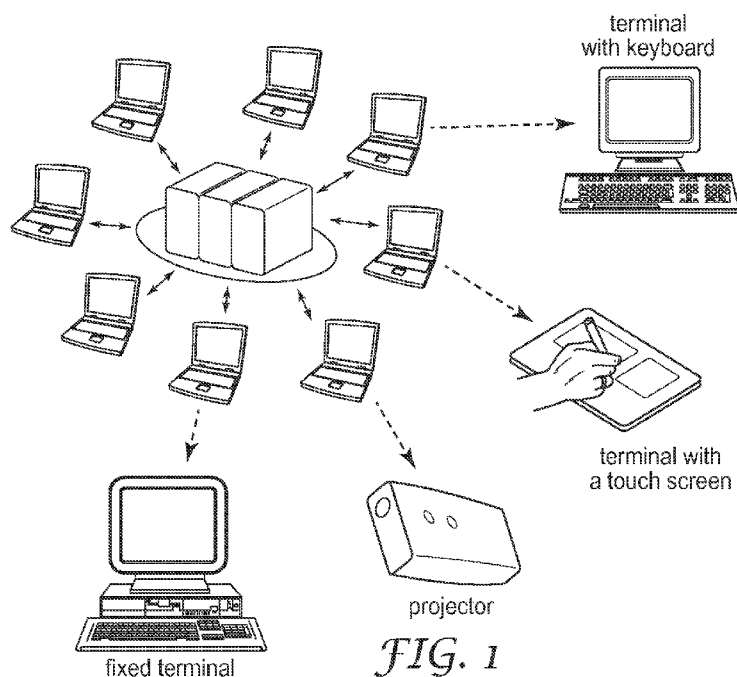




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(54) **Title:** TERMINAL DEVICE

(57) **Abstract:** A terminal device and a method performed thereon are provided. According to an embodiment, the terminal device may include input means adapted to receive an instruction inputted by a user; transmission means adapted to send to a computing device the instruction inputted by the user and receive an execution result of the instruction inputted by the user, by way of a wireless transmission supporting virtual ports; signal conversion means adapted to convert the execution result into signals suitable for output; and output means adapted to indicate the user the execution result of the instruction inputted by the user by means of outputting the signals converted by the signal conversion means. The terminal device above and the method performed thereon may implement low cost and low power consuming terminal device.



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TERMINAL DEVICE

Technology Field

5 This invention involves a computing system; specifically, a unique terminal device that allows the commands to be issued to the computing system for further interaction.

Background

10 Recently, cloud computing has become increasingly popular. Telecommunications, IT services, computer device manufacturers, and software companies are all aggressively adapting development around cloud computing. From Garner's statistics, in the next five years, the market cloud computing serves will reach \$515 billion and its compound annual growth rate will reach to 27.4%; the growth rate is five times more than the IT market.

15 Because cloud services has its special advantage in saving IT costs, more and more users, especially business users, approve of the cloud service, as its distinguishing feature has obtained high regard especially in mature markets.

20 The whole cloud computing service chain mainly includes two parts, the server side and the client side. For the server side, a lot of companies may already provide relatively mature service. For the client side, currently, the most commonly seen terminals are desktops, notebooks, netbooks, or tablet PC, etc. These terminals usually include complex processors such as Central Processing Unit (CPU) and storage (such as hard disk). However, in all the cloud services, the computing and the storing are all happening at the server side. In another words, the cloud computing client side only needs to handle the command input and output outcomes. As a result, resources are unnecessarily wasted on the client side and it becomes necessary to provide a terminal that is suitable for the client side in a cloud computing
25 environment.

Summary

30 The goal of the invention is aimed at fixing the problem of wasted resources at the terminal side. This invention involves a computing system; specifically, a unique terminal device that allows the commands to be issued to the computing system for further interaction.

35 Based on the invention, the terminal devices include: Input device - used to receive user commands; Transmission device- user commands are sent to the server and results are received from the server wirelessly through a virtual port; Signal changing device-processes the commands to optimized output signals; Display and output device - used to send the optimized output signals through the signal changing device to the users interacting with the system.

The concept of the invention is the communication between the terminal equipment and the computing system as follows: the user commands are received; the commands are sent to the server; the server executes the commands; the results from the server are returned wirelessly through a virtual port; the results are then processed to be optimized output signal; the optimized output signal is then returned to the user interacting with the system.

Through the above technical solution, all computing and storage are done on the computing system (such as host machine or server), the terminal equipment only needs to function to accept users entering commands, optimize the signals for sending, and output the results. Therefore, the terminal equipment only needs to be configured to accomplish these tasks; hence, lowering the cost of terminal equipment allows for the deployment of a low cost computing network.

Illustration Description

Fig. 1 is a schematic diagram that shows the terminal connection to the server.

Fig. 2 is a schematic diagram that shows the terminal connection to the host machine.

Fig. 3 is a schematic architecture diagram of how the invention is used at the client side during cloud computing.

Fig. 4 is a schematic diagram that shows how the terminal and the server communicate on the physical layer.

Fig. 5 is a schematic diagram that shows the terminal and the sever transmitting wirelessly through the virtual port.

Figs. 6A and 6B are schematic diagrams that show the terminal and the server communicate through AP.

Fig. 7 is a flow chart that shows how the terminal and the server communicate.

Fig. 8 shows the electric circuit of how the terminal executes in the first implementation.

Fig. 9 shows the electric circuit of how the terminal executes in the second implementation.

Detailed Description

Detailed explanation will be given on the execution method based on the figures. The unnecessary information will be omitted, so there is no confusion about the invention.

The computing terminal (terminal) and the cloud computing server (server) are used when explaining the invention in all the examples; however, technical personnel should understand that this invention can only handle simple tasks at the terminal side (such as input and output commands), and leaves the complex computing ability to the computing system at the server side. In this case, the terminal equipment could be a cloud computing terminal, a desktop, or a demonstration terminal used during teaching, such as television or network enabled home appliances. The computing system would be a device that has computing power, such as a server and/or a host machine used in cloud computing, a host

machine used at a teaching demonstration system, a desktop and/or a notebook that connects to the television that acts as a terminal equipment, etc., or could be the terminal equipment used in a peer to peer network.

As previously mentioned, the equipment currently used at the client terminal during cloud computing usually has complex processing power and the corresponding devices, such as CPU and hard disks, etc. These devices are not only expensive, but not necessary during cloud computing; essentially they are wasted resources and with high costs associated with them.

This invention provides a new terminal architecture. This terminal could include a user input device, such as a connector for connecting mouse and keyboard, or a touch screen device. Such a terminal could also include a transmission device that supports wireless transmission through a virtual port, either sending a command from an input device or receiving from the server, the results that are ready to be sent out through an output device.

Also, such device could include a signal changing device, which transforms the result to the optimized output signal for the output device. The terminal could also have an output device installed for displaying the result to the user.

In an implementation, an output device could be a device that sends out images, videos, audio frequency or vibration, the sole purpose is to notify the users the results.

In addition, the terminal could include a power supply unit that provides electricity to the above mentioned devices. It could be batteries or any commonly known power supply equipment.

Through this invented terminal, users could exchange messages with the cloud computing server. Users could enter commands through the input device; for example, search commands, and send the commands through the transmission device to the server. Before it sends, it could use the transmission device to change the commands to the optimized signals for transmitting. Users could also go through the transmission device to receive the results from the server, such as the search result; it could go through the signal changing device to turn the results from the server to an image and display it to the users on the output device.

Moreover, through this invented terminal, users could accomplish everything through cloud computing and without purchasing expensive equipment such as CPU and hard disks. It reduces the cost for users, especially for the business users.

Figs. 1 and 2 demonstrate two different scenarios using this invention. Fig. 1 shows the terminal connects to the server, and Fig. 2 shows the terminal connects to the host machine. There are no differences in connection method or how it works either connecting through the server or the host machine: therefore, to simplify the different scenarios, "server" will mean either the server or the host machine. Furthermore, server could also mean any device that has computing ability, for example, the host machine in the teaching demonstration system mentioned above.

Fig. 3 is the schematic architecture diagram showing how the invention is used as client terminal (1) in cloud computing. Below, it uses the example of users searching on the server, however, the technical personnel should understand that this invention provides the device and method not only to be used in cloud computing, but also if you need to perform any computing functionalities on the server instead on the client terminal.

Fig. 3 displays the input device (310) connected to receive user commands; it could be a touch screen (312), a USB port (314) that connects an external device (370), the external device (370) could be a mouse, keyboard, joystick, multimedia board, virtual keyboard, external touch screen, writing pad, sonic tablet, motion capture device or any input device. The technical personnel should understand that not just the USB port will work, but it could be any types of port that could be used to connect the input device. Then, the user could enter commands through the input device, for example, the touch screen, to perform search the term – “Cloud Computing” on the server.

The commands are sent to the transmission device (320). The transmission device changes the commands to the optimized signals for transmitting; for example, in accordance with IEEE 802.11n protocol, to the server through the wireless network. Under a different communication protocol (such as 3G or 4G mobile communication protocol), the commands could be altered to adapt to the corresponding transfer protocol, and transmit through a wired or wireless network. Furthermore, if the commands have already been altered to the proper transmitting protocols, the transmission device could send the commands directly to the server.

Once the server receives the command, it processes (such as signal processing or alter it to the format that the server could accept), then executes the command. In this example, the server executes the search “Cloud Computing” command, and then sends the result back to terminal (1); to be more accurate, it searches based on the rules, found the specified number, and returns the search result.

The transmission device (320) at terminal (1) receives the result and sends it to the signal changing device (330). The signal changing device (330) alters it to the proper signals for the output device (340). The signals could be in the following format: USB, thunderbolt, Display Port, firewire, etc., and then the output device shows the altered signals. If the output device is display equipment, then it will exhibit the search result. The display equipment could be an LCD screen, projector, OLED, e-Ink screen, LED plasma screen, cathode ray tube (CRT) or any suitable display equipment.

The output device could include a vibration device or other types of device. Or the vibration device could be used with the display device to remind the user to check the result on the display device. Or in some cases, the vibration device could be used alone. The output device also includes audio frequency device (such as a speaker), an images/videos output device (such as the devices mentioned above), or the other commonly known devices which will not be repeated.

Fig. 4 is the schematic diagram of the terminal (such as terminal (1)) communicating to the server on a physical layer. It shows that the terminal and the server could exchange data through the physical

interface and the digital interface in a wireless network. The digital interface of the server receives the commands from the terminal and send it to the central processor to further process it (it is not displayed in the figure). The physical interface at the client terminal receives the result and sends it to the signal changing device (shown as device 330 in Fig. 3) and it alters to the optimized signals for the output device to display for the users (shown as device 340 in Fig. 3). The physical/digital interfaces here could be the digital interface adapting to IEEE802.11n, and the wireless network could be the IEEE802.11n WiFi network protocol.

A higher level of the virtual port could be used to transmit data between server and terminal wirelessly. Fig. 5 demonstrates this. It shows that the transmission device (320) at the terminal side handles the transfer wirelessly through a virtual port and the corresponding device at the server side does the same thing. The USB drive (501) in Fig. 5 is corresponding to the digital interface of the server in Fig. 4 and the USB hardware socket/port (508) is corresponding to the digital interface of the terminal in Fig. 4.

As shown in Fig. 5, the external device at the terminal side could read the data format through the USB hardware socket/port and the data transform module changes it to the TCP data, the TCP data is packaged by the packet unpacked/packed module (506) as data packets and deployed through the packet receiving/transferring module (505) to the server on the network (such as a wireless network). The server's packet transferring/receiving module (504) receives the data packets and unpacked the packets as TCP data using packet unpacked/packed module. Then through the data transfer module (502), it changes the user commands to readable USB data and USB drivers (501) sends it to the server processor (such as CPU) for execution.

The server's processor (it is not shown in the figure) produces the result in readable USB data, through USB driver (501); it sends the data to data transform module (502). The data transform module (502) changes the USB data format to TCP data and packaged it as data packets by the packet packed/unpacked module (503) and deployed through the packet transferring/receiving module (504) to the terminal on the network. The packet receiving/transferring module (505) at the terminal receives the packets and unpacked as TCP data through the packet unpacked/packed module (506). The TCP data changes to the readable USB data using the data transform module (507), transfers it to the USB hardware socket/port (508) and sends to the USB external device (509) (if it is set up as a display equipment).

The USB external device (509) could be a touch screen, USB display device, mouse, microphone, speaker, USB flash disk, or any USB devices. Although Fig. 5 displays packet receiving/transferring, packets unpacked/packed and data transform module at the server and the terminal as separate modules, but in an implementation, it could be displayed as more or less modules. For example the packet receiving/transferring module (505), packet unpacked/packed module (506), data transform module (507) all could be displayed as one module.

In Fig. 5, both server and terminal have a device port set up (such as USB driver (501) and USB hardware socket/port (508)), so they could all work together. The module(502) to module (507), the transferring channels between the server's main processor (the unit) and the virtual USB port on the network, is transparent from an end user's perspective is it is no different from taking the USB device at the terminal (such as input and output device) connect directly at the server.

Although Figs. 4 and 5 only demonstrate the communication between the server and the terminal on a wireless network, the invention is not limited to this; that is, the network could use a different wireless network or even wired lines to achieve the same results—the primary difference here is the protocol used at the digital interface. Furthermore, the virtual port does not have to be a USB virtual port.

For instance, when connecting an external device to the terminal port, the USB device driver (501) and the USB hardware port/socket (508) in Fig. 5 could be switched to the corresponding parts. Also, modification of the data transforms modules (502 to 507) and corresponding change can produce TCP data and accomplish other different virtual ports' functionalities. From the above description, the technical personnel could see that modification could be easily done on this invention.

Now back to Fig. 3, it shows that the terminal (1) is communicating to the server through a transmission device (320). However, in some implementations, the terminal (1) could go through multiple transmission devices to communicate with the server (or a computing system). Or in other examples, the terminal (1) could transfer commands to the server through one transmission device and receive the results through another transmission device.

Moreover, if the terminal (1) has multiple same or different inputs, output devices and transmission devices, these input/output devices could be setup to go through the same or different transmission devices (for example, using the same or different transmission devices to communicate with the server). When the bandwidth is enough in one single channel, multiple output devices could use the same transmission device to communicate with the server to save cost. If the bandwidth is not enough in a single channel, one output device could be directed to communicate with one transmission device to avoid the data traffic is too large and cause the congestion. This is especially useful when displaying the search results in multiple ways (such as audio frequency, videos, vibrations and/or images) to the user.

Also, in other implementations, there could be multiple AP existing between the terminal and the server. In Fig. 6A, there could be multiple transmission devices (or output devices) correspond to one AP to save cost. Or there could be one transmission device (or output device) corresponds to one AP to ensure data transmission stability. Multiple AP could send data to the server and the server could use multiple AP to transfer to terminal (1). The quantity of the AP depends on the particular implementation scenario. For example, one AP could be assigned to video transmission to terminal (1) and one AP could be assigned to image and audio frequency transmissions. Or multiple APs are assigned to video transmission (the transmission load could be distributed evenly or any other ratio that works) and one AP is assigned to all the other transmission types.

As other technical personnel would know, the invention is not limited to this, there are other workable ways to assign AP in different implementations; equal data volume could be assigned to each AP to ensure stable data transmission.

Fig. 3 also includes the power source device (350) in terminal (1). The power source device (350) could be batteries (352), it works when the terminal (1) is mobile device. Batteries (352) could be charged using a power adapter (360). Under some circumstances, ex: when the terminal (1) is fixed, batteries (352) are not necessary, external power source could be used to charge the terminal device (1). For instance, uses an external battery packs or connects the power adapter (360) to the external power source to charge the terminal device (1). Wireless power module (354) could also be used to charge terminal (1). The wireless power module could directly supply power to the terminal (1) wirelessly or charge the batteries (352) to supply power to terminal (1). Through the wireless power module, it makes easy to supply power when the terminal (1) is a mobile device. One thing to point out is although it is not shown in Fig. 3 that the power source device (350) is connected to all the components/devices in terminal (1), but the technical personnel should know that the power device could be used to charge every component/device in terminal (1).

Fig. 3 is a schematic architecture diagram of Fig. 1, and it is only schematics, technical personnel should know that additional components could be added in there. For example, additional cache component could be added to connect to transmission device (320) (includes but not limits to memory, flash, etc.). This allows the user to continuously enter commands and reduces the waiting time and it could be used to cache the results from the server.

Fig. 7 is a flow chart of Fig. 1; it shows how the terminal (1) communicates the server. In step S10 of Fig. 7, the user enters the search command through input device (310), for example, "Cloud Computing". In step S20, the transmission device receives (320) the commands from the input device (310) and alters it to the optimized transmit signal before sending it to the server. In step S30, the transmission device (320) receives the search result about "Cloud Computing" based on the specified number from the server, and then transfers it to the signal changing device (330). In step S40, the signal changing device (330) alters the commands to the optimized output signals for the output device (340).

In Step S50, the output device (340) displays the result to the user, assuming that the output device has a display screen showing the search result of "Cloud Computing".

Based on the search result displayed on the output device (340), the user could further interact with the server. For example, the user could use an external device (370) – a mouse, click on the search result, and either visit the website, or further query the server on detail information about the site. Essentially, it will repeat steps S10 to S50 and get more query information.

The process in Fig. 3 and Fig. 7 shows that the user could easily use client terminal (1) functionalities (for example, in a cloud computing environment). Because the computing and storage are all done on the server (or the host machine), the terminal just needs to have devices that changes output

signals and shows the output result, it will reduce the cost and lower the cost of setting up cloud computing.

Figs. 8 and 9 are going to show the network implementation of terminal (1) in Fig. 1.

Fig. 8 shows the first implementation of how electric circuit of the terminal (1) in Fig. 3 works.

5 The electric circuit includes batteries (810), output components (830), a touch screen (860) and printed circuit board (PCB) components (820). The batteries (810) here and the batteries in Fig. 3 are the same; they supply the power through the discharge control circuit (821) and charge the power through the charging control circuit (822) in PCB (820). The charging control circuit (822) could connect to an external power source. The charging control circuit (822) could charge through a USB connector
10 connecting to a USB port of a computer or a power adapter through the USB port using the city power voltage 220v/110v to charge. The discharge control circuit (821) connects to each electricity circuit in the circuit board and supplies power to each component in the terminal. Or like mentioned before, it is not necessary to use batteries; the power adapter could connect directly to the discharge control circuit (821) and supply power.

15 PCB (820) also includes the main control circuit (850) in this invention, it controls display circuit (851), audio frequency controller (856), vibration controller (857), touch screen controller (858), communication port (852) and internal communication interface (853). The communication to the server goes through communication port (852); the commands first come from the internal communication interface (853).

20 The results from the server are delivered to the internal communication interface (853) which transfers the results to display circuit (851), audio frequency controller (856), and/or vibration controller (857), and then displayed through the output device (830). When using the IEEE802.11n protocol to communicate with the server, the communication port (852) could be a network card. However, the invention is not limited to that, when using other protocols, the corresponding communication ports could
25 be utilized.

The internal communication interface (853) is not only connected to the communication port (852), but also to display circuit (851), audio frequency controller (856), vibration controller (857), touch screen controller (858) and the terminal input port (840).

30 Like mentioned before, the input port (840) could be an USB port or could be any types of port that is suitable for the input device. The user could enter commands through the input device that connects to the input port (840), or through a touch screen (860). When uses the touch screen (860), it goes through the touch screen controller (858) which connects to internal communication interface (853). The user could double check the entered command which could go through internal communication interface (853) and LCD signal transform controller (854) display on the output device (830) – an LCD
35 panel (831).

In this example, the display circuit (851) includes the LCD signal transform controller (854) which provides image signal to LCD screen (831), an adjustable switch for LED backlight (832) and LED driver (855) which is used to adjust the brightness. The LCD signal transform controller (854) takes the result coming from internal communication interface (853) which receives from the communication port (852) and transforms it to the optimized image signal that could be shown on the corresponding display device. A different type of display device and the corresponding signal transform controller could be used. In some situations if using monochromatic reflection with no backlight LCD screen, LED driver (855) and LED backlight (832) are not even needed.

The main control circuit (850) includes audio frequency controller (856), which controls the speaker (834) which sends out the result through audio signal. The main control circuit (850) also includes vibration controller (857) which controls the vibration device (835) used to remind the user to check the result on the LCD screen (831) or let the user know the result.

It should be noted that Fig. 8 is only an example of how the terminal electric circuit could be; the invention is not limited to this. The functionality of the multiple components in Fig. 8 could be one component, for example, discharge control circuit (821) and the charging control circuit (822) could be one component or core. On the other hand, the one component could be set up as multiple components. The technical personnel should be able to think about these when studying this invention.

Fig. 9 shows the second implementation of the electric circuit of the terminal (1) in Fig. 3 works. Except the battery charging method is different in Figs. 8 and 9, how the electric circuit works is exactly the same, so the electric circuit part is going to be omitted.

Unlike using the USB connector to charge the batteries in Fig. 8, it is using wireless method to charge the batteries in Fig. 9. Fig. 9 shows that a wireless charging receiver (823) connects to the charging control circuit (822). The wireless charging receiver (823) communicates with a wireless charging transmitter (824) wirelessly and charges the batteries (810) through the transmitter based on the transmitting speed. The method to prolong the batteries (810) power in Fig. 9 is especially valuable to the users when the terminal is a mobile device and charging the batteries through a wired line is not convenient.

Although the different methods is shown in each implementation of Fig. 8 and 9, the two methods could be used together to provide the users more and flexible ways to charge the batteries.

Through this invention, the cost could be reduced and power consumption could be minimized. Especially if the terminal is a mobile device, preserve the power is especially important. Below, equipment names are going to be mentioned, and assuming that the output system is a display device as an example to show how this could be achieved.

For example, AUO B116XW03 V0 LCD screen could be the display device, its LCD screen is 11.6", HD ratio is 16:9 Color is TFT-LCD, the connecting port is LVDS, keyboard and multimedia board could be used as input equipment. DL-125 of Display link could be used as the LCD signal transform

controller (854), EM6A9160TS of EtronTech could be used as the core for the LED driver (855), to adjust the backlight and brightness. RT3350F of Ralink could be the core for communication port (852) which supports the standard network protocol IEEE802.11n; its fastest network speed could reach to 150Mbps. The digitalized USB signals could be transferred through IEEE802.11n protocol.

5 W9812G6JH-6 of winbond could be used as RAM for communication port (852) (166MHz, 128M), ensures stable transfer speed between the mobile terminal device and the host machine, and the wait time is not long. Batteries (810) – lithium ion batteries with volume 6930mAh, could use the output of 3.8V. Batteries (810) could connect directly to a 5V USB line, so it could use the same charging methods as all the other devices going through USB.

10 Under the above circumstances, the battery consumption is 5 W. If using the monochromatic reflection with no backlight LCD screen, the battery consumption could be reduced to 2.5 W; the battery could last 10.5 hours under normal working conditions. If using the wireless charging method for batteries in illustration 9, the terminal should work continuously without interruption.

15 In conclusion, the above implementation examples are only for this invention, technical personnel should understand that part or any of the modification of this invention should pertain to the scope of this invention's jurisdiction; therefore, the extent of this invention's protection should follow the patent claim.

What is claimed is:

1. A terminal device comprising:

input means adapted to receive one or more instructions inputted by a user;

transmission means adapted to send to a computing device the instructions inputted by the user and
5 receive an execution result of the instructions inputted by the user, by way of a wireless transmission
supporting virtual serial ports and a communication protocol, the computing device using virtual serial
ports independent of hardware as input and output interfaces;

signal conversion means adapted to convert the execution result into signals suitable for outputting;
and

10 output means adapted to indicate to the user the execution result of the instruction inputted by the
user by means of outputting the signals converted by the signal conversion means,

said input means and said output means respectively use the virtual serial ports of the computing
device, which are being used as input and output interfaces, to make the input means and the output
means appear to the user as directly connecting to the computing device.

15 2. A terminal device of claim 1, wherein the communication protocol is TCP / IP.

3. A terminal device of claim 1, wherein the transmission means conforms to one or more of:
WiFi protocols, the 3G communication protocols and the 4G communication protocols.

4. A terminal device of claim 1, wherein the input means comprises one or more of: a mouse, a
keyboard, a joystick, a multiple media board, a virtual keyboard, a touch screen, a handwriting board, a
20 speech input device, and an action capture device, wherein when the input means comprises a touch
screen, the terminal device further comprises a touch screen controller for controlling the touch screen.

5. A terminal device of claim 1, wherein the input means comprises an interface adapted to
connect input devices.

6. A terminal device of claim 1, wherein the output means comprises one or more of: an audio
25 output device, a video/image output device, and a vibration device.

7. A terminal device of claim 6, wherein the video/image output device comprises an LCD,
plasma, or LED display, the signal conversion means further adapted to convert the execution result into
video/image signals suitable for the LCD, plasma, or LED display.

8. A terminal device of claim 1, wherein the execution result received by the transmission means is in one format of: USB, thunderbolt, DisplayPort and firewire.

9. A terminal device of claim 1, wherein all hardware of the terminal device is integrated together and powered by a battery capable of being wirelessly charged and/or charged via USB.

5 10. A terminal device comprising:

input means adapted to receive one or more instructions inputted by a user;

transmission means adapted to send to a computing device the instructions inputted by the user and receive an execution result of the instruction inputted by the user, by way of a wireless transmission;

10 signal conversion means adapted to convert the execution result into signals suitable for outputting;
and

output means adapted to indicate to the user the execution result of the instruction inputted by the user by means of outputting the signals converted by the signal conversion means,,

15 wherein there can be more than one input means, more than one output means and more than one transmission means, the input means and/or the output means correspond to respective ones of the more than one transmission means, and when there is one or more access points between the terminal device and the computing device, each of the more than one transmission means corresponds to one of the one or more access points, or a plurality of the more than one transmission means corresponds to a respective one of the one or more access points.

20 11. A terminal device of claim 1, wherein the input means comprises one or more of: a mouse, a keyboard, a joystick, a multiple media board, a virtual keyboard, a touch screen, a handwriting board, a speech input device and an action capture device, wherein when the input means comprises a touch screen, the terminal device further comprises a touch screen controller for controlling the touch screen.

12. A terminal device of claim 10, wherein the terminal device exchanges data with the computing device by way of wireless transmission supporting TCP/IP protocol.

25 13. A terminal device of claim 10, wherein the output means comprises one or more of: an audio output device, a video/image output device, and a vibration device.

14. A terminal device of claim 10, wherein all hardware of the terminal device is integrated together and powered by a battery capable of being wirelessly charged and/or charged via USB.

15. A method performed on a terminal device for implementing the interaction with a computing device, the method comprising:

receiving one or more instructions inputted by a user;

5 sending to a computing device the instructions inputted by the user and receive execution result of the instructions inputted by the user, by way of a wireless transmission method supporting virtual ports;

converting the execution result into signals suitable for outputting; and

indicating to the user the execution result of the instruction inputted by the user by means of outputting the converted signals.

10 16. A method of claim 15, wherein the wireless transmission method supporting virtual ports comprises:

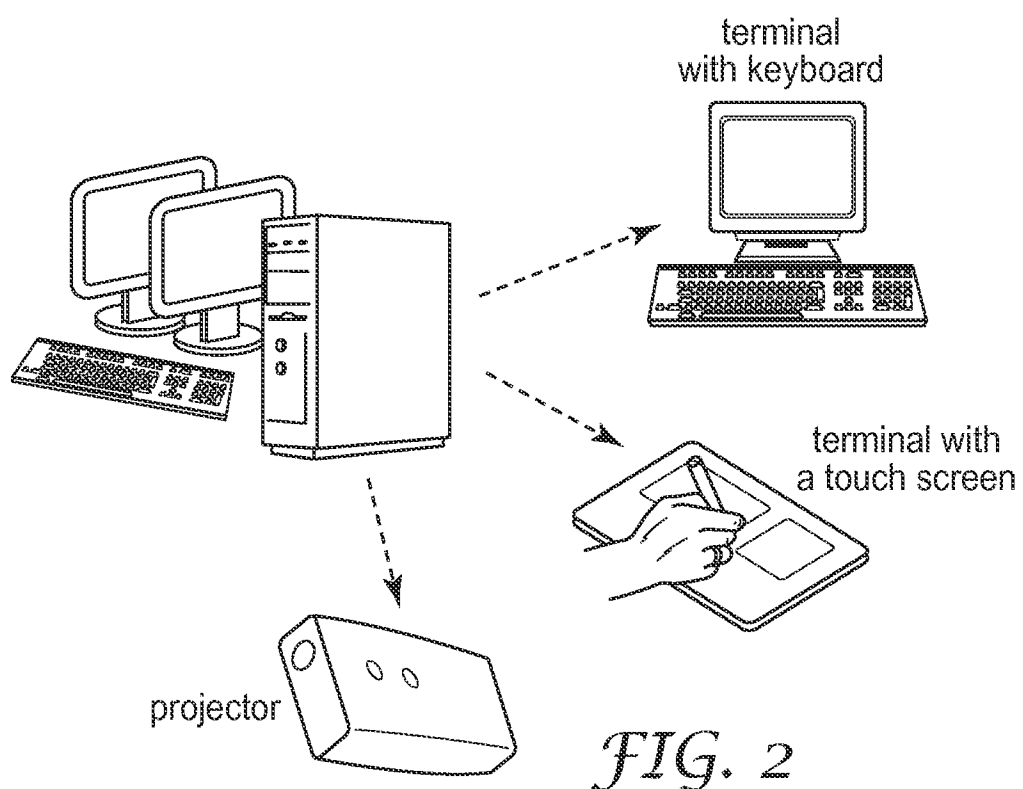
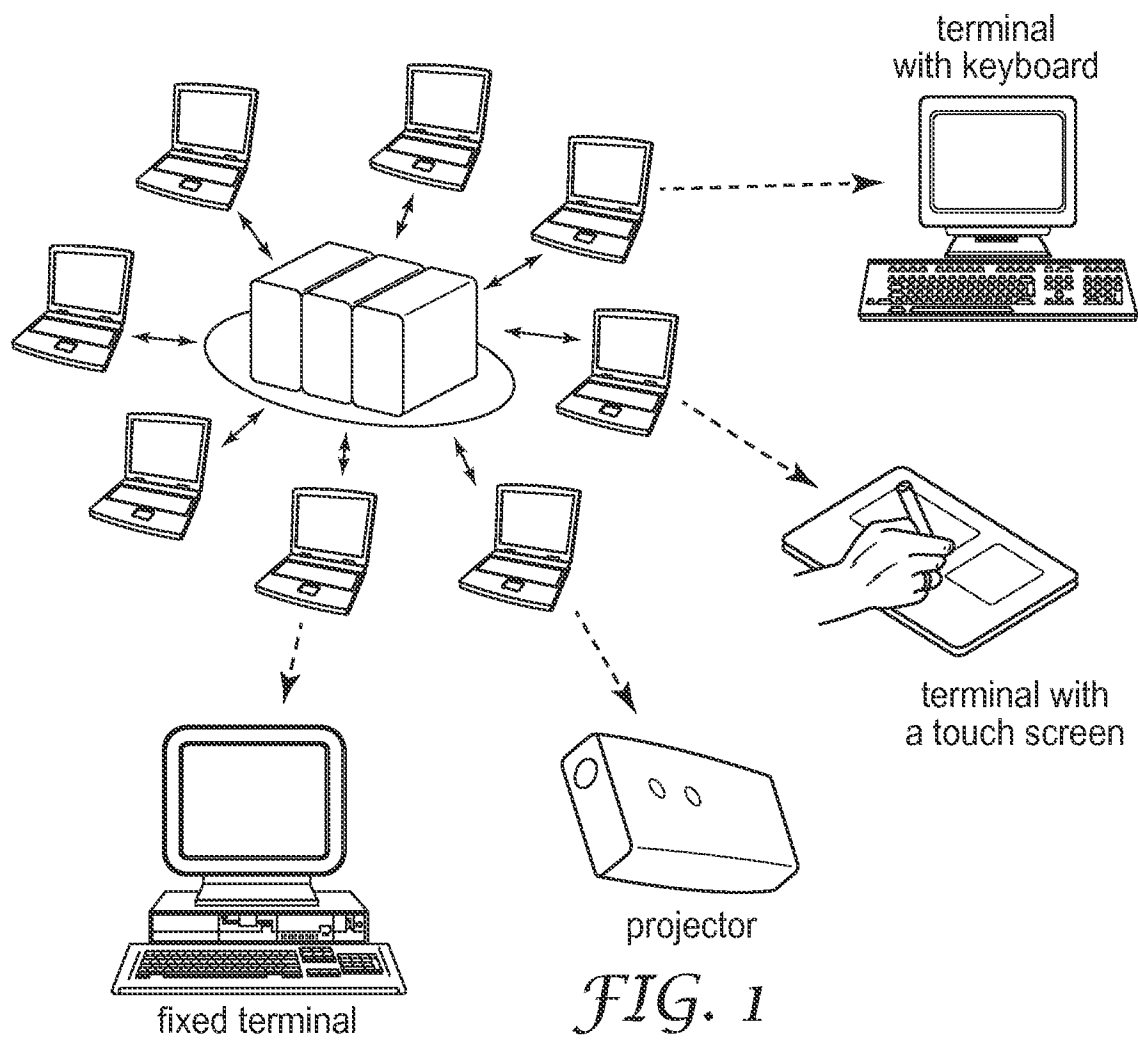
making the input means and the output means appear to the user as directly connecting to the computing device, by a port means provided at the terminal device adapted to cooperate with a corresponding port means at the computing device.

17. A method of claim 16, further comprising:

15 converting the signals transmitting between the port means at the terminal device and the corresponding port means at the computing device.

18. A method of claim 15, further comprising: communicating with the computing means by utilizing one of: WiFi protocols, the 3G communication protocols, and the 4G communication protocols.

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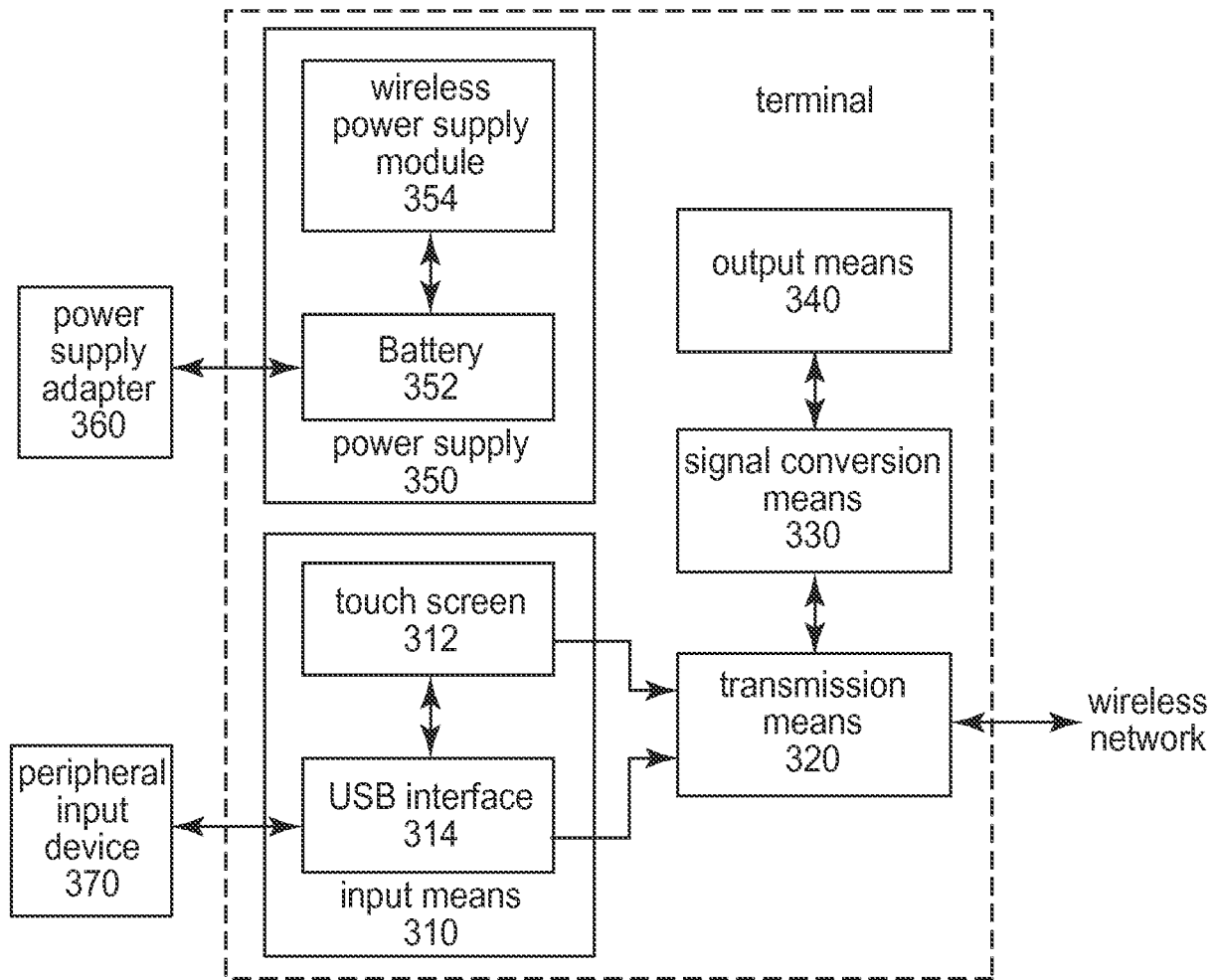


FIG. 3

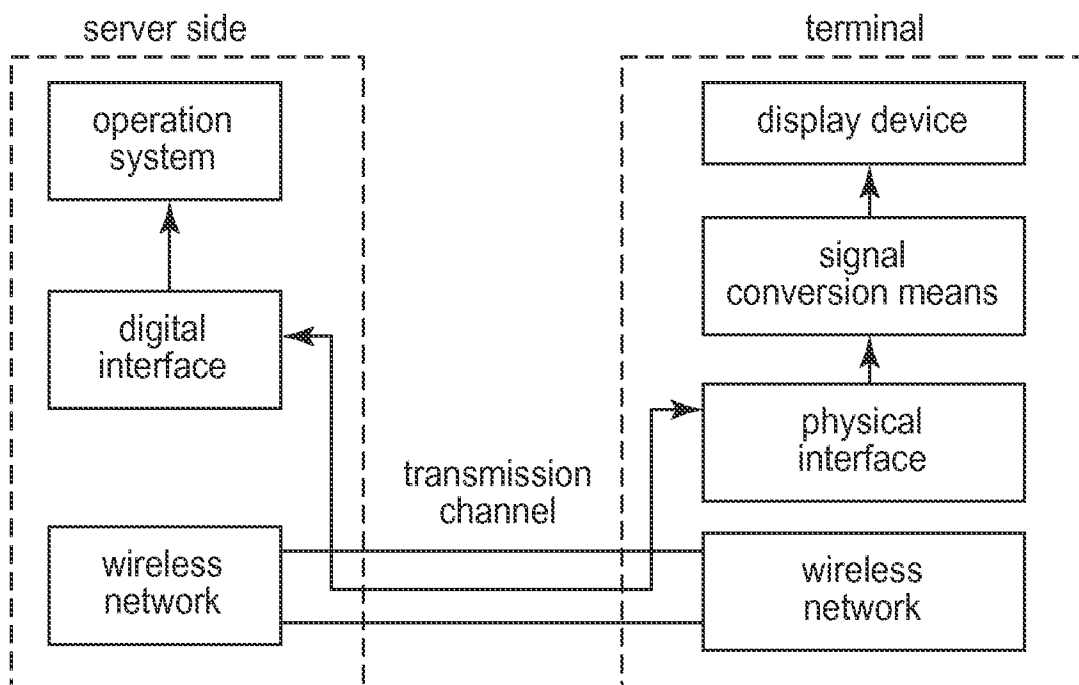
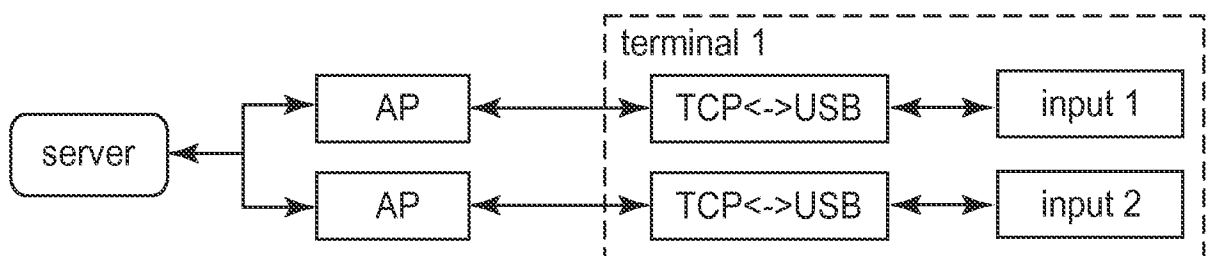
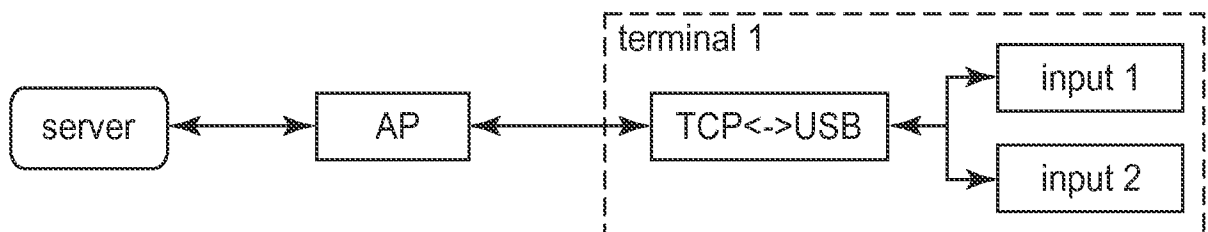
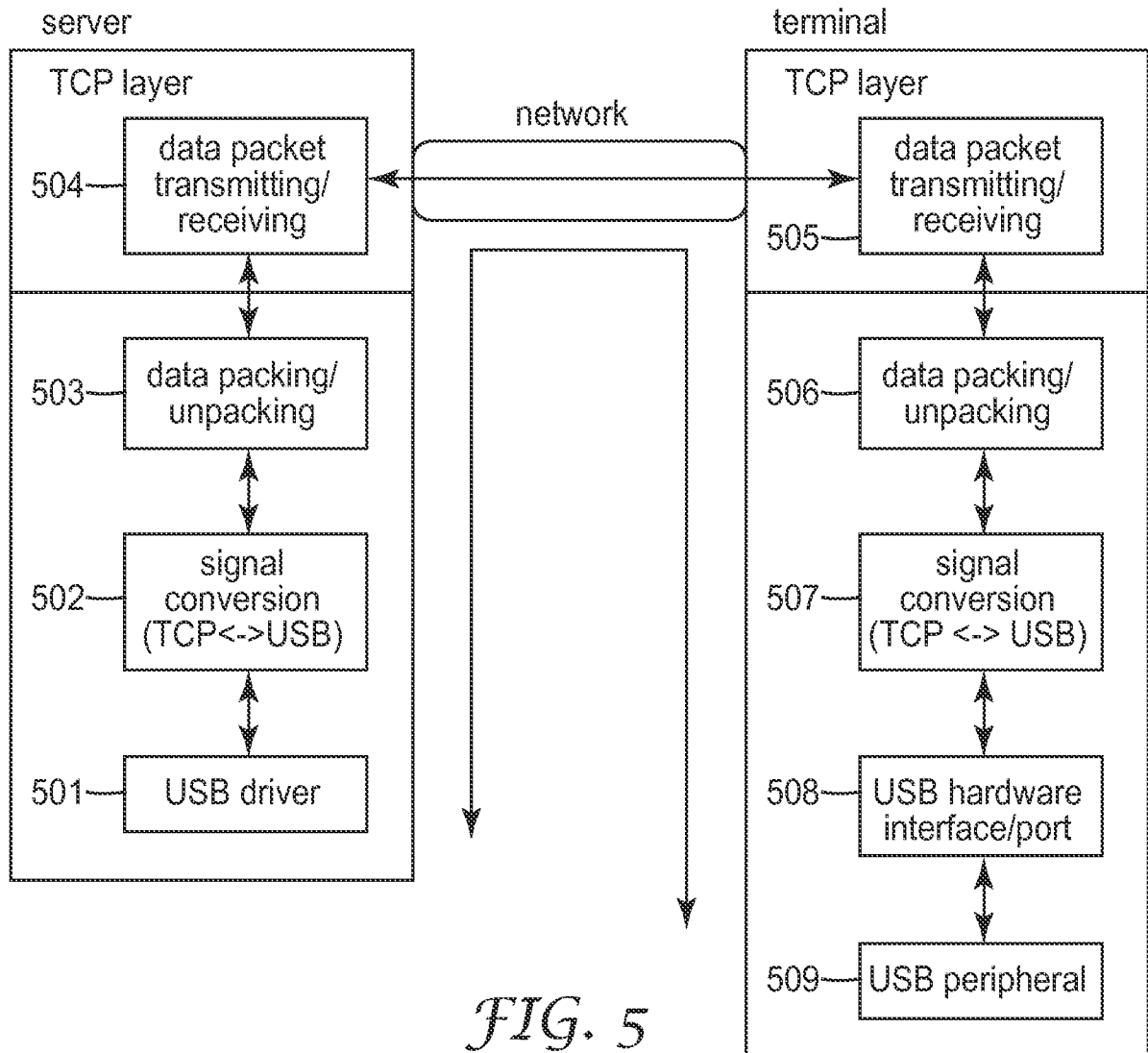
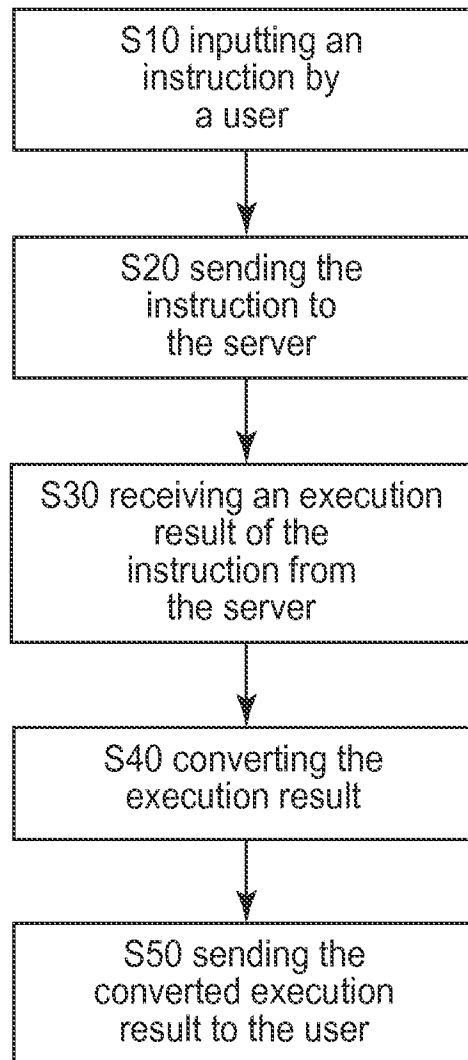


FIG. 4

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*FIG. 7*

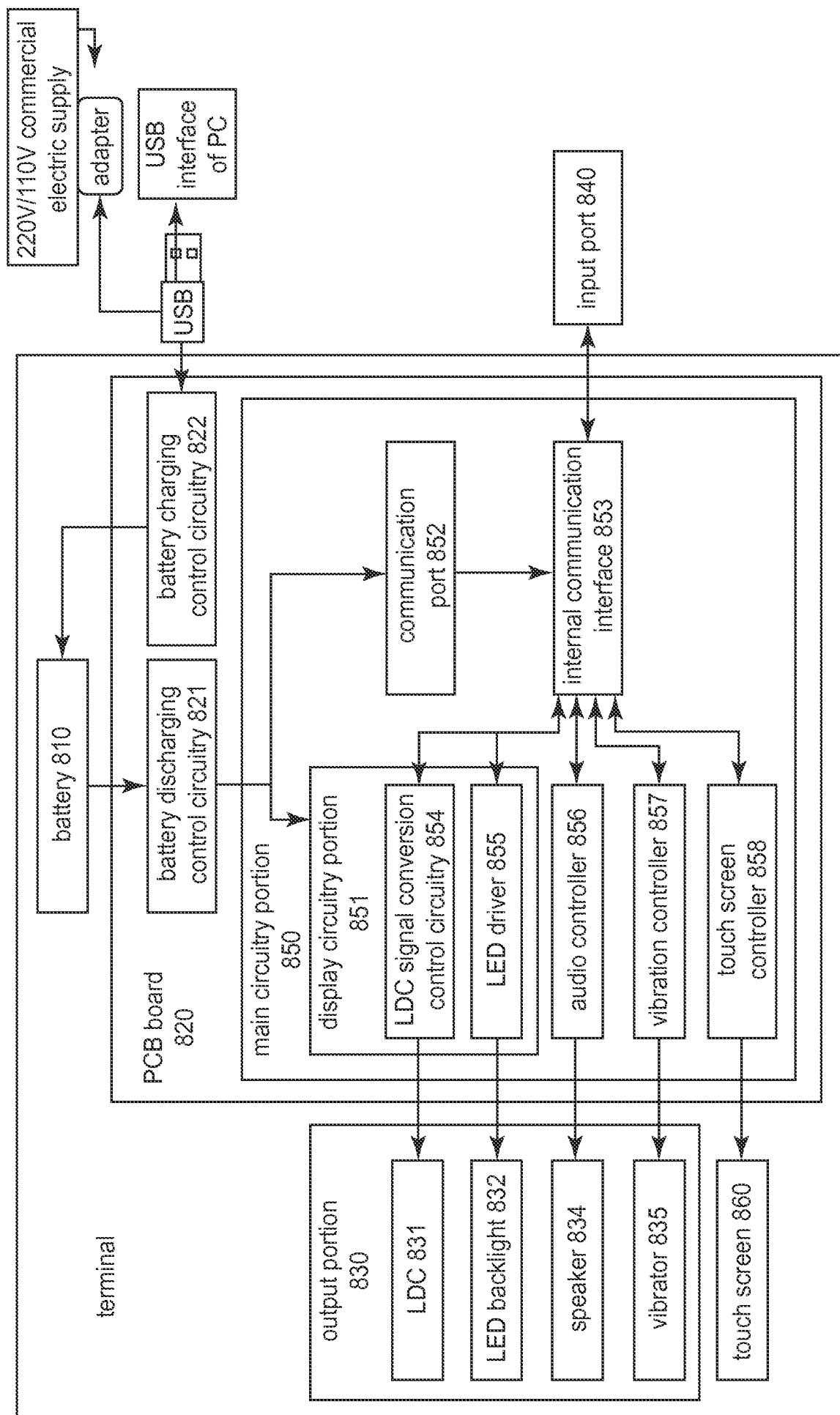


FIG. 8

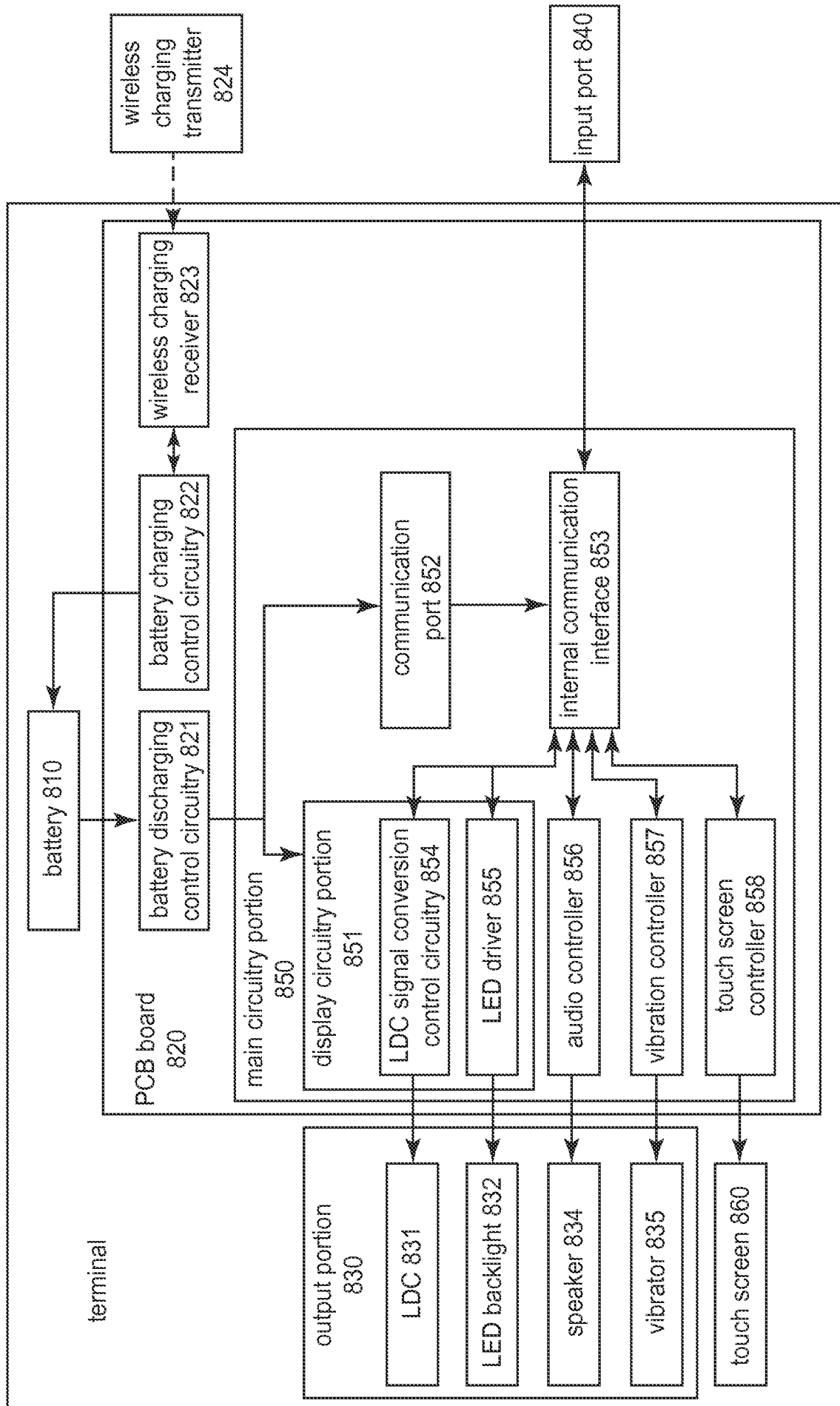


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/047300**A. CLASSIFICATION OF SUBJECT MATTER****G06F 15/17(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)

G06F 15/17; H04M 11/08; G06F 17/60; H04Q 7/04; G06F 15/02; G06F 1/32; G06F 1/16

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: terminal, transmission, input/output, port, USB.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6341133 B1 (YOJI KAWAMOTO et al.) 22 January 2002 See abstract, column 4 line 32 - column 7 line 39, claim 7 and figures 1-3.	1-18
Y	JP 2003-515222 A (HWANG, IVAN, CHUNG-SHUNG) 22 April 2003 See abstract, paragraphs [0106]-[0141], claim 1 and figures 1A-1E.	1-18
A	JP 2003-029872 A (SONY CORP) 31 January 2003 See abstract, paragraphs [0013]-[0034], claims 3,4 and figures 1,7.	1-18
A	US 2005-0066207 A1 (ROD G. FLECK et al.) 24 March 2005 See abstract, paragraphs [0033]-[0049], claim 1 and figure 3.	1-18



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

20 August 2013 (20.08.2013)

Date of mailing of the international search report

21 August 2013 (21.08.2013)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/047300

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