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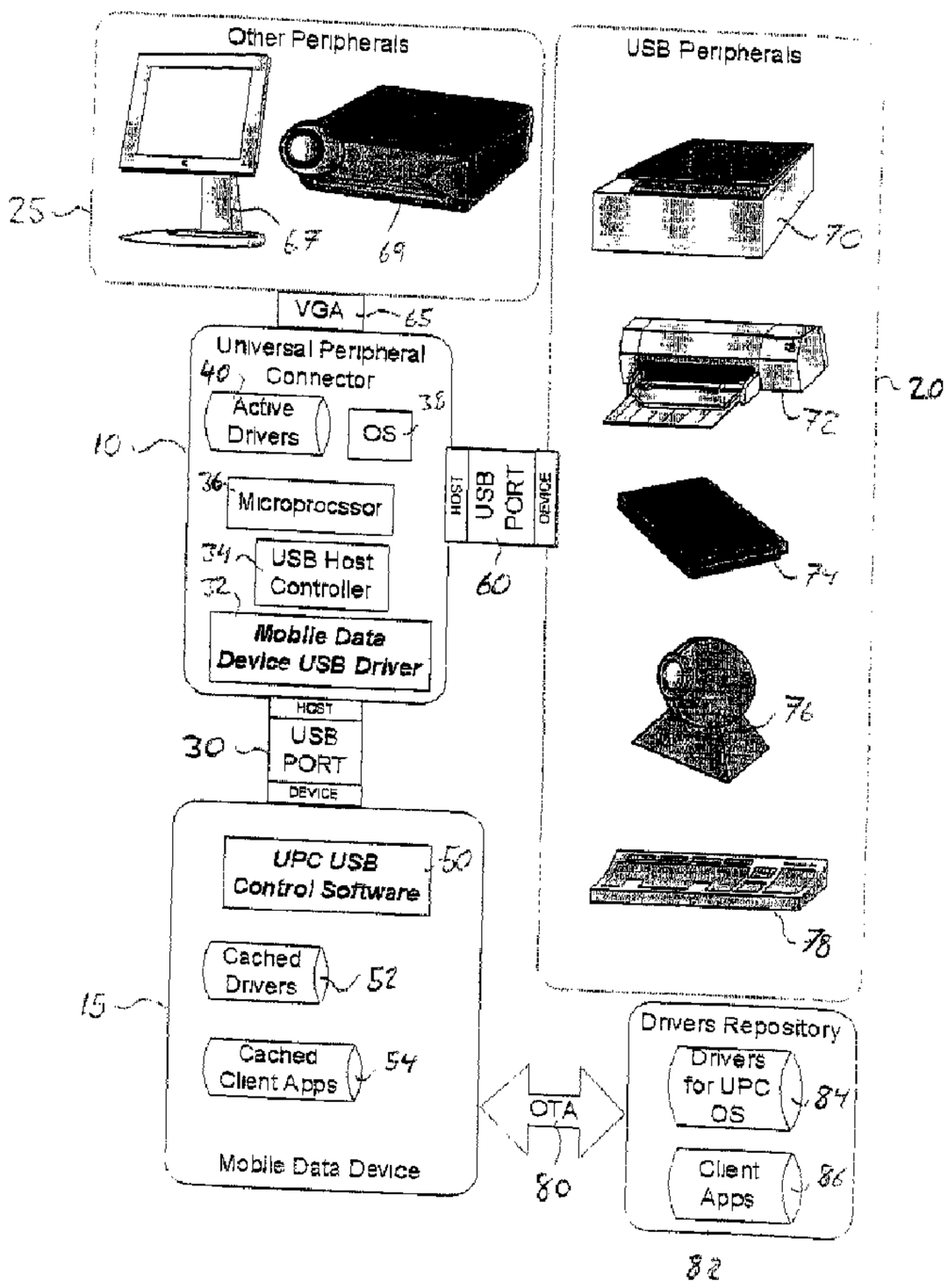

(57) Abrégé/Abstract:
A universal connector apparatus for a mobile device and in communication with the mobile device, the apparatus comprising: at least one universal serial bus (USB) connector providing at least one connection; at least one USB host controller configured to

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(57) Abrégé(suite)/Abstract(continued):
control the at least one USB connection; a microprocessor configured to control the at least one USB host controller, the microprocessor having an operating system; a USB device control interface on the mobile device configured to communicate and control the universal connector apparatus; and a USB driver configured to operate within the operating system to enable the mobile device to connect to one or more peripherals via the at least one USB connector.

ABSTRACT

A universal connector apparatus for a mobile device and in communication with the mobile device, the apparatus comprising: at least one universal serial bus (USB) connector providing at least one connection; at least one USB host controller configured to control the at least one USB connection; a microprocessor configured to control the at least one USB host controller, the microprocessor having an operating system; a USB device control interface on the mobile device configured to communicate and control the universal connector apparatus; and a USB driver configured to operate within the operating system to enable the mobile device to connect to one or more peripherals via the at least one USB connector.

UNIVERSAL PERIPHERAL CONNECTOR

[0001] The present application relates generally to the field of wireless communication devices and, in particular, to a connector to connect the wireless communication device with a peripheral device.

[0002] Many mobile data devices, such as wireless data devices, personal digital assistants, smart phones and cellular telephones, include a universal serial bus (USB) interface. The USB is used for a variety of functions but is primarily designed to connect the mobile data device with a computer.

[0003] The connection of a mobile data device to a computer allows the mobile data device to be a client and the computer to be the USB server. However, in many cases, it would be also desirable to connect the data device to a USB peripheral. Such peripherals include, for example, input devices, printers, cameras, mass storage devices, projectors, as well as many other peripherals known to those skilled in the art.

[0004] The problem with connecting a mobile data device to a peripheral is that the mobile data device would have to become the USB server. In current mobile data devices, the device is configured to connect to a USB host and not to a USB peripheral device. There is therefore a need to enable connectivity between a mobile data device and a USB peripheral device utilizing an existing USB port on the mobile data device.

[0005] Attempts have been made to solve the above problem. New data devices may include a technology labelled as USB On-The-Go. The problem with USB On-The-Go is that it requires at least USB 2.0 in order to work. Many existing mobile data devices do not include this version of USB ports and therefore a solution is required that will work with all mobile data devices. WO2004/029817 discloses a bus connection system in which a bus station, in the form of a hardware “dongle” operates in conjunction with a USB device.

[0006] The present method and apparatus provide a USB peripheral connector to connect the mobile data device to a variety of peripherals. A universal peripheral connector apparatus is provided which includes at least one USB port, a controller to control the one USB port, a microprocessor configured to control the USB host controller, a USB driver for a mobile data device, wherein the USB driver is

configured to operate within the operating system operating on the microcontroller and further is configured to enable the mobile data device to connect to one or more peripherals using the universal peripheral connector apparatus.

[0007] The universal peripheral connector apparatus can include a number of known standard interfaces to support peripherals. Besides USB this could include for example a VGA port to enable a mobile data device to display the user interface of the data device on the VGA screen or to connect to a peripheral such as an overhead projector for making presentations.

[0008] The universal peripheral connector can be a stand-alone device connecting to the mobile data device through a standard USB cable or could include a cradle to hold the mobile data device. The cradle could have a USB connector built in so that when a user inserts the mobile data device into the cradle, the cradle is connected to the mobile data device through the USB port. Peripherals can then be connected to the cradle using other ports on the cradle, such as a USB or a VGA port. The above is not meant to be limited to a cradle or on the stand-alone USB peripheral connector, and one skilled in the art would realize that other type supports could be used.

[0009] The universal peripheral connector could be used by connecting it to a mobile data device. The universal peripheral connector could then detect the presence of the USB peripheral at the USB port. Further, if a peripheral is detected, the universal peripheral connector can determine whether or not a driver exists for that peripheral. If a driver does not exist, then a driver can be obtained. Because the mobile data device communicates over the air, if the driver is not stored in either the universal peripheral connector or the mobile data device, then it can be obtained over the air from a driver repository that the mobile data device knows about. Once the driver is obtained and loaded, it can be used to drive the peripheral device.

[0010] The present application therefore preferably provides a universal connector apparatus for a mobile device and in communication with the mobile device, the apparatus comprising: at least one universal serial bus (USB) connector providing at least one connection; at least one USB host controller configured to control the at least one USB connection; a microprocessor configured to control said at least one USB host controller, the microprocessor having an operating

system; a USB device control interface on said mobile device configured to communicate and control said universal connector apparatus; and a USB driver configured to operate within said operating system to enable said mobile device to connect to one or more peripherals via said at least one USB connection, internal memory adapted to store one or more USB peripheral drivers for connecting a mobile device to said one or more peripherals, wherein said peripheral drivers are loaded onto said connector apparatus from a remote repository via a mobile device connected to the apparatus.

[0011] The present application further provides a method of connecting and facilitating control of a universal serial bus (USB) peripheral from a mobile device using a universal connector apparatus, the method comprising the steps of: detecting at the connector apparatus the connection or presence of a USB peripheral; if the peripheral is the mobile device configuring the mobile device for remote control of the universal connector; and if the peripheral device is not the mobile device, configuring the mobile device if connected for remote control of the universal connector; locating a driver for said peripheral, said locating step including requesting the driver from the mobile device, wherein the mobile device requests the driver from a drivers' repository over an air interface if the driver is not stored on the mobile device, and driving said peripheral using said driver to provide a functional feature at the mobile device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The present apparatus and method will be better understood with reference to the drawings in which:

FIGURE 1 is a block diagram of an exemplary universal peripheral connector connected to a mobile data device and to various peripherals;

FIGURE 2 is a flow chart of a method of connecting a universal peripheral connector to a peripheral device and to a mobile data device;

FIGURE 3 is a block diagram of an exemplary mobile data device that can be used with the present apparatus and method;

FIGURE 4A is an exemplary USB sled that a mobile data device can be placed into;

FIGURE 4B is a rear view of the USB sled of FIGURE 4A;

FIGURE 4C is an alternative embodiment using a USB dongle or USB peripheral device to connect the handheld device to the peripheral;

FIGURE 5 is a high level diagram showing the USB housing connected to the mobile data device and the peripheral device; and

FIGURE 6 is a block diagram of a further embodiment of a universal peripheral device.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0013] Reference is now made to the drawings. **Figure 1** shows a universal peripheral connector **10** for connecting a mobile data device **15** with a USB peripheral **20** or another peripheral **25**. Since many mobile devices **15** do not include a USB port that can be a host USB port, universal peripheral connector **10** is required in order to connect the mobile data device **15** to a peripheral **20**. Universal peripheral connector **10** is connected to mobile data device through a USB connection **30**. As will be appreciated by those skilled in the art, USB connection **30** can either be a USB cable, a connector connecting directly to mobile data device **15**, or other known connection.

[0014] Universal peripheral connector **10** includes a mobile data device USB driver **32** for use in driving USB connection **30** to communicate with mobile data device **15**.

[0015] Universal peripheral connector **10** further includes a USB host controller **34** in order to control the USB port or USB ports on the universal peripheral connector. Since the universal peripheral connector can connect to USB peripherals or other peripherals, at least one USB port is included on universal peripheral controller, but multiple ports could exist.

[0016] A microprocessor **36** on universal peripheral connector **10** is configured to control the USB host controller and an operating system **38** is adapted to execute on the microprocessor.

[0017] Universal peripheral connector **10** may further include a number of active drivers **40** which are the commonly used drivers to drive USB and other peripherals.

[0018] Mobile data device **15**, an exemplary version of which is described in more detail below, includes a UPC USB control software module **50** that is used to control the universal peripheral connector. Thus, even though the mobile data device is the client device for the universal peripheral connector's host USB port, control of the universal peripheral connector lies within the mobile data device.

[0019] Mobile data device **15** further includes cached drivers **52** which are stored to provide universal peripheral connector **10** with drivers necessary to drive various USB and other peripherals. Cached drivers **52** could be uploaded into universal peripheral connector if universal peripheral connector **10** does not include the driver in its active drivers module **40**.

[0020] As is described in more detail below, mobile data device **15** further includes cached client applications **54** which are used to exchange data with the USB and other peripherals.

[0021] Universal peripheral connector **10** preferably includes a USB connector **60** to connect with a USB peripheral **20**. Multiple connectors **60** could exist for universal peripheral connector **10**.

[0022] As illustrated in **Figure 1**, a VGA port **65** is also optionally a part of universal peripheral connector **10**. VGA port **65** is used to connect to peripherals such as a monitor **67** or a projector **69**.

[0023] Other ports could also exist on universal peripheral connector **10** to accommodate peripherals that do not use either USB or VGA ports.

[0024] Examples of universal serial bus peripherals **20** could include storage devices **70**, printers **72**, external drives **74**, cameras **76**, or keyboards **78**. Other devices are contemplated to also be within the scope of the present application, and the application is not limited by the specific type of peripheral used.

[0025] In operation, a universal peripheral connector **10** is connected to a mobile data device **15** through USB port **30**. Mobile data device driver **32** is used to establish communication with mobile data device **15** and UPC USB controls software communicates with microprocessor **34** to control a USB host controller **36** to a control USB host controller **34**. If a peripheral is connected to USB port **60**, USB host controller **34** attempts to determine the appropriate driver for the peripheral. It looks in active driver module **40** to determine whether the active driver is located on the universal peripheral connector. If the relevant driver is not located within the active driver module, universal peripheral connector **10** asks mobile data device **15** for the appropriate driver.

[0026] Mobile data device **15** then looks in its cached driver storage **52** to determine whether the appropriate driver exists on the mobile data device. If the cached driver storage **52** does not contain the appropriate driver, mobile data device **15** uses an air interface to obtain the appropriate device driver. The air interface **80** can thus be used to obtain a driver from driver repository **82** which stores drivers for the UPC operating system in its storage **84**. It can also be used to obtain client applications **86**.

[0027] The appropriate driver is then sent over the air back to mobile data device **15** which then can send the driver to USB host controller **34**. Microprocessor **36** could optionally tell the universal peripheral connector to store the driver in its active driver storage.

[0028] Once the device is connected to the universal peripheral connector and to a peripheral, the client application **54** can be used to communicate with the peripheral device. For example, if the mobile data device is being used for email and the user connects the mobile data device to a printer to print out the email, the mail application can include a print option. The print option could send the data to the printer through USB port **30** and USB port **60**. One skilled in the art will realize that various options exist for sending data to a peripheral device and these would be known to those skilled in the art.

[0029] In the above printing example, the mobile data device could for example use TCP/IP for printing. The email program could include a local loopback interface in which the application printed to a port with the address 127.0.0.n where n is a number between 0 and 255. The print driver could look to this port and send the data on this port through the USB connection. Other options could include, for example, FTP.

[0030] Reference is now made to **Figure 2**. **Figure 2** shows a flow chart of the way that the universal peripheral connector connects to both the mobile data device and to a peripheral device. If a peripheral is connected to the UPC via USB in step **201**, the UPC first checks to see whether the peripheral is a mobile data device in step **203**. If yes, the peripheral next checks in step **205** whether the mobile data device supports the universal peripheral connector. If the peripheral device is not a mobile device as determined in step **203**, the UPC next proceeds to step **207** in which it attempts to configure a mobile data device also connected to the UPC for remote control of the UPC host controller.

[0031] From **207**, the UPC proceeds to step **209** in which it checks whether the mobile data device is configured for UPC control.

[0032] If in step **205** the device does not support the UPC or if in step **209** the mobile data device is not configured for UPC control, the UPC proceeds to step **211** in which a user notification is generated and the process ends.

[0033] If in step **205** the mobile data device does support the UPC, the UPC next proceeds to step **213** in which it attempts to configure the mobile data device for remote control of the UPC host controller, similar to step **207**.

[0034] The UPC then proceeds from step **213** to step **215** in which a state is entered in which the mobile data device is now enabled to use a USB peripheral through the UPC.

[0035] From step **209**, if the mobile data device is configured for UPC control, the UPC next proceeds to step **217** in which flow connectivity is established between the peripheral and the mobile device through the UPC.

[0036] The UPC next proceeds to step **219** in which it checks whether it or the mobile device has the driver for the peripheral that has just been attached. If it does not have the driver, then the driver is located in step **221** by obtaining it over the air and consulting the repository **84** as illustrated in **Figure 1**.

[0037] From step **221**, the UPC proceeds to step **215** in which the mobile data device is enabled to use the peripheral via the UPC.

[0038] If in step **219** the UPC discovers that it does have the driver, then the driver is loaded for the peripheral in step **223** and the UPC moves to step **215**.

[0039] Reference is now made to **Figure 6**. **Figure 6** shows an alternative embodiment of a universal peripheral connector **10** which communicates through USB port **30** with a mobile data device **15** and through a USB port **60** to a peripheral device.

[0040] In the alternative embodiment of **Figure 6**, a microprocessor **36** communicates with a driver interface **602** which may or may not be the same as active driver module **40**.

[0041] Microprocessor **36** further communicates with other serial interfaces **604** which could include the VGA interface or other interfaces know to those skilled in the art. A power supply **606** supplies power to UPC **10**.

[0042] Microprocessor **36** further communicates with a USB master chip set **610** and USB slave chip set **612**. In this way, UPC **10** can either be the master or slave for each of the USB drives. Master and slave are also referred to as host end device in this specification.

[0043] Master chip set **610** and slave chip set **612** interact with USB housing interface **614** which could be the same as USB host controller **34** as seen in **Figure 1**. USB housing interface then drive USB interface **30** and USB interface **60**. USB housing interface **614** further is adapted to communicate with an internal USB peripheral **616** if required.

[0044] As will be appreciated by those skilled in the art, the universal peripheral connector **10** needs to be positioned between the handheld device and the peripheral. This can be accomplished in several ways. As seen in **Figure 5**, USB housing, which is the universal peripheral connector **10**, is connected to peripheral **20** through a USB connection **60** and a handheld device **15** is connected through a USB port **30**.

[0045] Reference is now made to **Figure 4**. UPC **10** can have several configurations. As seen in **Figure 4A**, UPC **10** can be a sled **410**. In this case, handheld device **15** is inserted into the sled and a connector within sled **410** is adapted to connect to the USB port of handheld device **15**.

[0046] Various ports within USB sled **410** can be used to connect to peripherals through a standard USB cable. Alternatively, as seen in **Figure 4B**, the peripheral can fit into a cavity **415** specially adapted for that peripheral.

[0047] As with the device in **Figure 6**, a power supply **606** is provided to the sled **410**. This can be either an external power supply or an internal supply such as batteries.

[0048] In a further alternative configuration as seen in **Figure 4C**, a UPC **10** can be a dongle **420**. Dongle **420** is adapted to connect to handheld device **15** and peripheral **20** through USB cables using ports **30** and **60** as described above. The power supply in this case could be an external power supply or batteries within the dongle **420**.

[0049] As will be appreciated by those in the art, handheld device **10** can consist of various handheld devices, including telephones, personal digital assistants, pagers, or other mobile data devices. The above is not meant to be limited to any specific mobile device. Referring to **Figure 3**, an exemplary mobile device that can be used in accordance with the present apparatus and method is described.

[0050] **Figure 3** is a block diagram illustrating a host mobile station including preferred embodiments of the techniques of the present application. Mobile station **1100** is preferably a two-way wireless communication device having at least voice and data communication capabilities. Mobile station **1100** preferably has the capability to communicate with other computer systems on the Internet. Depending on the exact functionality provided, the wireless device may be referred to as a data messaging device, a two-way pager, a wireless e-mail device, a cellular telephone with data messaging capabilities, a wireless Internet appliance, or a data communication device, as examples.

[0051] Where mobile device **1100** is enabled for two-way communication, it will incorporate a communication subsystem **1111**, including both a receiver **1112** and a transmitter **1114**, as well as associated components such as one or more, preferably embedded or internal, antenna elements **1116** and **1118**, local oscillators (LOs) **1113**, and a processing module such as a digital signal processor (DSP) **1120**. As will be apparent to those skilled in the field of communications, the particular design of the communication subsystem **1111** will

be dependent upon the communication network in which the device is intended to operate. For example, mobile station **1100** may include a communication subsystem **1111** designed to operate within the Mobitex™ mobile communication system, the DataTAC™ mobile communication system, GPRS network, UMTS network, EDGE network or CDMA network.

[0052] Network access requirements will also vary depending upon the type of network **1119**. For example, in the Mobitex and DataTAC networks, mobile station **1100** is registered on the network using a unique identification number associated with each mobile station. In UMTS and GPRS networks, and in some CDMA networks, however, network access is associated with a subscriber or user of mobile station **1100**. A GPRS mobile station therefore requires a subscriber identity module (SIM) card in order to operate on a GPRS network, and a RUIM in order to operate on some CDMA networks. Without a valid SIM/RUIM card, a GPRS/UMTS/CDMA mobile station may not be fully functional. Local or non-network communication functions, as well as legally required functions (if any) such as emergency calling, may be available, but mobile station **1100** will be unable to carry out any other functions involving communications over the network **1100**. The SIM/RUIM interface **1144** is normally similar to a card-slot into which a SIM/RUIM card can be inserted and ejected like a diskette or PCMCIA card. The SIM/RUIM card can have approximately 64K of memory and hold many key configuration **1151**, and other information **1153** such as identification, and subscriber related information.

[0053] When required network registration or activation procedures have been completed, mobile station **1100** may send and receive communication signals over the network **1119**. Signals received by antenna **1116** through communication network **1119** are input to receiver **1112**, which may perform such common receiver functions as signal amplification, frequency down conversion, filtering, channel selection and the like, and in the example system shown in **Figure 3**, analog to digital (A/D) conversion. A/D conversion of a received signal allows more complex communication functions such as demodulation and decoding to be performed in the DSP **1120**. In a similar manner, signals to be

transmitted are processed, including modulation and encoding for example, by DSP **1120** and input to transmitter **1114** for digital to analog conversion, frequency up conversion, filtering, amplification and transmission over the communication network **1119** via antenna **1118**. DSP **1120** not only processes communication signals, but also provides for receiver and transmitter control. For example, the gains applied to communication signals in receiver **1112** and transmitter **1114** may be adaptively controlled through automatic gain control algorithms implemented in DSP **1120**.

[0054] Network **1119** may further communicate with multiple systems, including a server **1160** and other elements (not shown). For example, network **1119** may communicate with both an enterprise system and a web client system in order to accommodate various clients with various service levels.

[0055] Mobile station **1100** preferably includes a microprocessor **1138** which controls the overall operation of the device. Communication functions, including at least data and voice communications, are performed through communication subsystem **1111**. Microprocessor **1138** also interacts with further device subsystems such as the display **1122**, flash memory **1124**, random access memory (RAM) **1126**, auxiliary input/output (I/O) subsystems **1128**, serial port **1130**, keyboard **1132**, speaker **1134**, microphone **1136**, a short-range communications subsystem **1140** and any other device subsystems generally designated as **1142**.

[0056] Some of the subsystems shown in **Figure 3** perform communication-related functions, whereas other subsystems may provide "resident" or on-device functions. Notably, some subsystems, such as keyboard **1132** and display **1122**, for example, may be used for both communication-related functions, such as entering a text message for transmission over a communication network, and device-resident functions such as a calculator or task list.

[0057] Operating system software used by the microprocessor **1138** is preferably stored in a persistent store such as flash memory **1124**, which may instead be a

read-only memory (ROM) or similar storage element (not shown). Those skilled in the art will appreciate that the operating system, specific device applications, or parts thereof, may be temporarily loaded into a volatile memory such as RAM **1126**. Received communication signals may also be stored in RAM **1126**. Further, a unique identifier is also preferably stored in read-only memory.

[0058] As shown, flash memory **1124** can be segregated into different areas for both computer programs **1158** and program data storage **1150**, **1152**, **1154** and **1156**. These different storage types indicate that each program can allocate a portion of flash memory **1124** for their own data storage requirements. Microprocessor **1138**, in addition to its operating system functions, preferably enables execution of software applications on the mobile station. A predetermined set of applications that control basic operations, including at least data and voice communication applications for example, will normally be installed on mobile station **1100** during manufacturing. A preferred software application may be a personal information manager (PIM) application having the ability to organize and manage data items relating to the user of the mobile station such as, but not limited to, e-mail, calendar events, voice mails, appointments, and task items. Naturally, one or more memory stores would be available on the mobile station to facilitate storage of PIM data items. Such PIM application would preferably have the ability to send and receive data items, via the wireless network **1119**. In a preferred embodiment, the PIM data items are seamlessly integrated, synchronized and updated, via the wireless network **1119**, with the mobile station user's corresponding data items stored or associated with a host computer system. Further applications may also be loaded onto the mobile station **1100** through the network **1119**, an auxiliary I/O subsystem **1128**, serial port **1130**, short-range communications subsystem **1140** or any other suitable subsystem **1142**, and installed by a user in the RAM **1126** or preferably a non-volatile store (not shown) for execution by the microprocessor **1138**. Such flexibility in application installation increases the functionality of the device and may provide enhanced on-device functions, communication-related functions, or both. For example, secure communication applications may enable electronic commerce functions and other such financial transactions to be performed using

the mobile station **1100**. These applications will however, according to the above, in many cases need to be approved by a carrier.

[0059] In a data communication mode, a received signal such as a text message or web page download will be processed by the communication subsystem **1111** and input to the microprocessor **1138**, which preferably further processes the received signal for output to the display **1122**, or alternatively to an auxiliary I/O device **1128**. A user of mobile station **1100** may also compose data items such as email messages for example, using the keyboard **1132**, which is preferably a complete alphanumeric keyboard or telephone-type keypad, in conjunction with the display **1122** and possibly an auxiliary I/O device **1128**. Such composed items may then be transmitted over a communication network through the communication subsystem **1111**.

[0060] For voice communications, overall operation of mobile station **1100** is similar, except that received signals would preferably be output to a speaker **1134** and signals for transmission would be generated by a microphone **1136**. Alternative voice or audio I/O subsystems, such as a voice message recording subsystem, may also be implemented on mobile station **1100**. Although voice or audio signal output is preferably accomplished primarily through the speaker **1134**, display **1122** may also be used to provide an indication of the identity of a calling party, the duration of a voice call, or other voice call related information for example.

[0061] Serial port **1130** in **Figure 3** would normally be implemented in a personal digital assistant (PDA)-type mobile station for which synchronization with a user's desktop computer (not shown) may be desirable. Such a port **1130** would enable a user to set preferences through an external device or software application and would extend the capabilities of mobile station **1100** by providing for information or software downloads to mobile station **1100** other than through a wireless communication network. The alternate download path may for example be used to load an encryption key onto the device through a direct and thus reliable and trusted connection to thereby enable secure device communication.

[0062] Other communications subsystems **1140**, such as a short-range communications subsystem, is a further optional component which may provide for communication between mobile station **1100** and different systems or devices, which need not necessarily be similar devices. For example, the subsystem **1140** may include an infrared device and associated circuits and components or a Bluetooth™ communication module to provide for communication with similarly enabled systems and devices.

[0063] The embodiments described herein are examples of structures, systems or methods having elements corresponding to elements of the techniques of this application. This written description may enable those skilled in the art to make and use embodiments having alternative elements that likewise correspond to the elements of the techniques of this application. The intended scope of the techniques of this application thus includes other structures, systems or methods that do not differ from the techniques of this application as described herein, and further includes other structures, systems or methods with insubstantial differences from the techniques of this application as described herein.

Claims:

1. A universal connector apparatus for a mobile device, the apparatus comprising:

at least one universal serial bus (USB) connector providing at least one connection;

at least one USB host controller configured to control the at least one USB connection;

a microprocessor configured to control said at least one USB host controller, the microprocessor having an operating system; and

a USB driver configured to operate within said operating system to enable a mobile device to connect to one or more peripherals via said at least one USB connection;

internal memory adapted to store one or more USB peripheral drivers for connecting a mobile device to said one or more peripherals,

wherein said peripheral drivers are loaded onto said connector apparatus from a remote repository via a mobile device connected to the apparatus.

2. The apparatus of claim 1, wherein said USB host controller comprises a USB master chipset and a USB slave chipset.

3. The apparatus of any one of claims 1 or 2, further comprising a video graphics array (VGA) connector to connect a mobile device to a VGA peripheral.

4. The apparatus of any one of claims 1 to 3, wherein the universal connector apparatus is a sled adapted to receive a mobile device.

5. The apparatus of any one of claims 1 to 4, wherein the universal connector apparatus is a dongle connected to a mobile device through a USB cable.

6. A universal connector system comprising the universal connector apparatus of any one of claims 1 to 5 and a mobile device connected to said apparatus, the apparatus being in communication with the mobile device, wherein

the mobile device has a USB device control interface configured to communicate and control said universal connector apparatus.

7. The system of claim 6 further comprising one or more peripherals connected to said apparatus, wherein said one or more peripherals comprises one or more printers, one or more facsimile machines, one or more computers, one or more digital cameras, one or more portable memory devices, one or more portable music players, one or more scanners, one or more barcode scanners, one or more monitors, one or more projectors, one or more keyboards, and/or one or more media writers.

8. The system of claim 6 or claim 7, wherein it further comprises a remote repository for drivers, said mobile device having means to communicate with said remote repository over an air interface to obtain a driver.

9. A method of connecting and facilitating control of a universal serial bus (USB) peripheral from a mobile device using a universal connector apparatus, the method comprising the steps of:

detecting at the connector apparatus the connection or presence of a USB peripheral;

if the peripheral is the mobile device configuring the mobile device for remote control of the universal connector; and

if the peripheral device is not the mobile device,

configuring the mobile device if connected for remote control of the universal connector;

locating a driver for said peripheral, said locating step comprising

requesting the driver from the mobile device, wherein the mobile device requests the driver from a drivers' repository over an air interface if the driver is not stored on the mobile device; and

driving said peripheral using said driver to provide a functional feature at the mobile device.

10. The method of claim 9 further comprising the steps of:

connecting a video graphics adapter (VGA) peripheral to a VGA port on the connector apparatus;

locating a driver for the VGA peripheral; and

driving the VGA peripheral from the mobile device.

11. A computer program product for connecting and facilitating control of a universal serial bus (USB) peripheral from a mobile device using a universal connector apparatus, the computer program product comprising a computer readable medium embodying program code means executable by a processor of the universal connector apparatus for implementing the method of any one of claims 9 to 10.

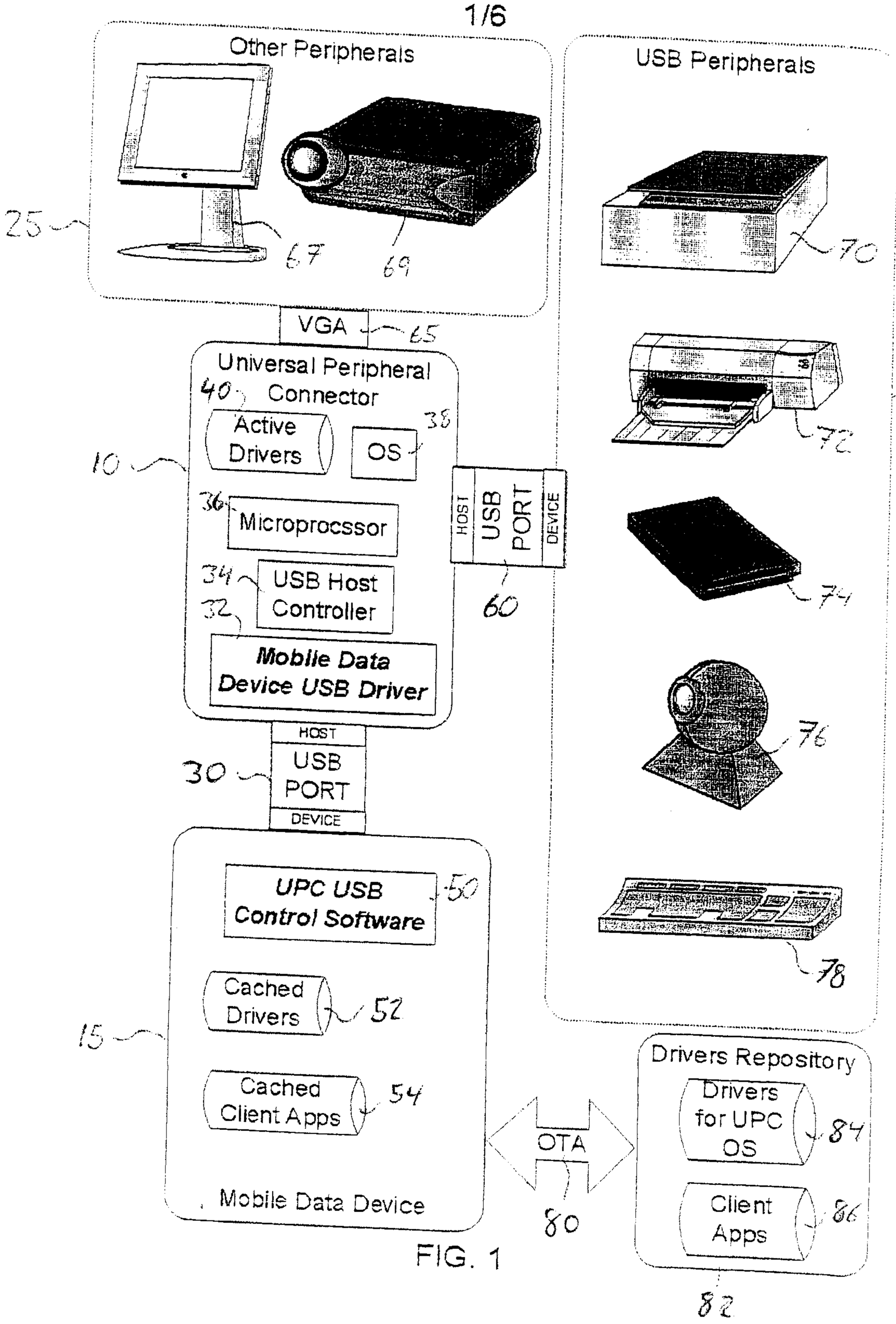
Other Peripherals
25
67
69
USB Peripherals
70
VGA
65
Universal Peripheral Connector
40
Active Drivers
OS
38
10
36
Microprocssor
34
USB Host Controller
32
Mobile Data Device USB Driver
HOST
USB PORT
DEVICE
30
HOST
USB PORT
DEVICE
60
20
72
74
76
78
UPC USB Control Software
50
Cached Drivers
52
15
Cached Client Apps
54
Mobile Data Device
OTA
80
Drivers Repository
Drivers for UPC OS
84
Client Apps
86
82

FIG. 1

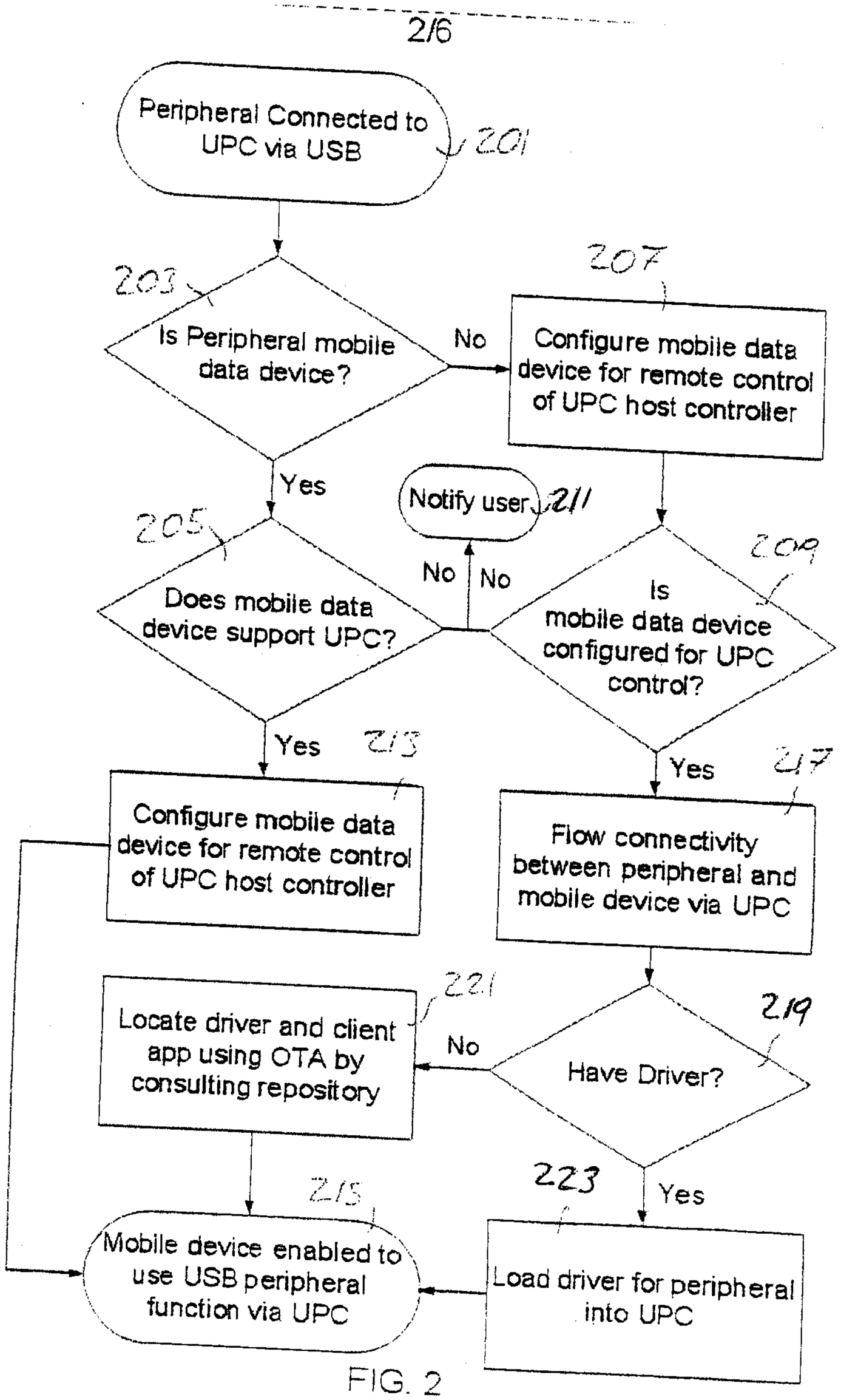
216
Peripheral Connected to UPC via USB
201
203
Is Peripheral mobile data device?
No
207
Configure mobile data device for remote control of UPC host controller
Yes
Notify user
211
205
Does mobile data device support UPC?
No
No
209
Is mobile data device configured for UPC control?
Yes
213
Configure mobile data device for remote control of UPC host controller
Yes
217
Flow connectivity between peripheral and mobile device via UPC
221
Locate driver and client app using OTA by consulting repository
No
219
Have Driver?
223
Yes
215
Mobile device enabled to use USB peripheral function via UPC
Load driver for peripheral into UPC

FIG. 2

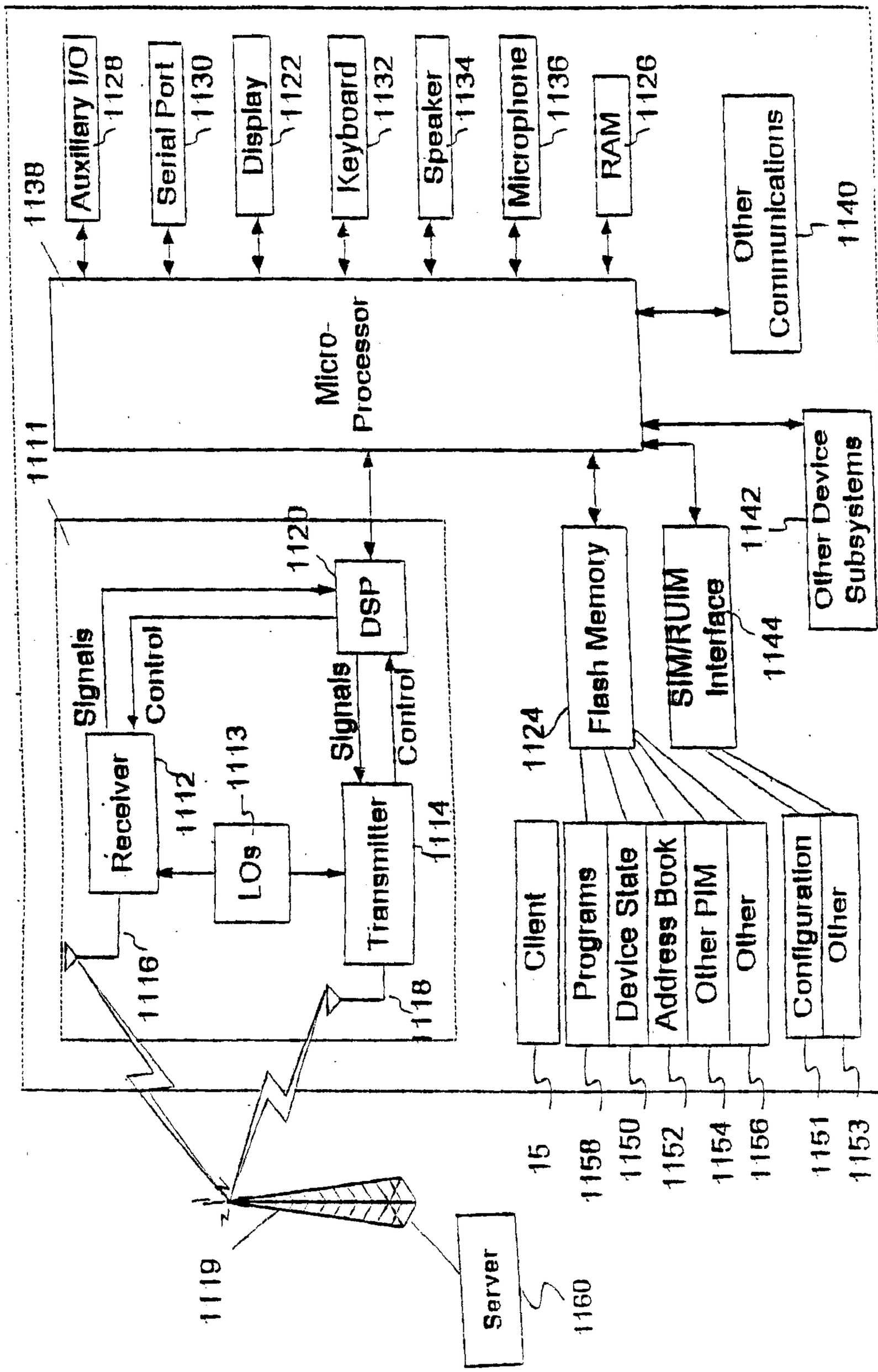
1138
Auxiliary I/O
1128
Serial Port
1130
Display
1122
Keyboard
1132
Speaker
1134
Microphone
1136
RAM
1126
Other Communications
1140
Micro-Processor
1111
1120
DSP
Signals
Control
Receiver
1112
1113
LOs
Transmitter
114
1116
118
1119
Server
1160
Flash Memory
SIM/RUIM Interface
1142
1144
Other Device Subsystems
Client
Programs
Device State
Address Book
Other PIM
Other
Configuration
Other
15
1158
1150
1152
1154
1156
1151
1153
1100

FIG.3

Design A: USB Sled

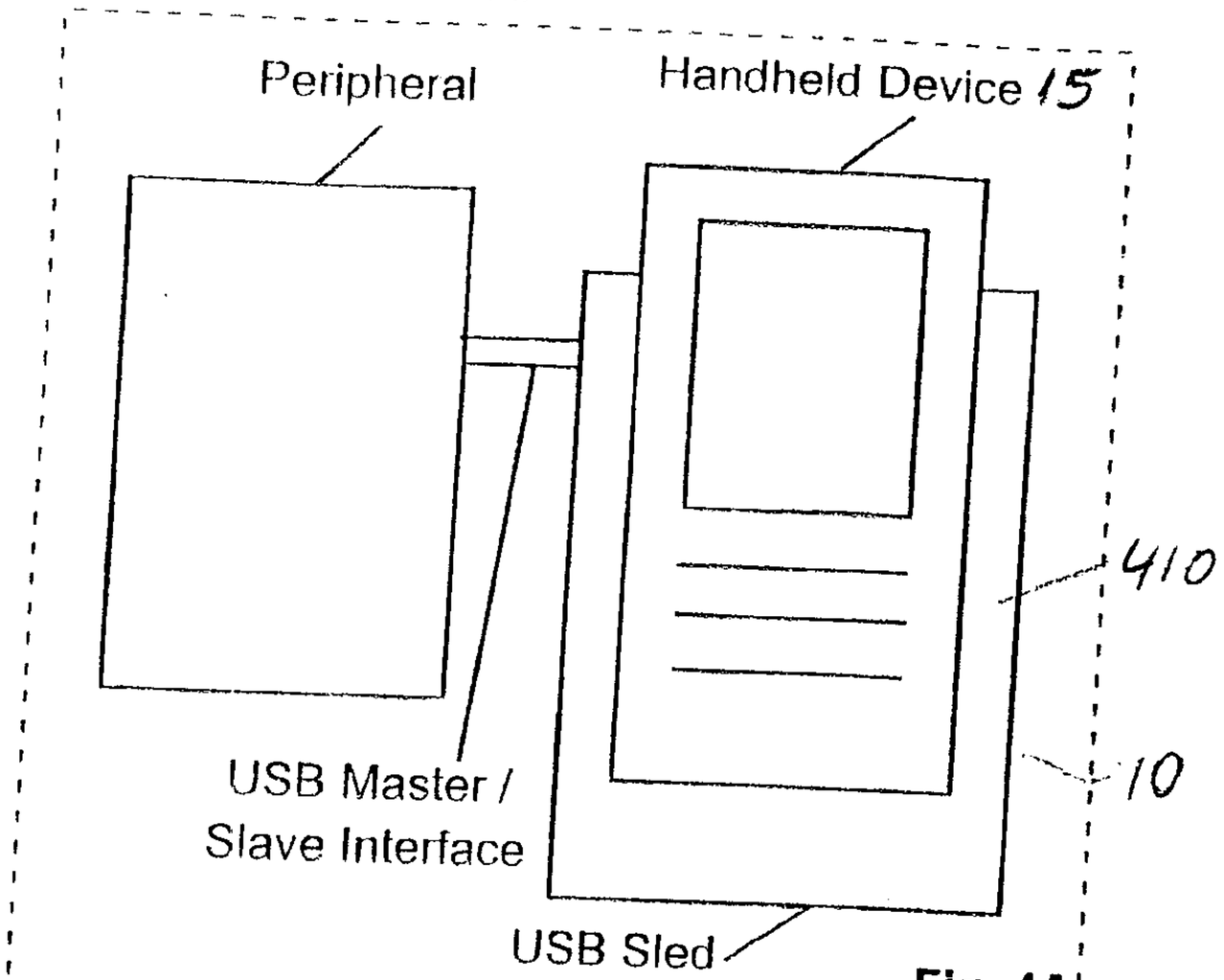

Fig. 4A

Design A: Sled Housing, Back View

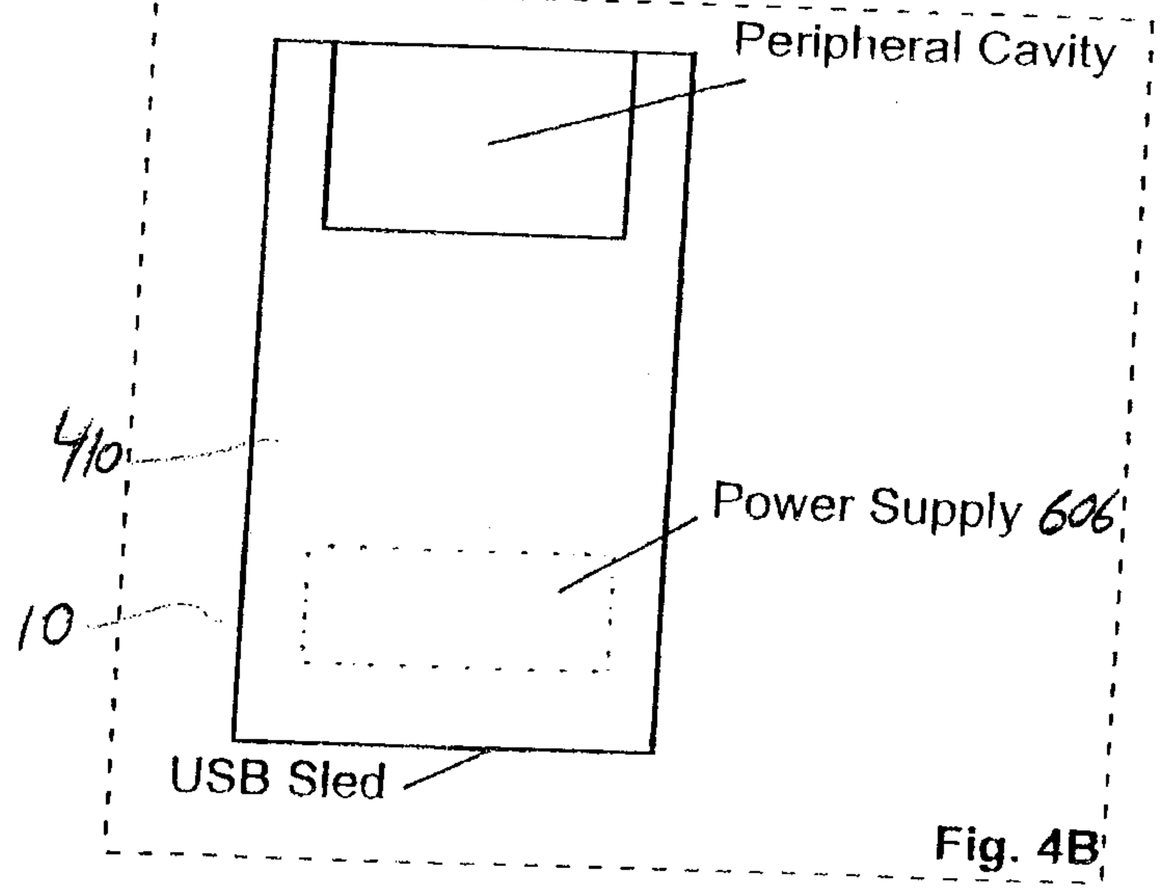

Fig. 4B

Design B: USB Dongle

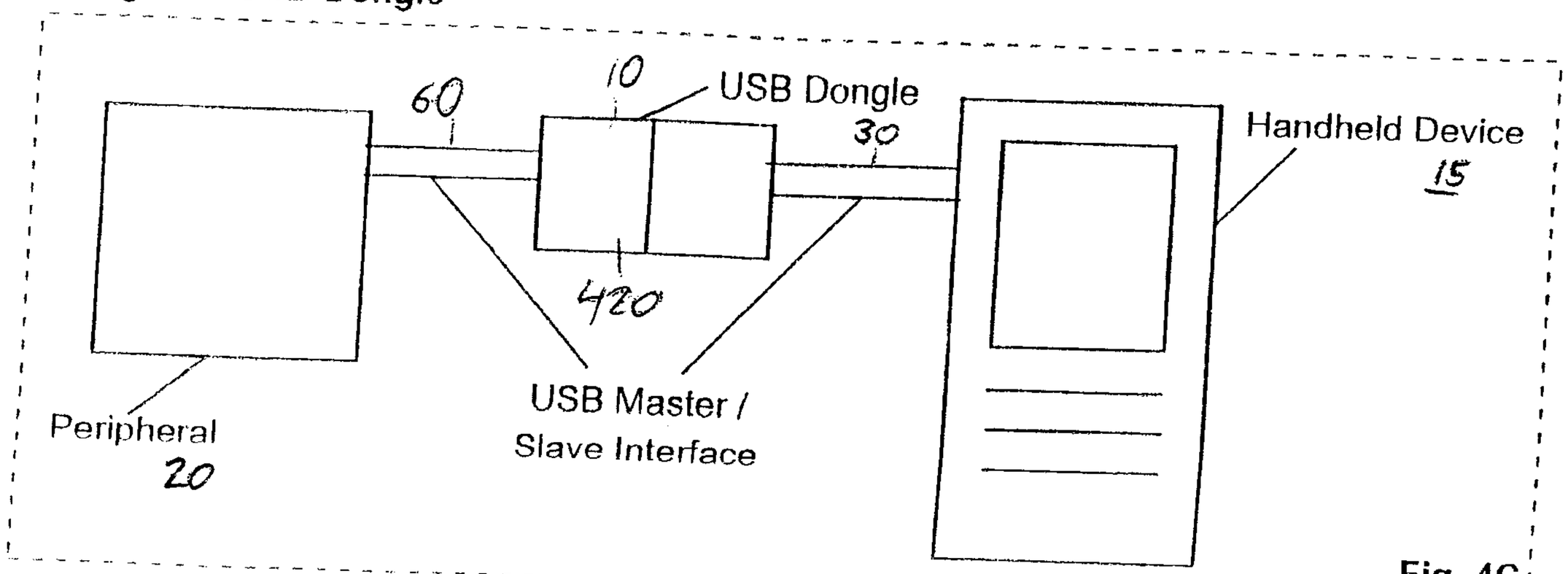

Fig. 4C

FIG. 4

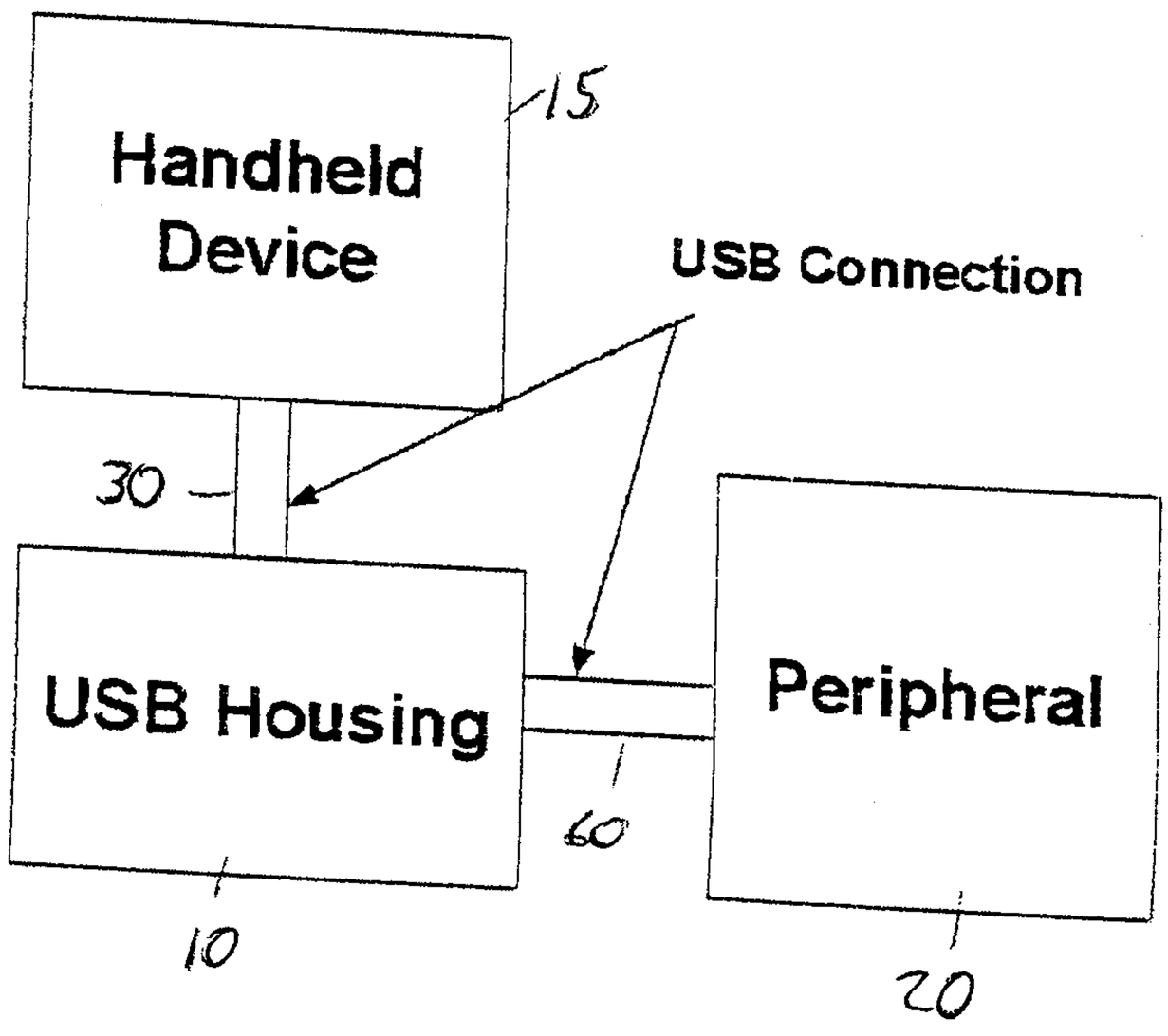
System
Handheld Device
15
USB Connection
30
USB Housing
Peripheral
60
10
20

FIG. 5

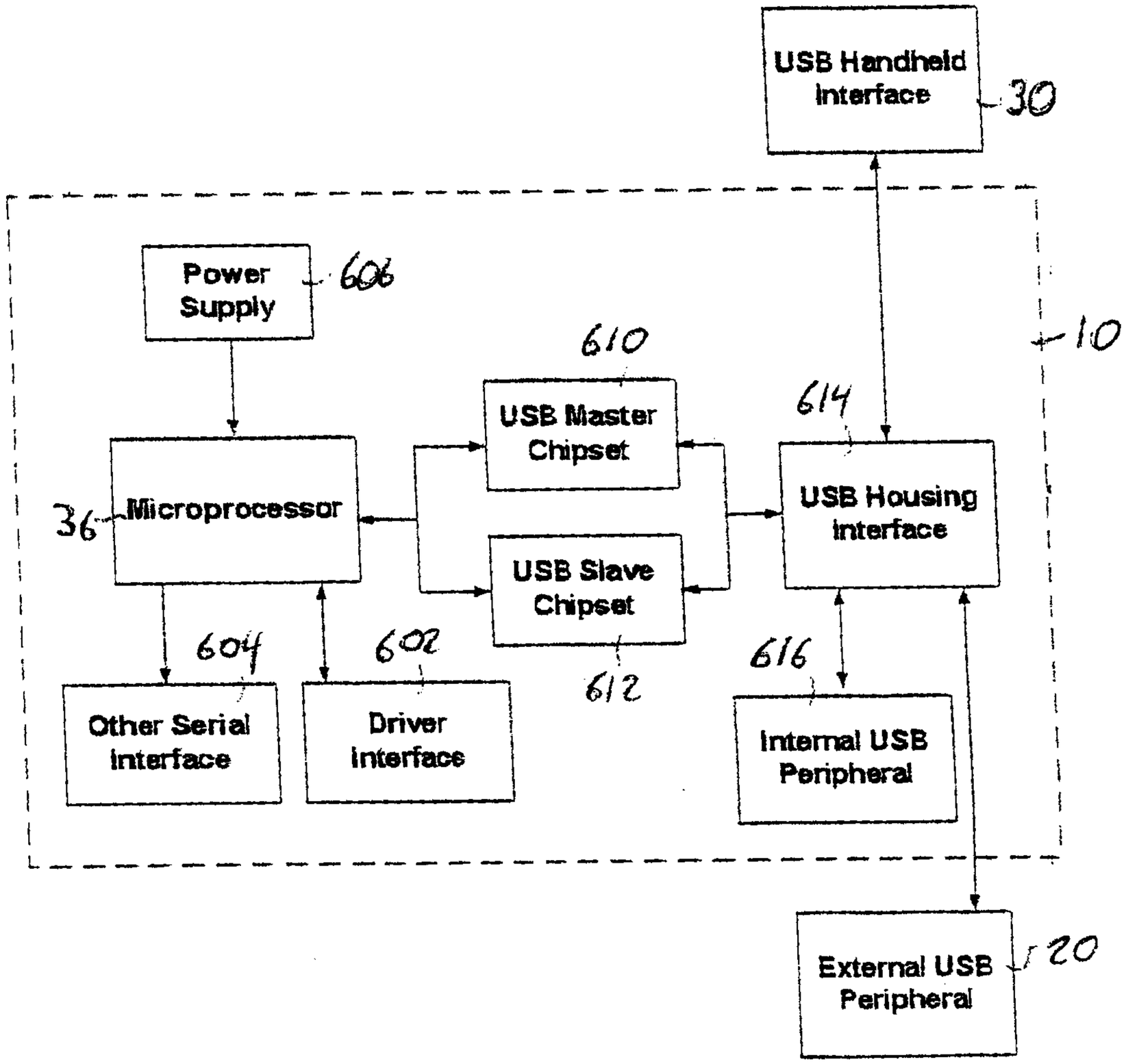
USB Handheld Interface
30
10
Power Supply
606
610
USB Master Chipset
614
USB Housing Interface
36
Microprocessor
USB Slave Chipset
604
602
612
616
Other Serial Interface
Driver Interface
Internal USB Peripheral
External USB Peripheral
20

FIG. 6

Other Peripherals

25

67

69

USB Peripherals

70

72

74

76

78

20

VGA 65

Universal Peripheral Connector 40

Active Drivers

OS 38

10

36 Microprocssor

34 USB Host Controller

32 *Mobile Data Device USB Driver*

HOST USB PORT DEVICE

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30 HOST USB PORT DEVICE

UPC USB Control Software 50

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Cached Client Apps 54

15

Mobile Data Device

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Drivers Repository

Drivers for UPC OS 84

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82