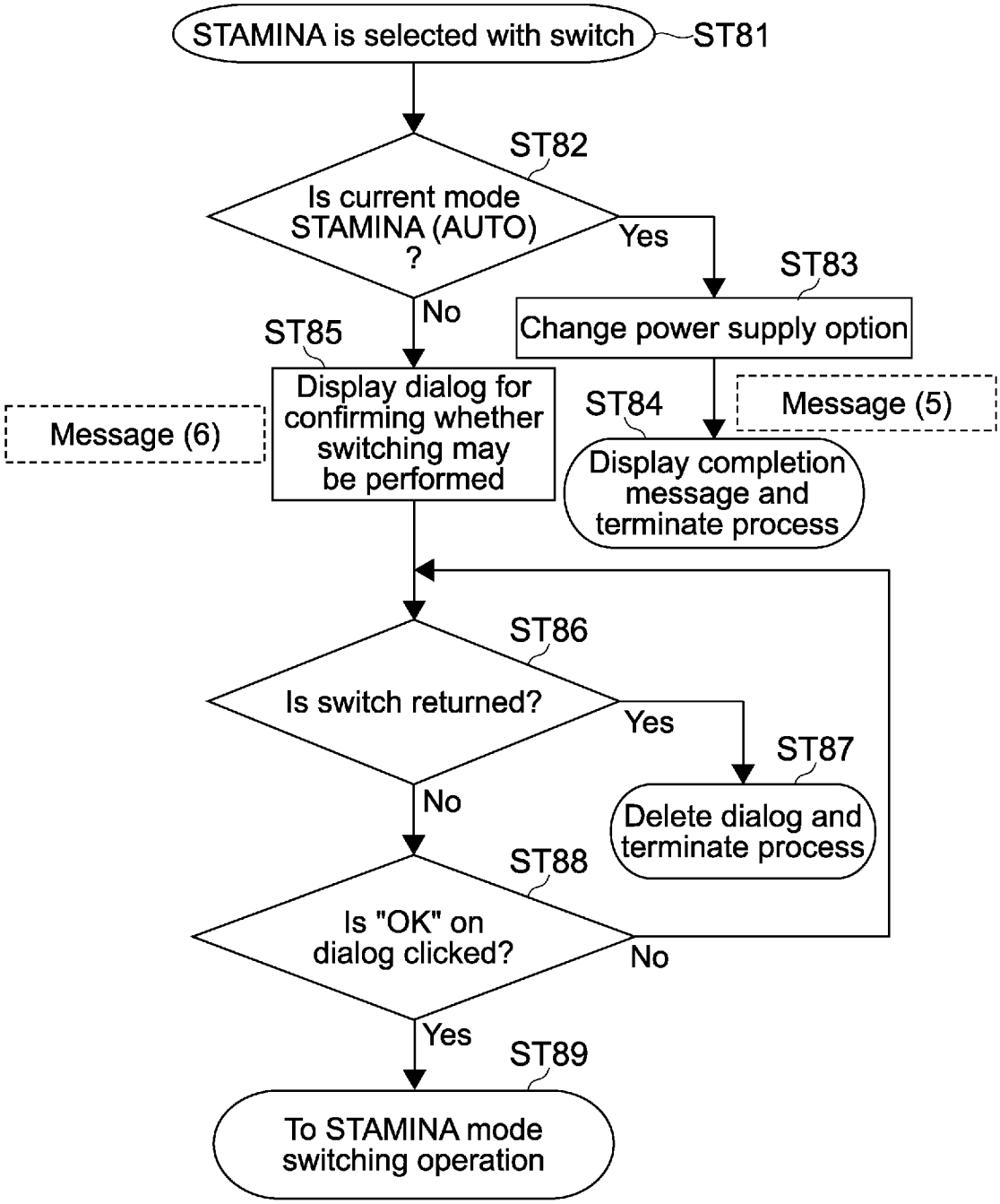
STAMINA is selected with switch
ST81
ST82
Is current mode STAMINA (AUTO) ?
Yes
No
ST83
Change power supply option
ST84
Message (5)
Display completion message and terminate process
ST85
Message (6)
Display dialog for confirming whether switching may be performed
ST86
Is switch returned?
Yes
No
ST87
Delete dialog and terminate process
ST88
Is "OK" on dialog clicked?
No
Yes
ST89
To STAMINA mode switching operation

FIG.7

[Fig. 8]

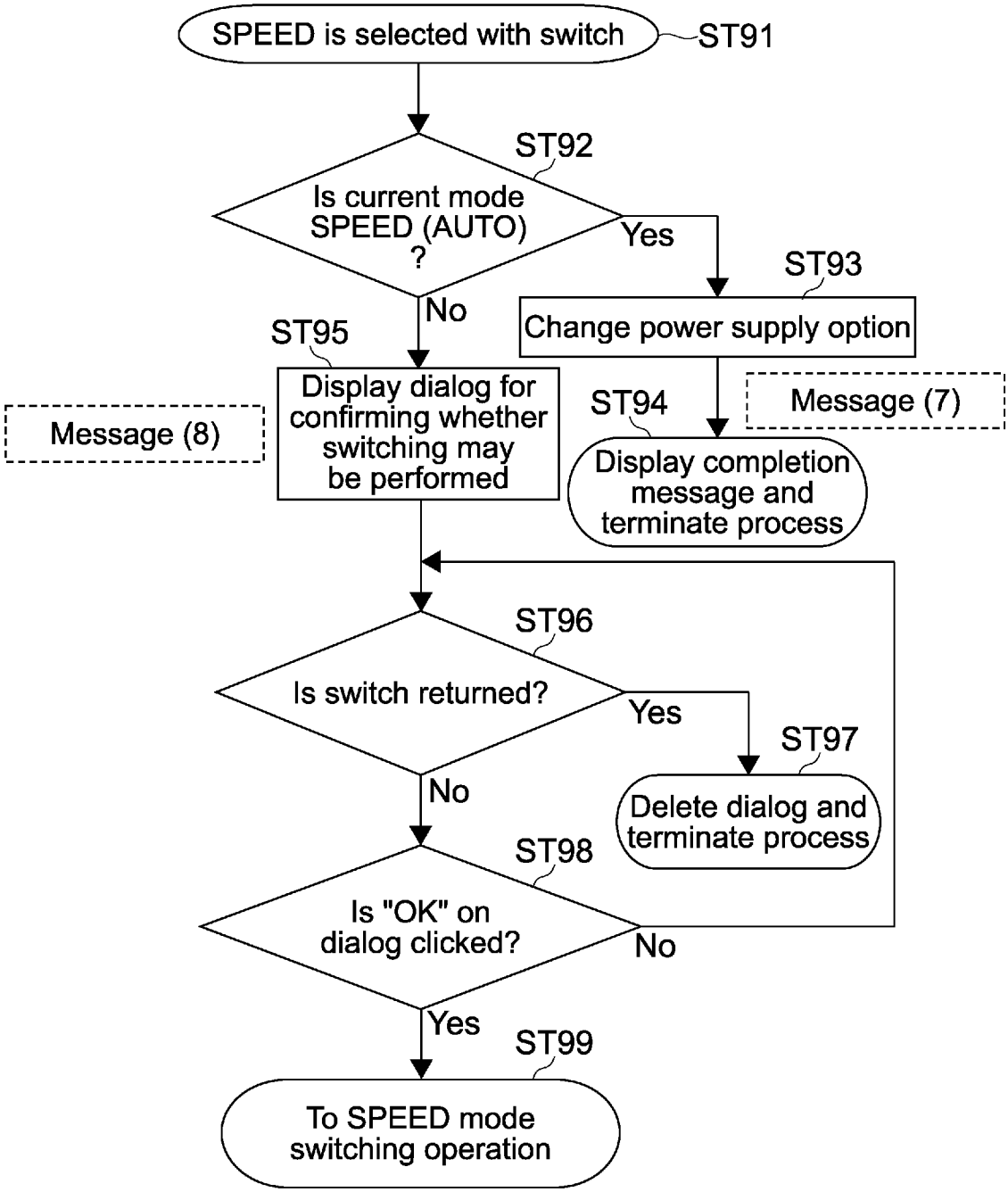
SPEED is selected with switch
ST91
ST92
Is current mode SPEED (AUTO) ?
Yes
No
ST93
Change power supply option
ST94
Message (7)
Display completion message and terminate process
ST95
Message (8)
Display dialog for confirming whether switching may be performed
ST96
Is switch returned?
Yes
No
ST97
Delete dialog and terminate process
ST98
Is "OK" on dialog clicked?
No
Yes
ST99
To SPEED mode switching operation

FIG.8

[Fig. 9]

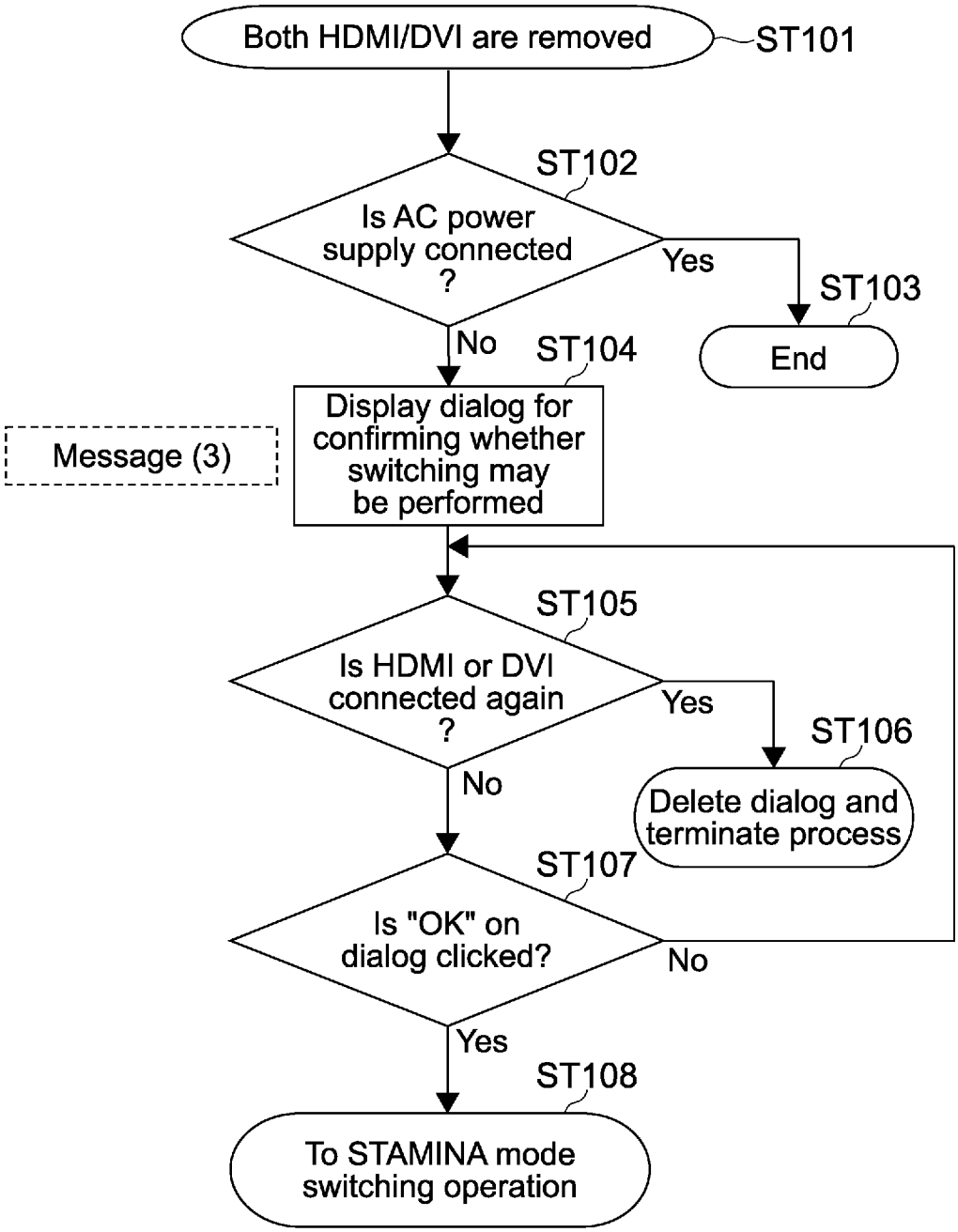
Both HDMI/DVI are removed
ST101
ST102
Is AC power supply connected ?
Yes
ST103
End
No
ST104
Display dialog for confirming whether switching may be performed
Message (3)
ST105
Is HDMI or DVI connected again ?
Yes
ST106
Delete dialog and terminate process
No
ST107
Is "OK" on dialog clicked?
No
Yes
ST108
To STAMINA mode switching operation

FIG.9

[Fig. 10]

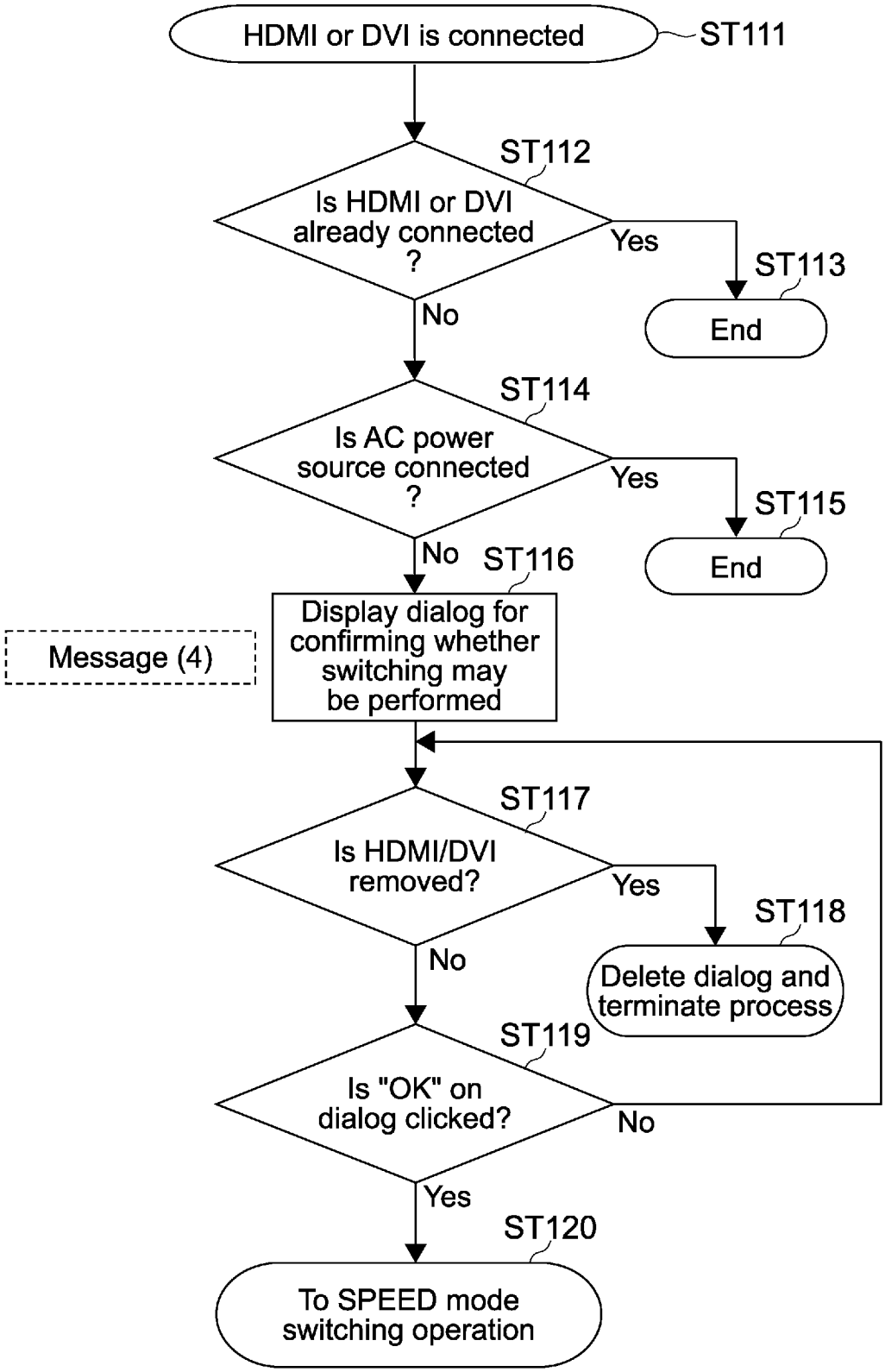
HDMI or DVI is connected
ST111
ST112
Is HDMI or DVI already connected ?
Yes
ST113
End
No
ST114
Is AC power source connected ?
Yes
ST115
End
No
ST116
Display dialog for confirming whether switching may be performed
Message (4)
ST117
Is HDMI/DVI removed?
Yes
ST118
Delete dialog and terminate process
No
ST119
Is "OK" on dialog clicked?
No
Yes
ST120
To SPEED mode switching operation

FIG.10

[Fig. 11]

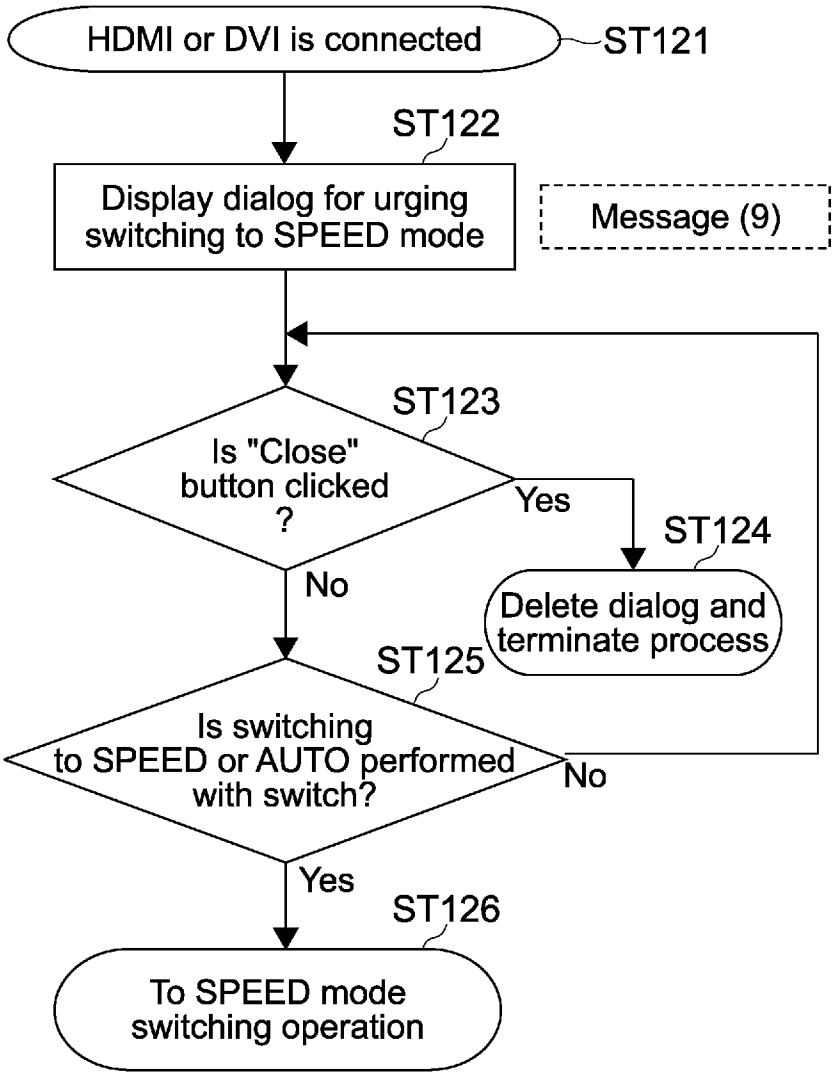
HDMI or DVI is connected
ST121
ST122
Display dialog for urging switching to SPEED mode
Message (9)
ST123
Is "Close" button clicked ?
Yes
ST124
Delete dialog and terminate process
No
ST125
Is switching to SPEED or AUTO performed with switch?
No
Yes
ST126
To SPEED mode switching operation

FIG.11

[Fig. 12]

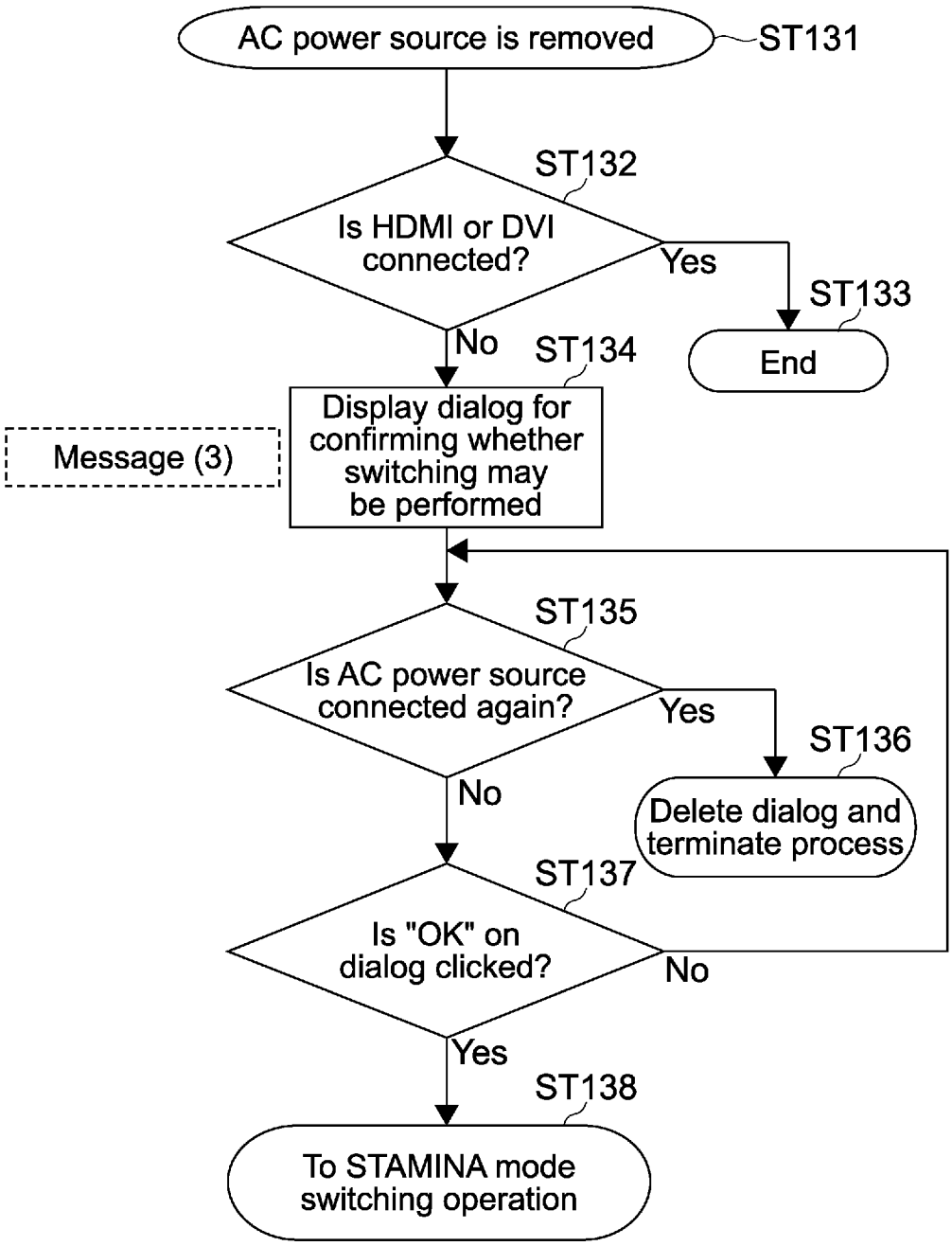
AC power source is removed
ST131
ST132
Is HDMI or DVI connected?
Yes
ST133
End
No
ST134
Display dialog for confirming whether switching may be performed
Message (3)
ST135
Is AC power source connected again?
Yes
ST136
Delete dialog and terminate process
No
ST137
Is "OK" on dialog clicked?
No
Yes
ST138
To STAMINA mode switching operation

FIG.12

[Fig. 13]

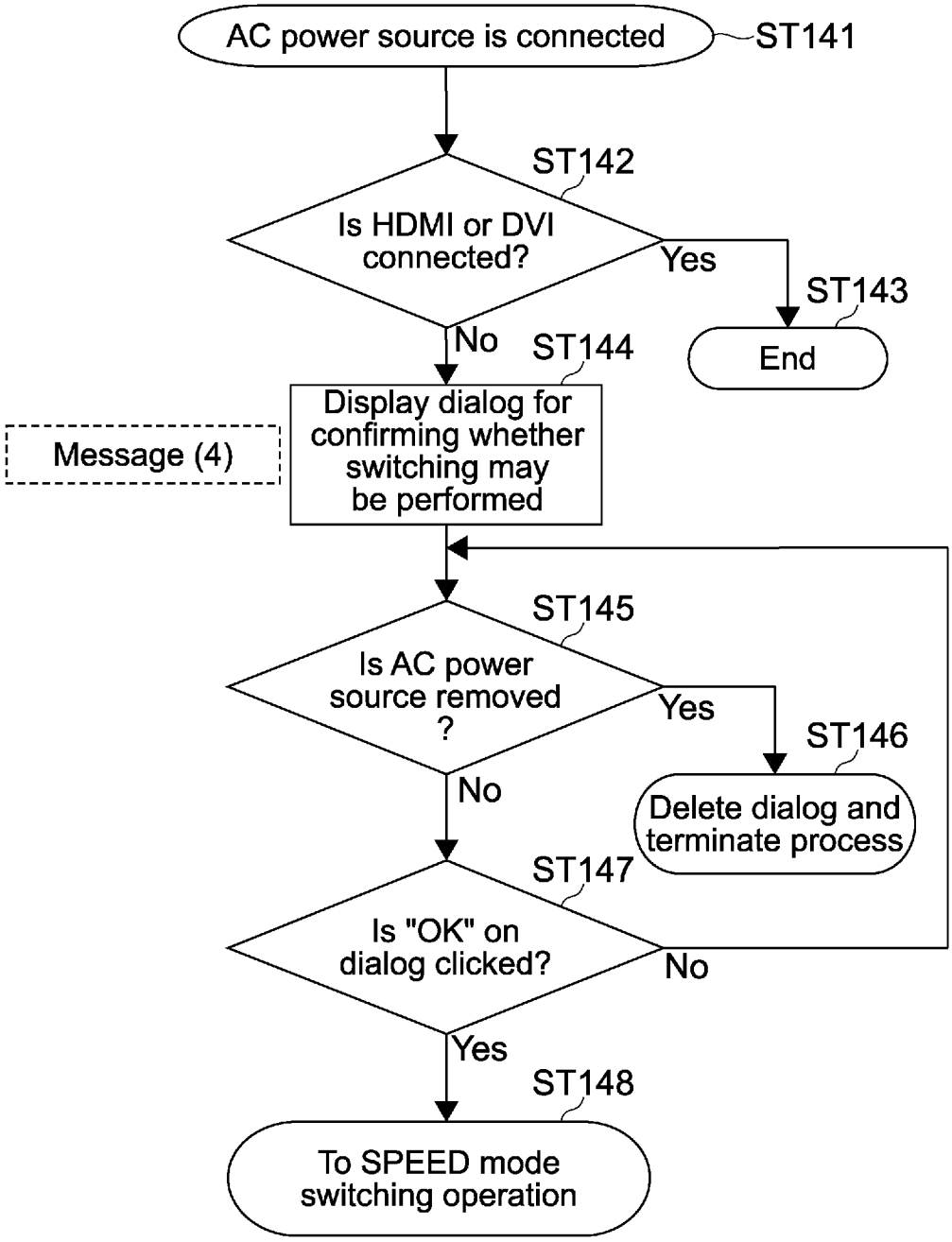
AC power source is connected
ST141
ST142
Is HDMI or DVI connected?
Yes
ST143
End
No
ST144
Display dialog for confirming whether switching may be performed
Message (4)
ST145
Is AC power source removed ?
Yes
ST146
Delete dialog and terminate process
No
ST147
Is "OK" on dialog clicked?
No
Yes
ST148
To SPEED mode switching operation

FIG.13

[Fig. 14]

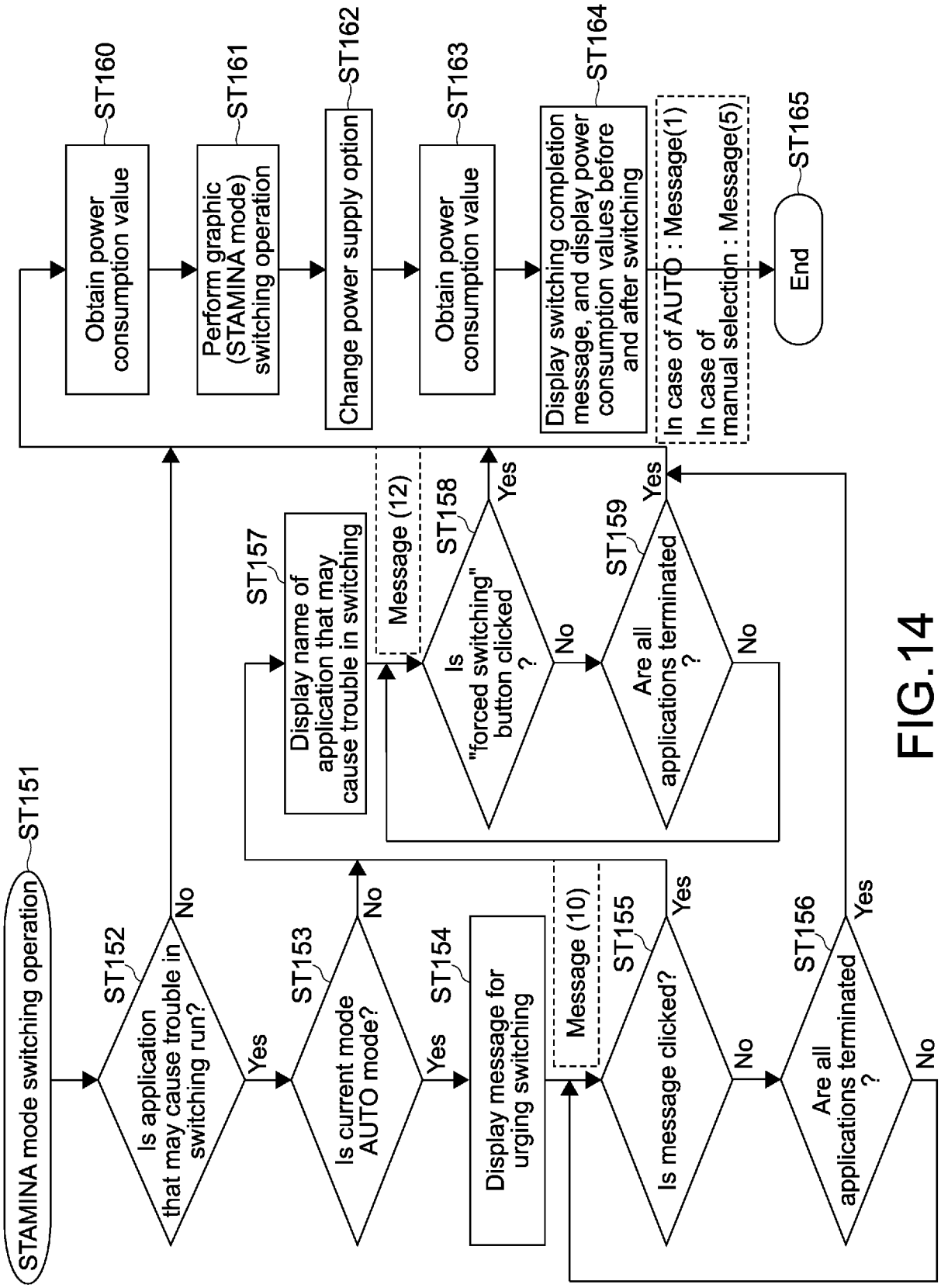
STAMINA mode switching operation
ST151
Is application that may cause trouble in switching run?
ST152
Yes
No
Is current mode AUTO mode?
ST153
Yes
No
Display message for urging switching
ST154
Message (10)
Is message clicked?
ST155
Yes
No
Are all applications terminated ?
ST156
Yes
No
Display name of application that may cause trouble in switching
ST157
Message (12)
Is "forced switching" button clicked ?
ST158
Yes
No
Are all applications terminated ?
ST159
Yes
No
Obtain power consumption value
ST160
Perform graphic (STAMINA mode) switching operation
ST161
Change power supply option
ST162
Obtain power consumption value
ST163
Display switching completion message, and display power consumption values before and after switching
ST164
In case of AUTO : Message(1)
In case of manual selection : Message(5)
End
ST165

FIG.14

[Fig. 15]

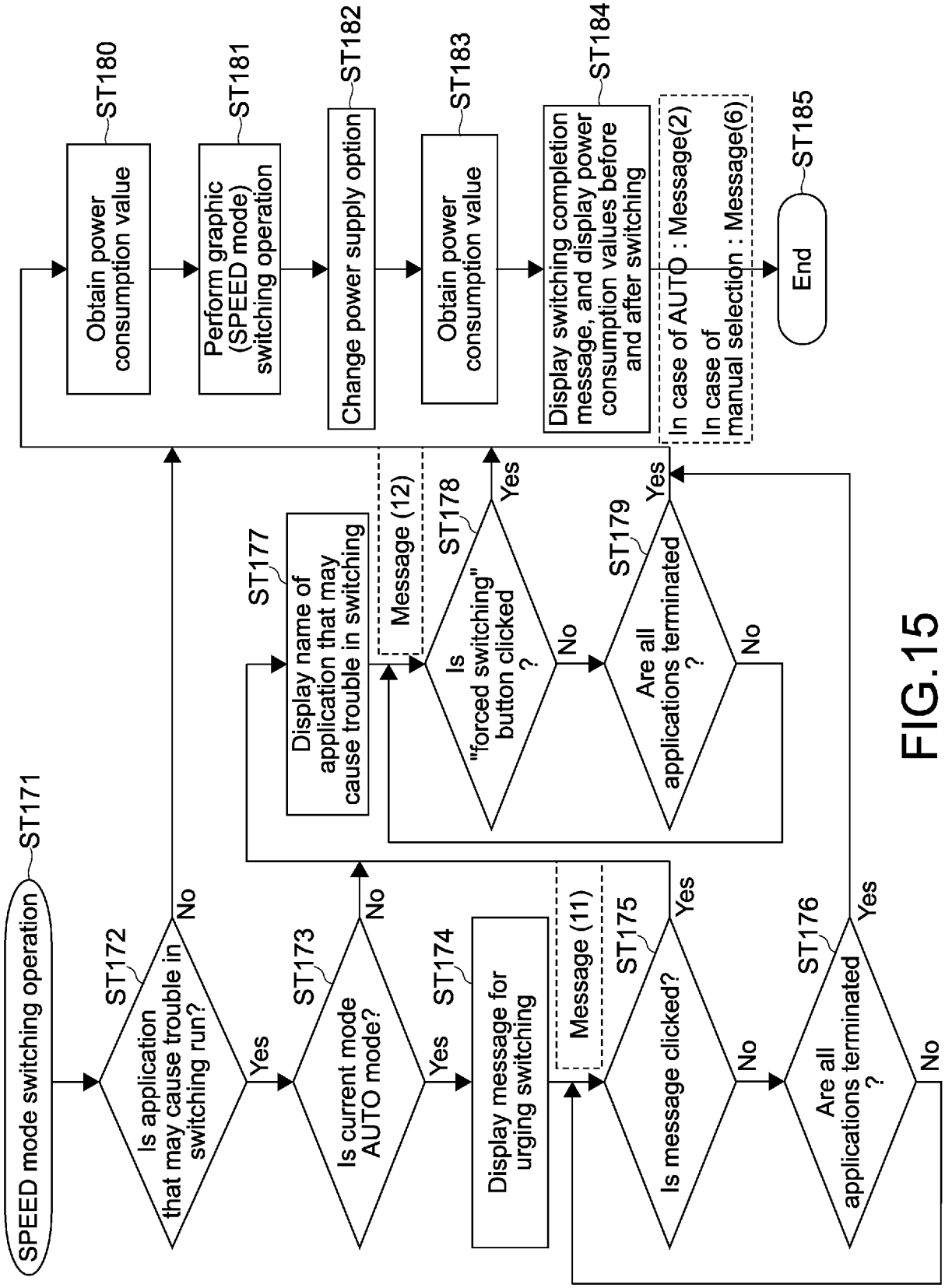
SPEED mode switching operation
ST171
Is application that may cause trouble in switching run?
ST172
No
Yes
Is current mode AUTO mode?
ST173
No
Yes
Display message for urging switching
ST174
Message (11)
Is message clicked?
ST175
Yes
No
Are all applications terminated ?
ST176
Yes
No
Display name of application that may cause trouble in switching
ST177
Message (12)
Is "forced switching" button clicked ?
ST178
Yes
No
Are all applications terminated ?
ST179
Yes
No
Obtain power consumption value
ST180
Perform graphic (SPEED mode) switching operation
ST181
Change power supply option
ST182
Obtain power consumption value
ST183
Display switching completion message, and display power consumption values before and after switching
ST184
In case of AUTO : Message(2)
In case of manual selection : Message(6)
End
ST185

FIG.15

[Fig. 16]

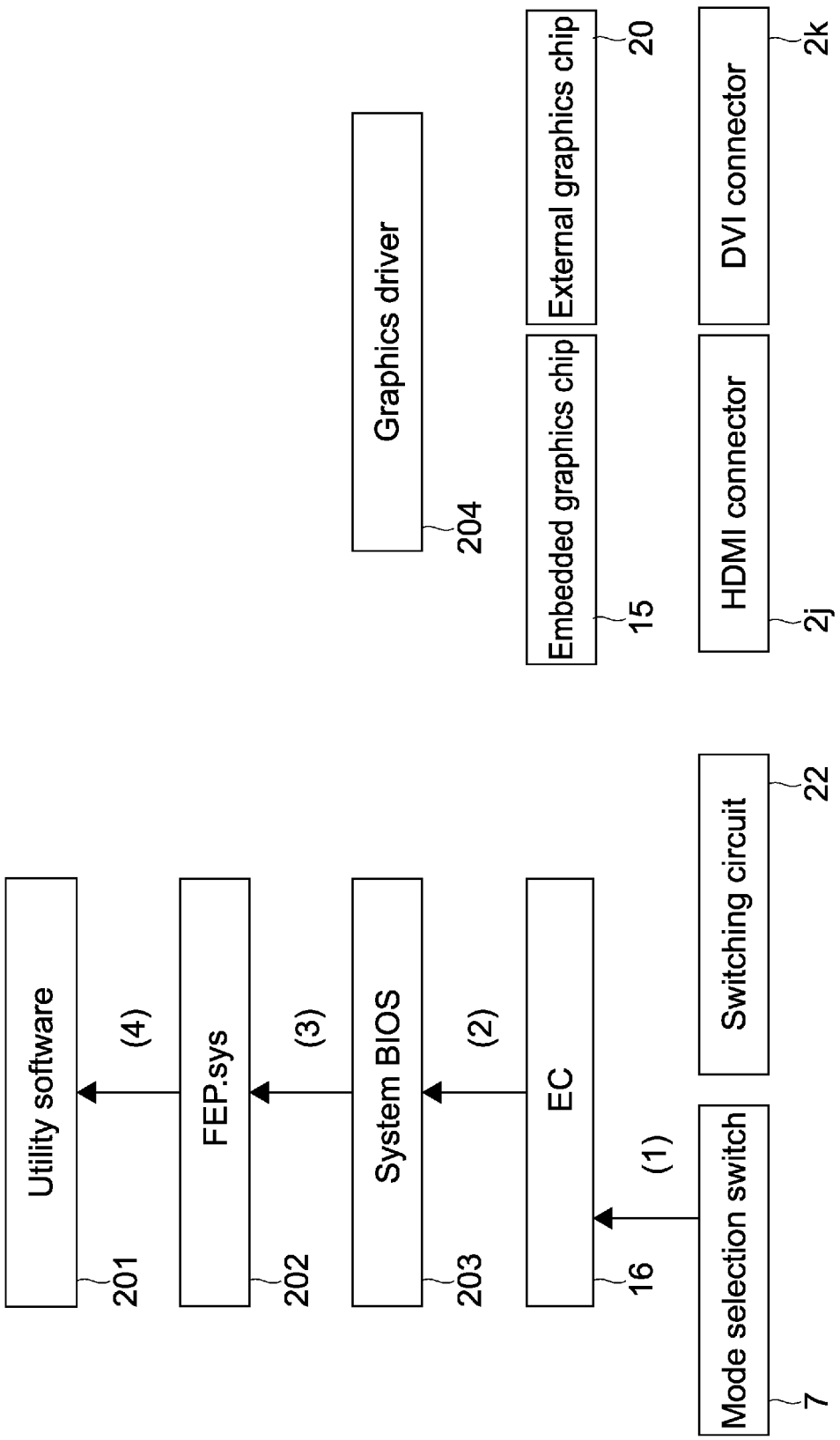
Utility software
201
(4)
FEP.sys
202
(3)
System BIOS
203
(2)
EC
16
(1)
Mode selection switch
7
Switching circuit
22
LED display unit
8
Graphics driver
204
Embedded graphics chip
15
External graphics chip
20
HDMI connector
2j
DVI connector
2k

FIG.16

[Fig. 17]

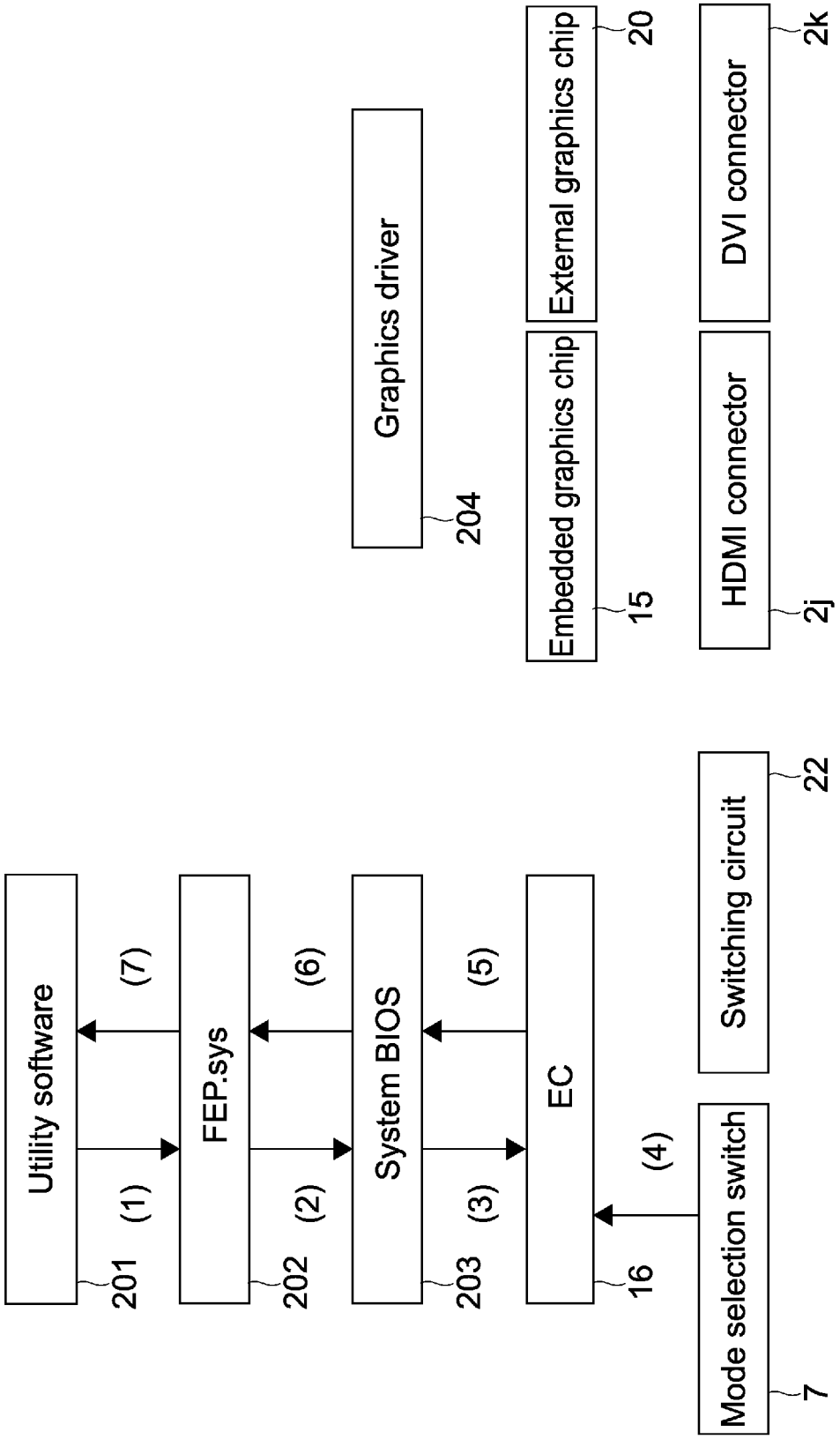
Utility software
201
(1)
(7)
FEP.sys
202
(2)
(6)
System BIOS
203
(3)
(5)
EC
16
(4)
Mode selection switch
7
Switching circuit
22
LED display unit
8
Graphics driver
204
Embedded graphics chip
15
External graphics chip
20
HDMI connector
2j
DVI connector
2k

FIG.17

[Fig. 18]

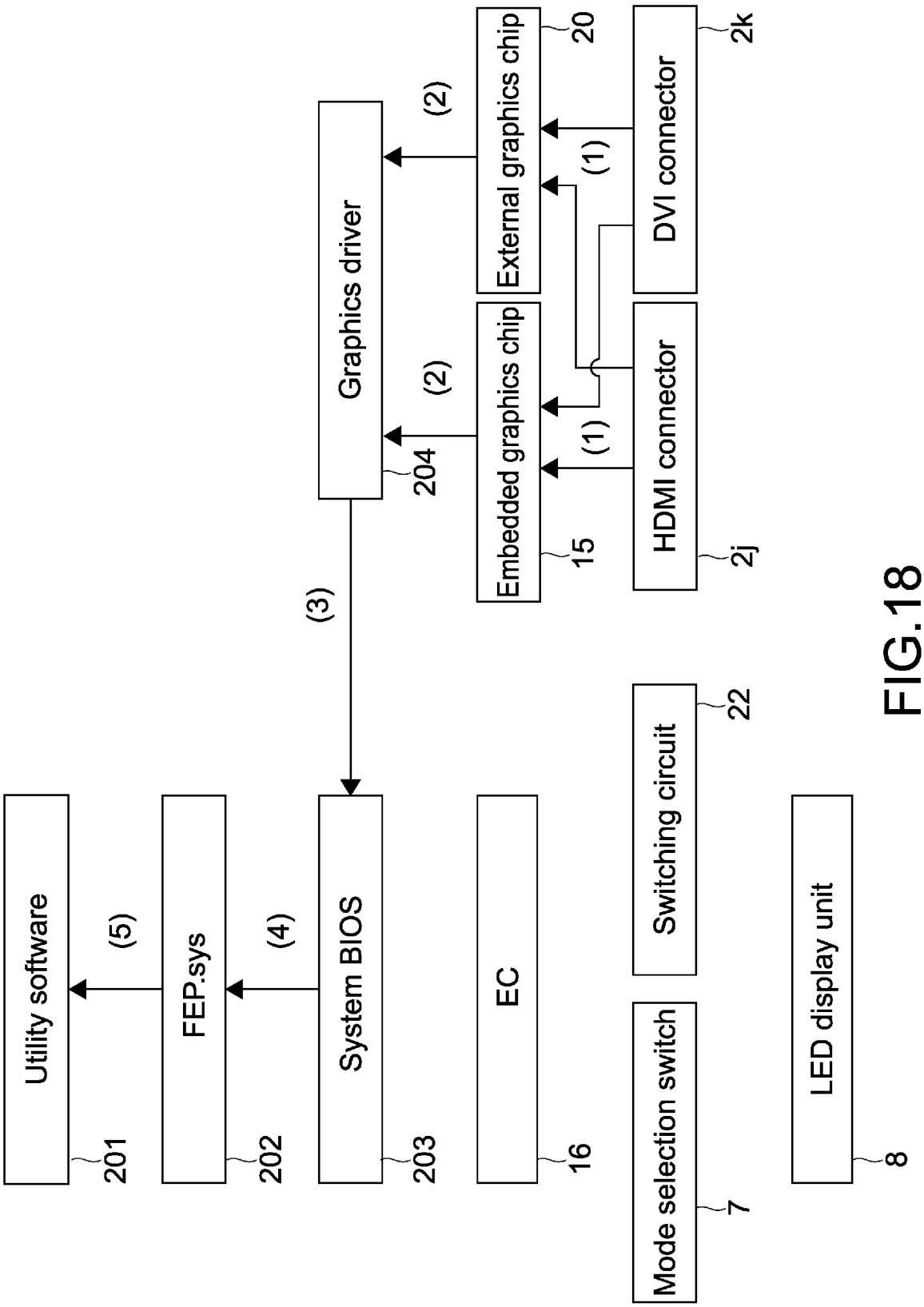
Utility software
201
(5)
FEP.sys
202
(4)
System BIOS
203
(3)
Graphics driver
204
(2)
(2)
Embedded graphics chip
15
(1)
External graphics chip
20
(1)
HDMI connector
2j
DVI connector
2k
EC
16
Switching circuit
22
Mode selection switch
7
LED display unit
8

FIG.18

[Fig. 19]

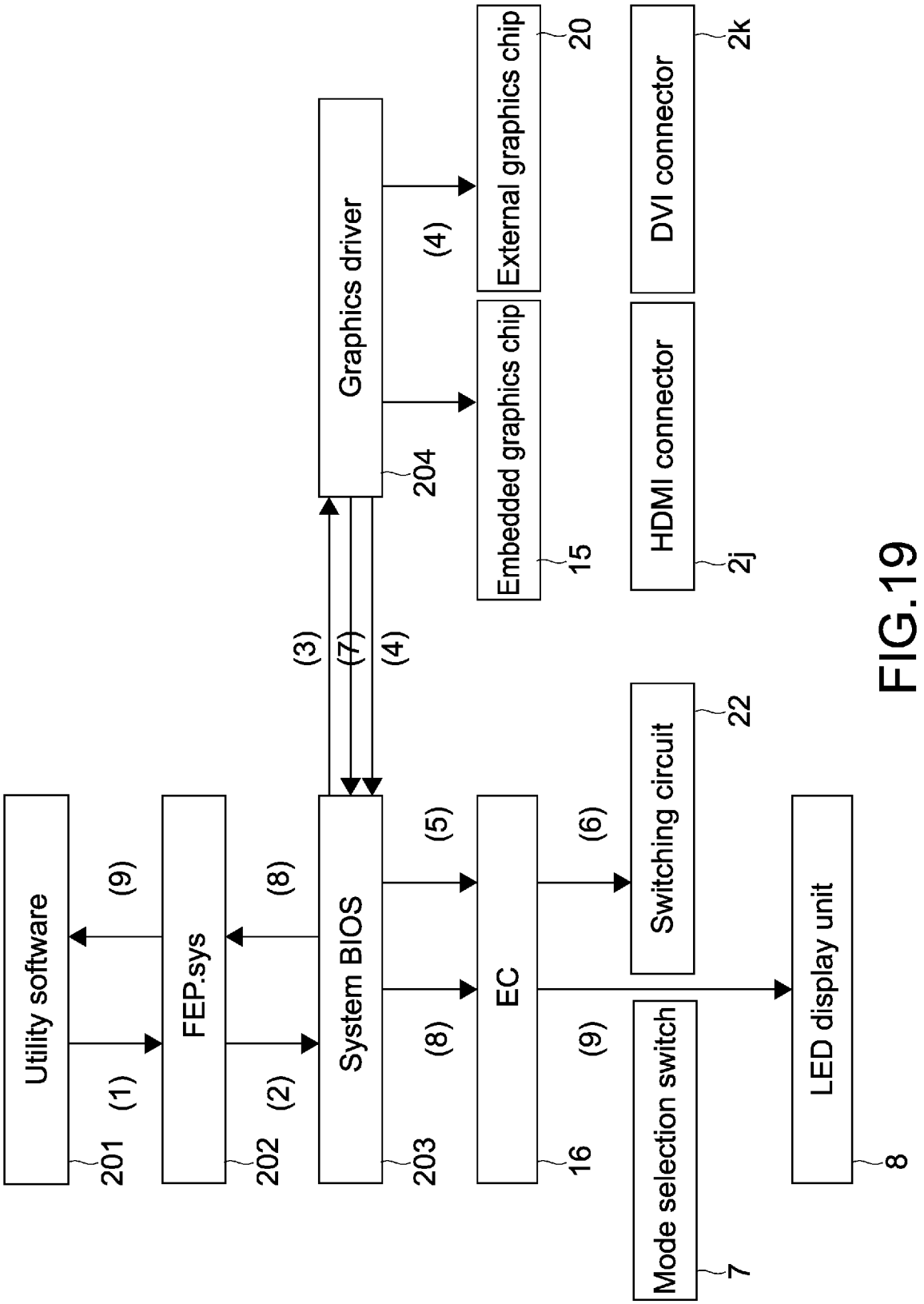
Utility software
201
(1)
(9)
FEP.sys
202
(2)
(8)
System BIOS
203
(3)
(7)
(4)
(5)
(8)
EC
16
(6)
(9)
Switching circuit
22
Mode selection switch
7
LED display unit
8
Graphics driver
204
(4)
External graphics chip
20
Embedded graphics chip
15
DVI connector
2k
HDMI connector
2j

FIG.19

[Fig. 20]

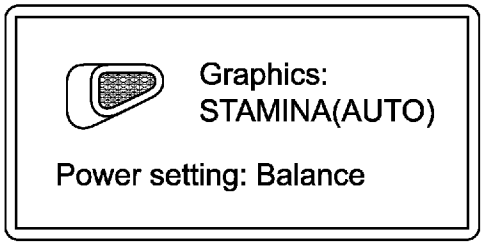

FIG.20

[Fig. 21]

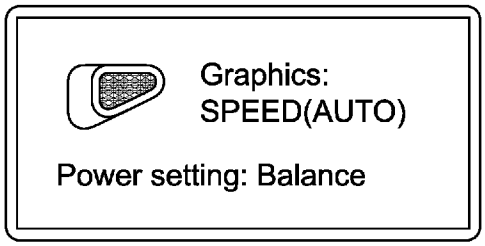

FIG.21

[Fig. 22]

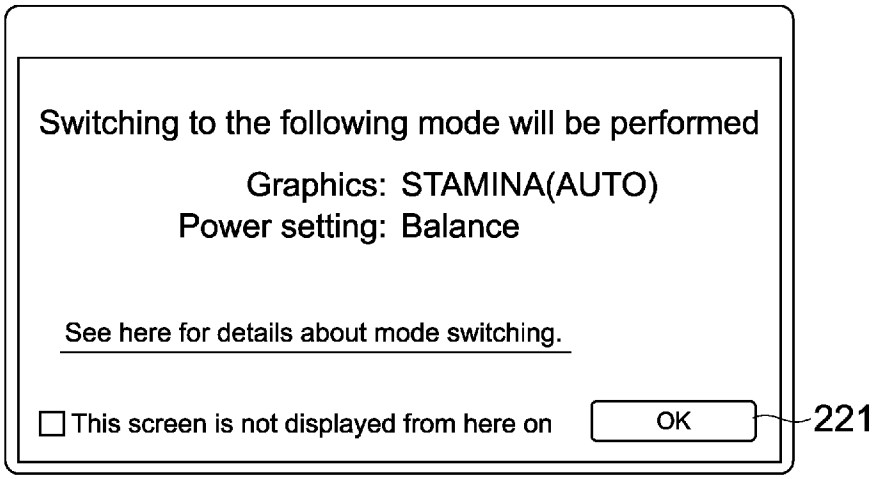

FIG.22

[Fig. 23]

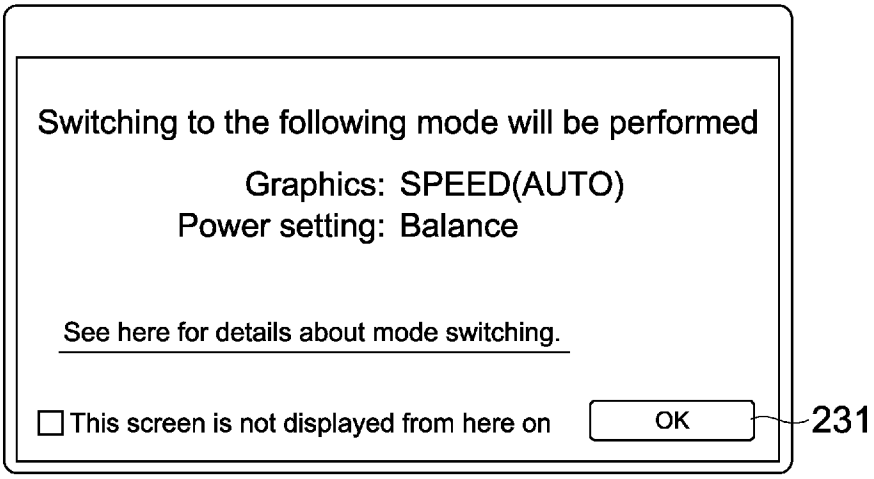

FIG.23

[Fig. 24]

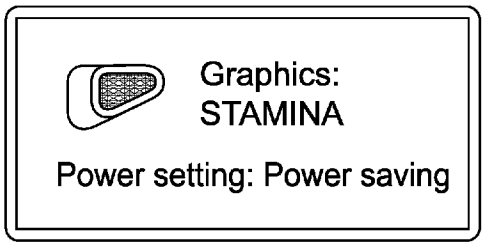

FIG.24

[Fig. 25]

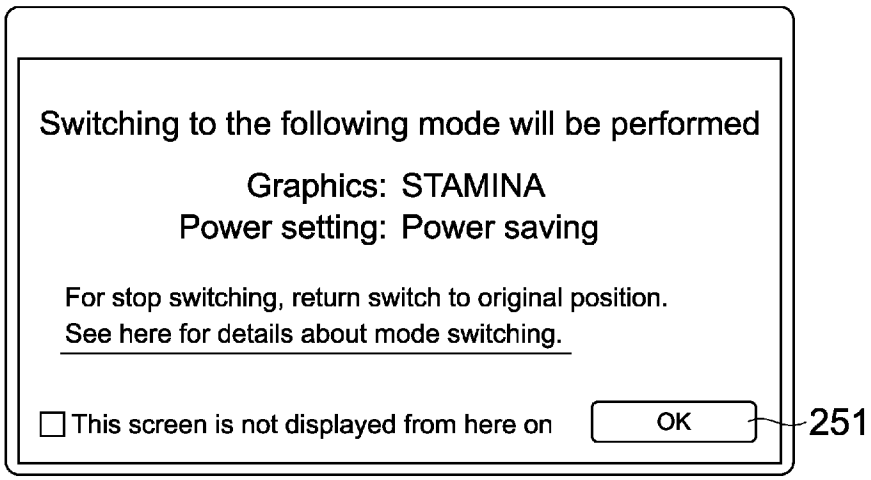

FIG.25

[Fig. 26]

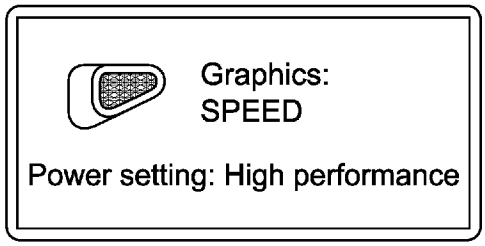

FIG.26

[Fig. 27]

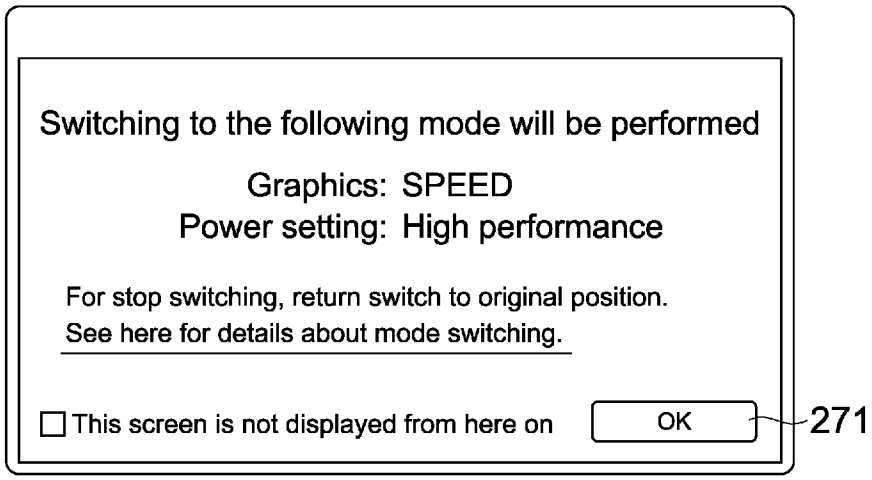

FIG.27

[Fig. 28]

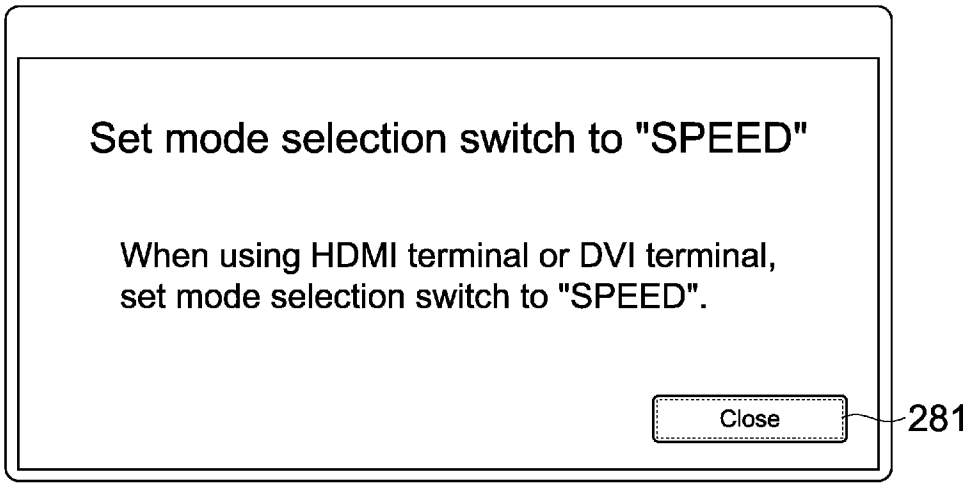

FIG.28

[Fig. 29]

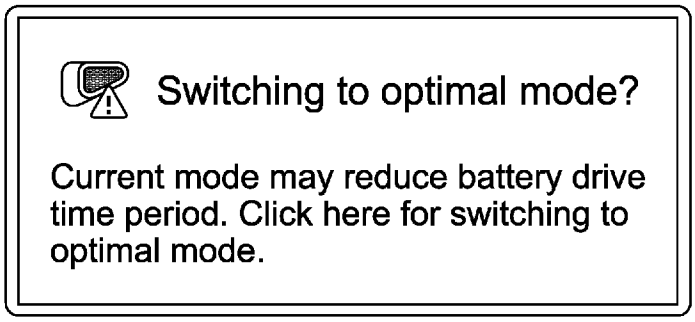

FIG.29

[Fig. 30]

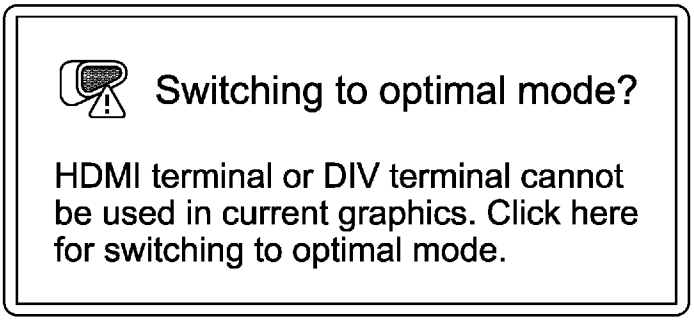

FIG.30

[Fig. 31]

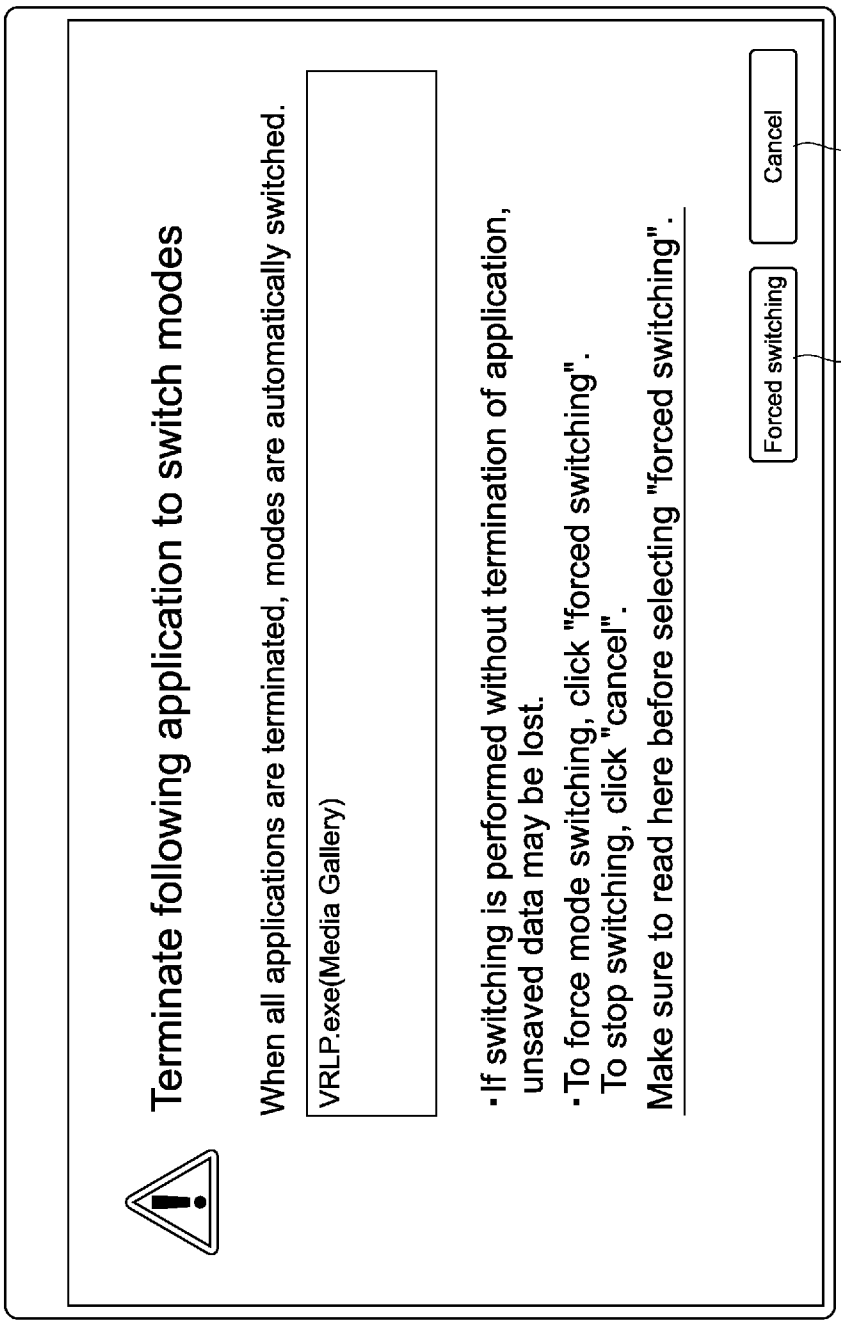
Terminate following application to switch modes
When all applications are terminated, modes are automatically switched.
VRLP.exe(Media Gallery)
・If switching is performed without termination of application, unsaved data may be lost.
・To force mode switching, click "forced switching".
To stop switching, click "cancel".
Make sure to read here before selecting "forced switching".
Forced switching
Cancel
311
312

FIG.31

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/007606

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. G06F9/445(2006.01)i, G06F1/32(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. G06F9/445, G06F1/32

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2011
Registered utility model specifications of Japan 1996-2011
Published registered utility model applications of Japan 1994-2011

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	NEW SONY NOTEBOOKS DELIVER THE ULTIMATE IN MOBILITY, PERFORMANCE AND ENTERTAINMENT, [online], Sony Electronics Inc., 2010.01.06, 6th paragraph, [retrieved on 2011.01.31]. Retrieved from the Internet: <URL: http://news.sel.sony.com/en/press_room/consumer/computer_peripheral/notebooks/release/55906.html>.	1-3,5-7
L	Sony Electronics News & Information, Press Room, [online], Sony Electronics Inc., [retrieved on 2011.01.31]. Retrieved from the Internet: <URL: http://news.sel.sony.com/en/press_room/consumer/computer_peripheral/notebooks?page=3&archive=>.	

☑ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31.01.2011	08.02.2011

Name and mailing address of the ISA/JP	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	SAKANIWA, Takeshi Telephone No. +81-3-3581-1101 Ext. 3545

5B 9288

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/007606

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2009-539192 A (ATI TECHNOLOGIES ULC) 2009.11.12, [0112]-[0117],[0120],[0125],[0127] & US 2007/0283175 A1 & US 2008/0143731 A1 & US 2008/0204460 A1 & WO 2007/140404 A2	3,5
Y	JP 2007-48219 A (FUJITSU LIMITED) 2007.02.22, [0038]-[0043],Fig.4 (Family: none)	5
Y	JP 2009-151242 A (TOSHIBA CORP) 2009.07.09, abstract,[0023]-[0037] & US 2009/0160733 A1	3
P,A	JP 2010-20596 A (SONY CORPORATION) 2010.01.28, whole document and Figures & EP 2144156 A2	1-7
O,Y	Unable to switch display card on IdeaPad V360/V460, [online], 2011.01.10, see STATEMENT DESCRIPTION:, SOLUTION:, [retrieved on 2011.01.31]. Retrieved from the Internet: <URL: http://consumersupport.lenovo.com/in/en/HintsandTips/hints_show_12947146012942.html>.	1,2,6,7
O,Y	Norihiko Wakasugi, Optimus Technology: 3rd generation GPU switching technology by NVIDIA, [online], PC Watch, Impress Watch Corporation, 2010.02.09, see Conventional GPU switching tech., [retrieved on 2011.01.31]. Retrieved from the Internet: <URL: http://pc.watch.impress.co.jp/docs/news/20100209_347871.html>.	1,2,6,7