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(72) Inventors; and
(71) Applicants : **DVIR, Harel** [IL/IL]; 13 Benbenishti St, 75779 Rishon Lezion (IL). **DVIR, , Ira** [IL/IL]; 13 Benbenishti St, 75779 Rishon Lezion (IL). **HARE, Christopher** [GB/US]; 8636 Barrett Ridge Road, Wake Forest, NC 27587 (US).

(74) Agents: **BLUM, GADOR & CO** et al.; 53 Derech Hashalom, Vered Tower, 53454 Givatayim (IL).

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(54) **Title**: METHOD AND SYSTEM OF CHARGING A MOBILE DEVICE

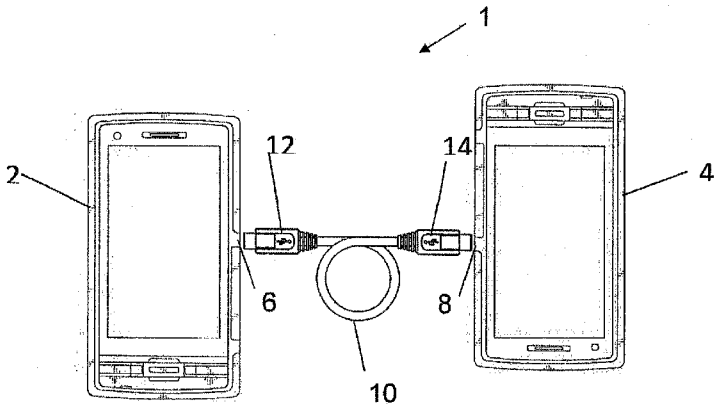

FIGURE 1

(57) **Abstract**: The invention relates to a method and system of charging power and, more particularly, but not exclusively, to a method and system of charging a mobile device such as a cellular phone and/or a tablet from another mobile device, by disguising one of the devices as a device and the other one, if needed, as a host, by means of software and/or hardware, thereby allowing charging of one device's battery from the other device's battery.

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METHOD AND SYSTEM OF CHARGING A MOBILE DEVICE

RELATED APPLICATIONS

The present application claims priority from United States provisional patent application serial number 61/668,051 filed on July 5, 2012, the entire contents of which are incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to a method and system of sharing electric power and, more particularly, but not exclusively, to a method and system of charging a mobile device, such as cellular phone and/or tablet.

BACKGROUND OF THE INVENTION

Mobile communication and multimedia devices like Smart phones, Media players, Tablets and modern Feature-phones are power hungry. Users tend to use many of their features, which are power consuming, like WiFi, GPS, and especially video playback and taking photographs. The extensive use of many of these tasks results in short battery life. In many cases, mobile device users end up with a dead battery, often in a location where they have no access to a charging device, like a wall charger, a PC, or a car charger. Such a situation is not only frustrating, but could be dangerous, since these days people are used to being available at all times, require two-way access to emergency services, and use their mobile devices not only as phones, but as email clients and IP communication devices. However, on many such occasions, when users cannot operate their cellular or mobile devices due to a dead battery, there are other mobile device users in their presence, whose devices (phones/tablets/media players) have fully or partially charged batteries.

A recent trend in the mobile market is to unify and harmonize the I/O (Input/Output) data ports and charging ports of all devices, including mobile devices. As of January 30, 2009, Micro-USB (Universal Serial Bus) has been accepted and is being used by almost all cell phone manufacturers (including Hewlett-Packard, HTC,

LG, Motorola, Nokia, RIM, Samsung, Sony Ericsson) as the standard charging port in most of the world. In addition, on October 22, 2009, the International Telecommunication Union (ITU) also announced that it has embraced micro-USB as the Universal Charger Solution (UCS), its, "energy-efficient one-charger-fits-all new mobile phone solution", and added: "Based on the Micro-USB interface, UCS (Universal Charger Solution) chargers will also include a 4-star or higher efficiency rating—up to three times more energy-efficient than an unrated charger".

A USB On-The-Go (OTG) device is required to have one, and only one, standard USB connector: a Mini-AB or Micro-AB receptacle or port. This receptacle is capable of accepting both Mini-A and Mini-B plugs, and alternatively, Micro-A and Micro-B plugs, attached to any of the legal cables and adapters, as defined in Micro-USB 1.01. The OTG device with the A-plug inserted is called the A-device and is responsible for powering the USB interface when required and, by default, assumes the role of host. The OTG device with the B-plug inserted is called the B-device and, by default, assumes the role of peripheral. An OTG device with no plug inserted defaults to acting as a B-device. If an application on the B-device requires the role of host, then the Host Negotiation Protocol (HNP) is used to temporarily transfer the host role to the B-device. OTG devices attached either to a peripheral-only B-device or a standard/embedded host (A-device) will have their role fixed by the cable, since in these scenarios, it is only possible to attach the cable one way around.

The USB Battery Charging Specification of 2007 defines new types of USB ports, e.g., charging ports. As compared to standard downstream ports, where a portable device can only draw more than 100 mA current after digital negotiation with the host or hub, charging ports can supply currents above 0.5 A without digital negotiation. A charging port supplies up to 500 mA at 5 V, up to the rated current at 3.6 V or more, and drops its output voltage if the portable device attempts to draw more than the rated current. The charger port may shut down if the load is too high.

Sourcing power from a USB port, as such, is known in the art. This is the way in which all USB powered devices derive power and charge batteries. It is defined in

the USB specifications. For charging purposes, mobile devices are configured as peripheral devices.

There are three USB specifications — USB 1.0, 2.0, and 3.0 — the most common variant being USB 2.0. In any USB network, there is one host and one device. In almost every case, one's PC (Personal Computer) is the host, and one's smart phone/tablet/camera is the device. Power always flows from the host to the device, although data can flow in both directions. A typical USB socket has at least four pins and a USB cable has four wires. The inside pins carry data (D+ and D-), and the outside pins are a VBUS and ground. The VBUS provides a 5-volt power supply. A fifth ID pin is sometimes provided. In terms of actual current (milliamps or mA), there are three kinds of USB ports dictated by the current specs: a standard downstream port, a charging downstream port, and a dedicated charging port. The first two can be found on computers and the third kind applies to "dumb" wall chargers. In the USB 1.0 and 2.0 specs, a standard downstream port is capable of delivering up to 500mA (0.5A); in USB 3.0, it can deliver up to 900mA (0.9A). The charging downstream and dedicated charging ports provide up to 1500mA (1.5A). When USB devices are first connected, they are interrogated by the host controller, which enquires of each their maximum power requirements.

The possibility of charging one cellular phone from another, according to the specifications detailed above, does not exist today. This is because, if two identical mobile devices (e.g., cellular handsets) were connected, charging from one mobile device to the other would not take place, since it is impossible for conventional devices to decide which device takes what role, i.e., in which direction the current should flow. In other words, there is no way for the two mobile devices to decide between themselves which device would do the charging, and which device would be charged.

SUMMARY OF THE INVENTION

The present invention relates to a method and system of sharing power and, more particularly, to a method and system of charging a mobile device having telecommunication features, preferably 3G, LTE or higher, such as a smart cellular phone or a feature phone and/or tablet, from another mobile device.

According to the present invention, there is provided a method and system of charging a mobile device from another mobile device. The desired charging from device A to device B or from device B to device A is implemented by disguising one of the devices as, or causing it to electrically emulate a charger, by means of software or hardware.

According to the invention, there is provided a system including at least two mobile devices (e.g., smart phones or tablets), which may operate on batteries and include wired or wireless communication and charging ports. The devices typically (in everyday mode) do not identify themselves as charging devices, when connected to other devices. The present system enables one of the devices to electrically emulate a charger, which enables the other device to charge its battery from the first device's battery.

Optionally, the device which is meant to be charged can disguise itself as a device with high power consumption, by means of software or hardware, in order to allow it to draw the maximal allowed power from the charging device, according to present and future limitations. In this case, there is no need for the charging device to disguise itself as a charger, although it can do so.

A program is run in the charging device to identify the device as a charger, or to disconnect or bypass the data cables in the connector between the two devices, which causes the second device to identify the first device not as a telephone, but as a charger. Regarding the device to be charged, it is possible to run a program in it in

order to identify it as, or to emulate, a device having a high power consumption, in order to increase efficiency and reduce the charging time.

According to one embodiment of the present invention, a male to male connector, such as a cable or adapter, (i.e., a dual male connecting plug having two identical male B-Plugs, one on each end) will connect the two mobile devices. Alternatively, the connector can be a built-in B-plug, built into one of the devices. Prior to connecting the two mobile devices, the device which is intended to be the charging device disguises itself as (or emulates electrically) a charger, by means of software or hardware. Such disguising could optionally be done by disconnecting leads using software means, such as an application, or by a physical hardware switch.

According to some embodiments of the invention, the device which is intended to be charged disguises itself (or emulates electrically) a high power peripheral, by sending data which identifies it as such. This electrical emulation can be accomplished by means of software or hardware.

BRIEF DESCRIPTION OF THE DRAWINGS

Some embodiments of the invention are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example only and for purposes of illustrative discussion of embodiments of the invention. In this regard, the description taken with the drawings makes apparent to those skilled in the art how embodiments of the invention may be practiced.

In the drawings:

FIG. 1 is a schematic plan view illustration of a system for charging a mobile device according to one embodiment of the invention, using a male to male connector including a micro-USB cable having male micro-B plugs on both ends;

FIG. 2 is a flow chart schematically depicting the exemplary steps of the method for charging a mobile device, according to some embodiments of the present invention;

FIG. 3 is a flow chart schematically depicting the exemplary steps of the initiation and user selection, according to some embodiments of the method of the present invention.

FIG. 4 is a schematic plan view illustration of a system for charging a mobile device according to an alternative embodiment of the invention, where the connector is a male to male micro-USB adapter having male micro-B plugs on both ends; and

FIG. 5 is a schematic plan view illustration of a system for charging a mobile device according to another embodiment of the present invention, where the connector is a built-in, retractable, male micro-B plug.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

The present invention relates to methods and systems of sharing power and, more particularly, to a method and system of charging a mobile device having telecommunication features, preferably 3G, LTE or higher, such as a smart cellular phone or a feature mobile phone and/or a tablet equipped with cellular communication capabilities, from another mobile device. Thus, the invention relates to sharing power between two connected portable devices for charging one of the devices and, more particularly, but not exclusively, to methods and systems of sharing power, via a commonly used serial port, e.g., USB or micro/mini USB or any physical wired connection, between two mobile devices, to enhance battery life while distant from static charging devices.

It will be appreciated that, in order to implement the invention, a mobile device must be capable of being a "host" device in order to supply power over USB. By definition, if the device supports USB “On the Go” (and most modern phones do), the device is capable of being a host and, therefore, of supplying power over a VBUS (virtual bus) wire or other physical connection.

According to some embodiments of the present invention, there are provided methods and systems of boosting battery life that can be used for partially charging portable devices from one to another.

The invention relates to a system including at least two mobile devices (e.g., smart phones or tablets), which may operate on batteries and include wired or wireless communication and charging ports. The devices typically (in everyday mode) do not identify themselves as charging devices, when connected to other devices. The present system enables one of the devices to electrically emulate a charger, which enables the other device to charge its battery from the first device's battery.

Optionally, software means, such as a software application, or features within a non-specific application, can be used to define one of the devices (the charging device) as "master/host" and the other device (the charged device) as "slave/peripheral

device" to permit the host to provide electricity to the device. Optionally, a hardware switch, or other hardware means, can be used to neutralize any pre-configured identification of the charging device and/or charged device and/or to create the needed identification of the devices in order to create the needed master and slave relationship. In other words, in order to create the required master-slave relation for charging one mobile device from another, circuitry or software must be added to at least one of the devices to control a controller in that mobile device to tell the contacts (pins) in the USB connection to change function. This can be accomplished either by software for mobile devices having hardware designs that will allow that, or by hardware switching, or with a pre-designed hardware output charging plug (for example a built-in male micro-B plug, as shown in Figure 5, and described in detail below). One alternative is by providing an application in the mobile device that is activated by the user when required. Alternatively, the disguising of the device may be accomplished by a combination of hardware means and software means.

The disguise can be implemented in hardware by physical disconnection of the wires which are not designated for charging (the data wires), which can be actuated by a software command. Alternatively, it can be accomplished in the same way that there is identification of a newly connected object by means of any conventional identification method or device (as is accomplished for almost any USB device today). Such a port is present in almost any mobile device, whether in Micro USB form or in Apple's proprietary 30 pin connector to USB.

In order to connect two identical mobile devices for charging one of the devices from the other, a connector is required having a male plug on each end, for example, a cable or plug with two male B-plugs, one on each end, or two male A-plugs, one on each end. One particularly suitable connector is a USB OTG (On-The-Go) cable, an extension of the USB 2.0 specification used for connecting peripheral devices to each other. The preferred USB OTG cable or plug has dual male connectors for connecting with the female sockets in the smart phones or other mobile devices. Alternatively, two standard cables could be combined as follows: Cable A, having a mini or micro USB on one side and a regular male USB on the other, is coupled to cable B, which has an OTG mini or micro USB on one side and a female

regular USB on the other. The male regular USB is coupled inside the female regular USB and the micro/mini connectors respectively plug into the devices. Such cables exist on the market. When combining two cables this way, a pure software solution can be realized. Another option is to use a mobile device having a built-in B-plug, as shown in Figure 5 and described below.

Referring now to Figure 1, there is shown a plan view illustration of a charging system 1, according to one embodiment of the present invention. System 1 includes a first mobile device 2 and a second mobile device 4. Each mobile device 2 and 4 has a USB port 6, 8, which is preferably a Micro-AB socket which can receive either a Micro-A or Micro-B plug. Each mobile device also includes a battery, not shown, as known. A connector 10 connects the two devices. In this embodiment, connector 10 has two male Micro-B plugs 12 and 14, one on each of its ends. The first Micro-B plug 12 is plugged into the Micro-AB socket 6 of device 2, and the other Micro-B plug 14 is plugged into the Micro-AB socket 8 of device 4. Alternatively, a cable with two male Micro-A plugs, one on each of its ends, can be used.

Figure 2 is a flow chart of one method of using mobile device 2 to charge mobile device 4. First, it is determined that the battery of mobile device 2 is fully or partially charged (block 20). Then, a charger emulating software application is run on mobile device 2 (block 22) so as to permit mobile device 2 to electrically emulate a charger when plugged into a mobile device to be charged. Next, mobile device 2 is connected to mobile device 4 to be charged (block 24). Mobile device 4 identifies mobile device 2 as a charger or host (block 26). Next, mobile device 4 runs a session request protocol (SRP) to request the mobile device 2 to turn on VBUS power and start a charging session, thereby charging mobile device 4 (block 28) via the VBUS pins and wire in the USB connector. SRP allows both communicating devices to control when the link's power session is active, allowing fine control over the power consumption. The charging device (host) leaves its USB link unpowered until the device to be charged asks it to start delivering power. Mobile device 2 receives the request and opens a VBUS channel (block 30) to provide power to mobile device 4 from the battery of mobile device 2 (block 32).

According to some embodiments of the present invention, the device to be charged may include software and/or hardware to permit it to electrically emulate (i.e., disguise itself as) a high power consuming device. Once the device to be charged appears as a high power consuming device, electric power will flow only to that device and not from it, enabling it to charge its battery from another device's battery. It will be appreciated that typically this will be sufficient, although, alternatively, this emulation could be used in addition to the charging device emulating a charger. The device to be charged can electrically emulate or disguise itself as a power consuming peripheral, such as a USB hard drive or a USB Pico Projector. In one possible embodiment of the invention, the software application re-defines the fifth pin (the ID pin), which is by default defined as "host", so that, instead, it is defined as a "device". In this way, this device can be charged by another mobile device. As described above, the Session Request Protocol (SRP) can be used when one of the phones emulates a high consumption peripheral. In this case, such a session request could be initiated by the phone to be charged.

Preferably, both software and/or hardware options are provided on the mobile device, and the user has the option whether to use his mobile device as a charger to charge another mobile device or if he would like his mobile device to be charged from another mobile device. In this case, the user selects which of the two software applications on his mobile device to run. Alternatively, mechanical means, such as a switch, may be provided on the hardware to allow the user to selectively toggle between the different settings.

Figure 3 is a flow chart schematically depicting exemplary steps of the initiation and user selection, where the user's device can be configured either to charge another device or to be charged by another device. In this embodiment, the user's mobile device is first connected to a second mobile device (block 40). Next, the user's mobile device detects the USB connection between the two devices (block 42) and launches an application general user interface (GUI) (block 44), to permit the user to select a desired mode of operation. The program then provides the user the option of either emulating a charger, or allowing his mobile device to emulate a power

consuming device, so as to be charged. If the user selects the option of emulating a charger (block 46), so as to charge another mobile device, then the application defines his mobile device as a charger (block 48). If the user selects the option of charging his device (block 50), then the application defines his mobile device as a power consuming peripheral device (block 52) and his device will be charged using the second device's battery.

It will be appreciated that a variety of methods can be used to connect the two mobile devices. Figure 4 is a plan view illustration of a system 60, according to another embodiment of the present invention. System 60 is substantially the same as system 1 of Figure 1, except that the connector is a male to male adapter 62. Like elements have like reference numerals. Adapter 62 has two male Micro-B plugs 64 and 66, one on each of its ends. The first Micro-B plug 64 is plugged into the Micro-AB socket 6 of device 2, and the other Micro-B plug 66 is plugged into the Micro-AB socket 8 of device 4. Once the devices have been connected, operation of system 60 is substantially the same as system 1, described in detail above. Alternatively, a combination of two standard OTG cables, as described above, can be utilized, or an adapter with two male Micro-A plugs, one on each of its ends, if both devices have A plug connections.

Figure 5 is a plan view illustration of a mobile device 70, according to another embodiment of the present invention, wherein the USB connector is a built-in plug used to connect the two devices. Device 70 is substantially the same as each of the mobile devices of Figure 1, except that it includes a built-in plug 72 for connecting device 70 to the USB port of a second mobile device. A micro-USB (or any other USB type) folding plug 72 could be integrated with the mobile device, to allow its connection to another mobile device while avoiding the need for an additional cable or adapter.

In the illustrated embodiment, built-in plug 72 is a male Micro-B plug which can be plugged into the Micro-AB socket of a second device. Preferably, plug 72 is retractable and can be retracted into the body 74 of device 70, by any known means. Once the built-in plug 72 is plugged into the USB port of a second mobile device, the

charging operation is substantially the same as that of system 1, described in detail above. The built-in male Micro-B plug allows direct physical connection to another mobile device by connecting the built in folding plug directly to a second mobile device's USB socket, either for charging itself from that device, or for charging the other device, thereby obviating the need for a separate cable or adapter. According to other embodiments of the invention, a built-in male Micro-A plug can be used.

Inductive charging has been added lately to some wireless and mobile devices. It will be appreciated that the protocol of charging between two devices equipped with inductive charging capabilities could be defined according to the present invention. However, unlike a standardized MicroUSB charging connector, there are no de facto standards, although the Qi has become a standard adopted by many companies, such as Google and Nokia. The Qi standard includes only a power receiver unit in the device, however inductive charging could include in the future also a power transmitting unit. Once such a capability exists, the current invention could allow any person having ordinary skill in the art to use inductive charging for charging one device from another.

One possible implementation of a power (host/device) emulating software application is now disclosed. Such an application must adjusted and designed according to the different Operating Systems and the device's hardware implementation, and in particular to the hardware controllers and drivers. The Application is a system application which changes, upon the user's demand, the system's software or hardware behavior in order to define the USB and power control drivers or other components related to USB or power control of the device. The application could run in the background and monitor the USB port for connection changes. (This type of application is quite common and most smart phones users are familiar with the background application, which evokes and displays a menu when a phone is connected to the PC, allowing the user to connect the phone as a USB storage device.) For the current invention, when the USB monitoring application detects a USB port connection, it evokes and displays a menu for the user to choose the power mode of the current device: (a.) Charger mode or (b.) Charging mode.

These menu items could be added to any other USB monitoring application, which may exist on the device. In case (a.), the first device will negotiate the USB/inductive connection with a second connected device to act as a host ("power generation device") which will supply the power to the second device. The application on the first device will configure the appropriate drivers and other software or hardware components in order to supply the power to the second device. In case (b.), the first device will negotiate the USB/inductive connection with the second connected device to act as a "power consumption device" and the application on the first device will configure the appropriate drivers and other software or hardware components in order to withdraw the charge from the second device to the first device.

It will be appreciated that, if the user of the device having a low or empty battery wants to operate the device, and not necessarily charge the battery of his device, according to the system of the present invention, the battery of the charging device can act as a backup battery. In this way, the second device can operate using the battery of the first device.

Although the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made. It will further be appreciated that the invention is not limited to what has been described hereinabove merely by way of example. Rather, the invention is limited solely by the claims which follow.

WHAT IS CLAIMED IS:

1. A system for charging a mobile device, the system comprising:
a first mobile device and a second mobile device, each having telecommunications capabilities, each of which operates on a battery and includes at least one Universal Serial Bus (USB) port coupled to the battery;

a USB connector coupling said USB ports of said first and second mobile devices; and

means for selectively configuring one of said first and second devices as a host to emulate electrically a charger to charge the battery of the other.

2. The system according to claim 1, further comprising means for selecting said one of said first and second devices as said host.

3. The system according to claim 2, wherein the means for selecting includes a general user interface (GUI) in each said device permitting a user to select one of said first and second devices.

4. The system according to claim 2, wherein the means for selecting includes a mechanical switch permitting a user to select one of said first and second devices.

5. The system according to claim 1, wherein said means for selectively configuring includes software and/or hardware causing said device selectively to emulate electrically a charger.

6. The system according to claim 1, wherein said means for selectively configuring includes software and/or hardware to cause said device selectively to emulate electrically a power consuming peripheral.

7. The system according to claim 1, wherein said a USB connector is a built-in USB connector connecting said USB ports.

8. The system according to claim 1, wherein said mobile devices are selected from the group including a cellular smart phone, a feature phone, and a tablet.

9. The system according to claim 1, wherein said first device and said second device further comprise means for selectively configuring one of said devices as a high power consumption device, to be charged by the battery of the other of said devices.

10. The system according to claim 1, wherein the device being charged is selectively configured to emulate electrically a high power accessory, allowing maximal power extraction from the charging device.

11. A method for charging a mobile device, the method comprising:

providing a first mobile device and a second mobile device, each having telecommunications capabilities, each of which operates on a battery and includes at least one Universal Serial Bus (USB) port coupled to the battery;

coupling said USB ports of said first and second mobile devices; and

selectively configuring one of said first and second devices as a host to emulate electrically a charger to charge the battery of the other.

12. The method according to claim 11, further comprising selecting said one of said first and second devices as said host.

13. The method according to claim 11, further comprising configuring the device being charged to emulate electrically a high power accessory, allowing maximal power extraction from the charging device.

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14. The method according to claim 11, wherein said step of selecting includes selecting by a user via a general user interface (GUI) in each said device.

15. The method according to claim 11, wherein the step of selecting includes selecting by a user via a mechanical switch.

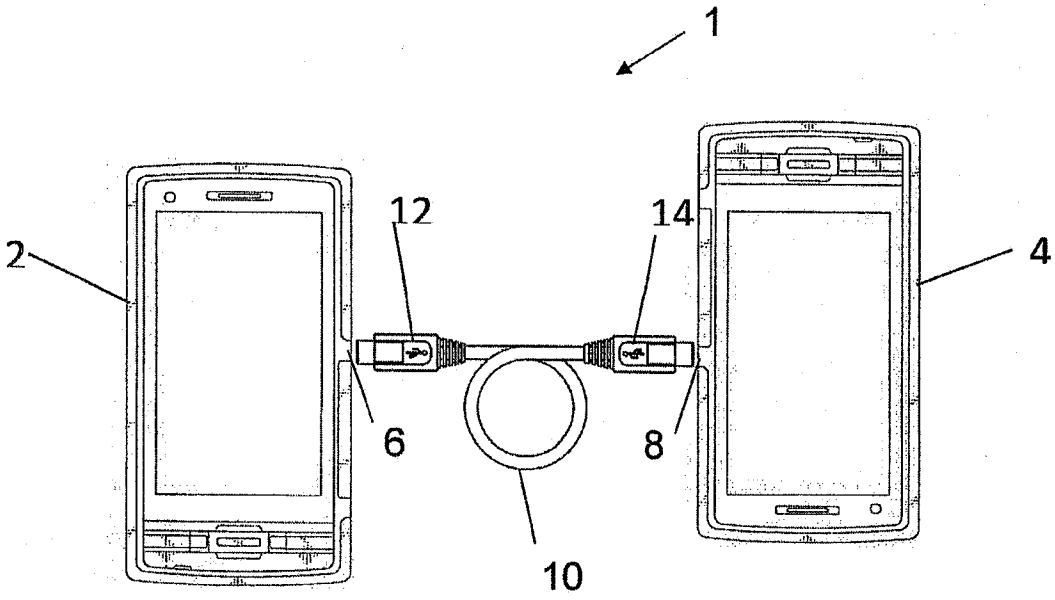

FIGURE 1

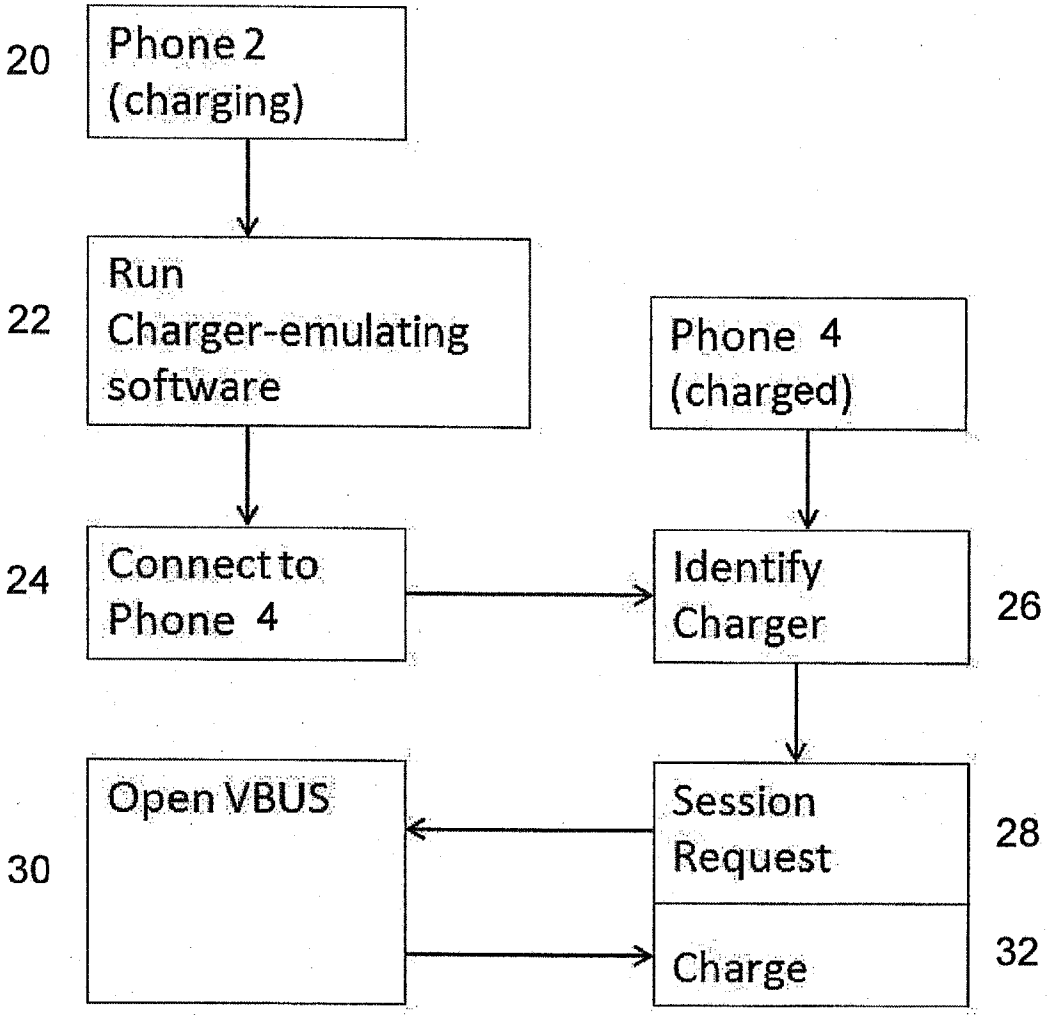
20
Phone 2 (charging)
22
Run Charger-emulating software
Phone 4 (charged)
24
Connect to Phone 4
Identify Charger
26
Open VBUS
30
Session Request
28
Charge
32

FIGURE 2

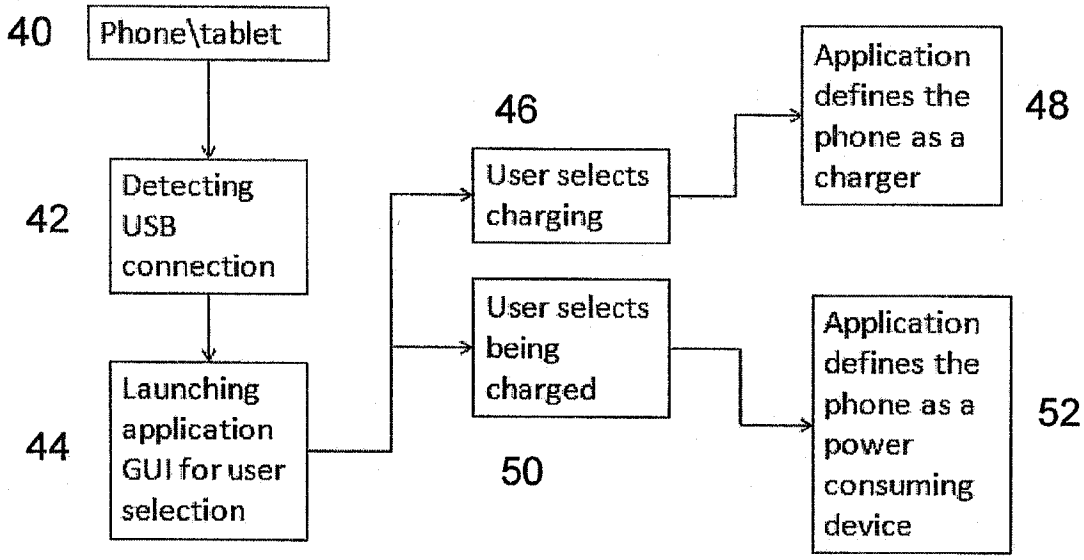
40
Phone\tablet
42
Detecting USB connection
44
Launching application GUI for user selection
46
User selects charging
User selects being charged
50
Application defines the phone as a charger
48
Application defines the phone as a power consuming device
52

FIGURE 3

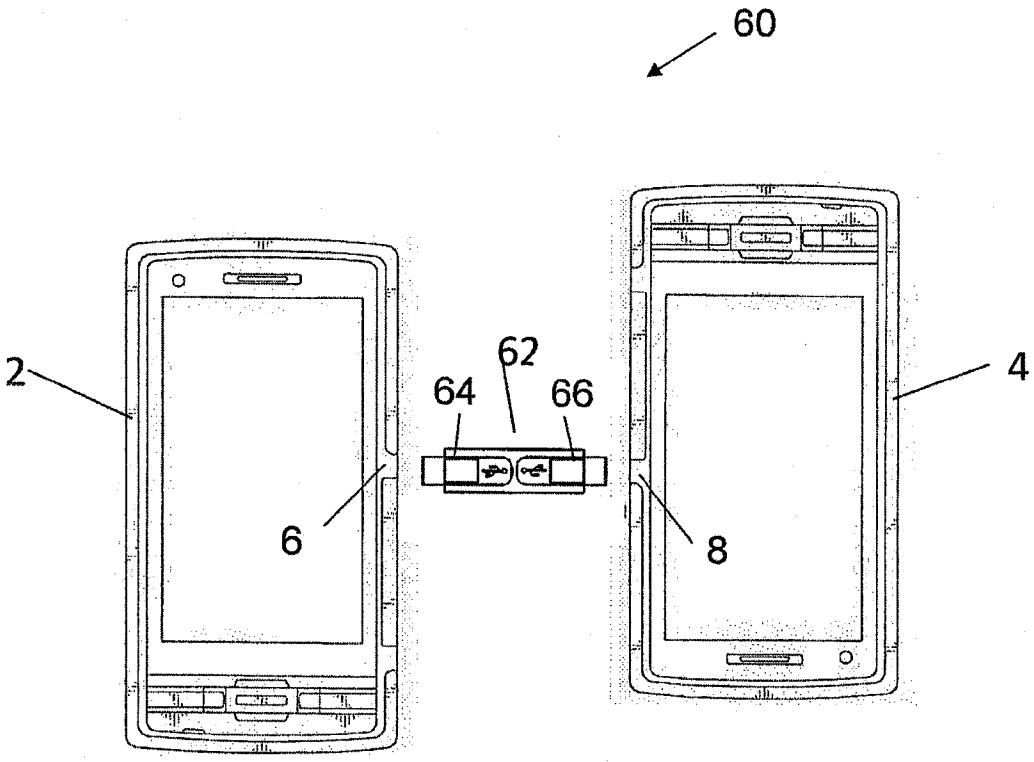

FIGURE 4

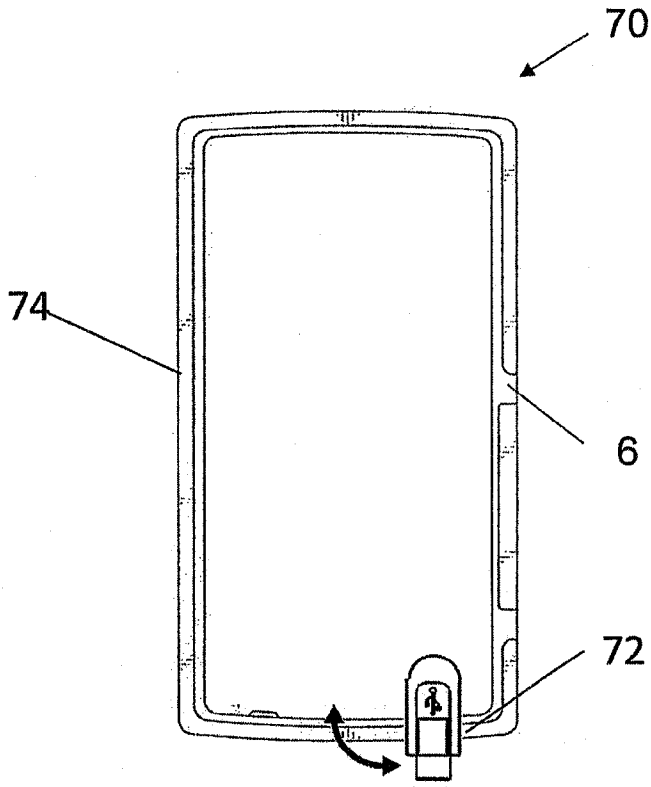

FIGURE 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL2013/050567

A. CLASSIFICATION OF SUBJECT MATTER
IPC (2013.01) H02J 7/00, G06F 13/10

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)
IPC (2013.01) H02J 7/00, G06F 13/10

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Databases consulted: USPTO, Eponline, Esp@cenet, Google Patents, FamPat database
Search terms used: MOBILE DEVICE, CHARGE, HOST, BATTERY, USB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2479062 A KULUKUNDIS CONSTANTINE 28 Sep 2011 (2011/09/28) Whole document	1-3,5-14
Y	Whole document	4,15
Y	US 6531845 B2 KERAI KANJI et al. 11 Mar 2003 (2003/03/11) Whole document	1-15
Y	WO 2007132304 A2 NOKIA CORP. 22 Nov 2007 (2007/11/22) Whole docoment	1-15
P,X	US 2012231857 A1 HSU CHENG-JUNG 13 Sep 2012 (2012/09/13) Whole docoment	1-15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"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
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"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
11 Sep 2013	11 Sep 2013
Name and mailing address of the ISA: Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616	Authorized officer DAVIDI Ariel Telephone No. 972-2-5651727

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL2013/050567

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2418546 A KULUKUNDIS CONSTANTINE 28 Mar 2006 (2006/03/28) Whole document	1-15
A	US 2003050102 A1 ROH JI-WON 13 Mar 2003 (2003/03/13) Whole docoment	1-15

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IL2013/050567

Patent document cited search report	Publication date	Patent family member(s)	Publication Date
GB 2479062 A	28 Sep 2011	GB 201105023 D0	11 May 2011
		GB 2479062 A	28 Sep 2011
		GB 201005078 D0	12 May 2010
US 6531845 B2	11 Mar 2003	EP 1158593 A1	28 Nov 2001
		GB 0012946 D0	19 Jul 2000
		GB 2362769 A	28 Nov 2001
		JP 2002044876 A	08 Feb 2002
		US 2002005707 A1	17 Jan 2002
		US 6531845 B2	11 Mar 2003
WO 2007132304 A2	22 Nov 2007	CN 101449447 A	03 Jun 2009
		CN 101449447 B	02 May 2012
		EP 2008353 A2	31 Dec 2008
		US 2007236975 A1	11 Oct 2007
		US 7508162 B2	24 Mar 2009
		WO 2007132304 A2	22 Nov 2007
		WO 2007132304 A3	07 Feb 2008
US 2012231857 A1	13 Sep 2012	TW 201237627 A	16 Sep 2012
		US 2012231857 A1	13 Sep 2012
GB 2418546 A	28 Mar 2006	GB 0421350 D0	27 Oct 2004
		GB 2418546 A	29 Mar 2006
US 2003050102 A1	13 Mar 2003	CN 1406039 A	26 Mar 2003
		CN 1305289 C	14 Mar 2007
		KR 20030023188 A	19 Mar 2003
		US 2003050102 A1	13 Mar 2003
		US 7158815 B2	02 Jan 2007