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(54) **FOLDABLE MOBILE PHONE**

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(73) Assignee: **Google Inc.**, Mountain View, CA (US)

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(60) Provisional application No. 61/113,262, filed on Nov. 11, 2008.

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**H04M 1/725** (2006.01)

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(52) **U.S. Cl.**

CPC ..... **H04M 1/725** (2013.01); **H04M 1/0214** (2013.01); **H04M 1/0235** (2013.01); **H04M 1/0256** (2013.01); **H04M 1/72575** (2013.01)

USPC ..... **455/575.4**; **455/566**; **455/90.3**

(58) **Field of Classification Search**

USPC ..... 455/90.3, 550.1, 566, 575.1, 575.4, 455/575.8

See application file for complete search history.

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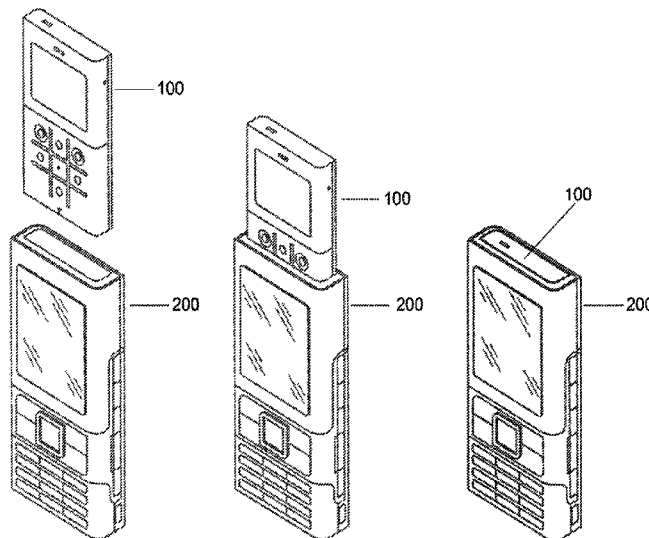
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(57) **ABSTRACT**

A mobile phone, including a processor operable to perform wireless communication, a housing for the processor, including front and back surfaces, a first display screen coupled with the processor and mounted on the outer side of the front surface, a second display screen coupled with the processor, separate from the first display screen, and a transparent portion on the outer side of the back surface through which the second display screen shows through to the outside of the housing.

**9 Claims, 10 Drawing Sheets**



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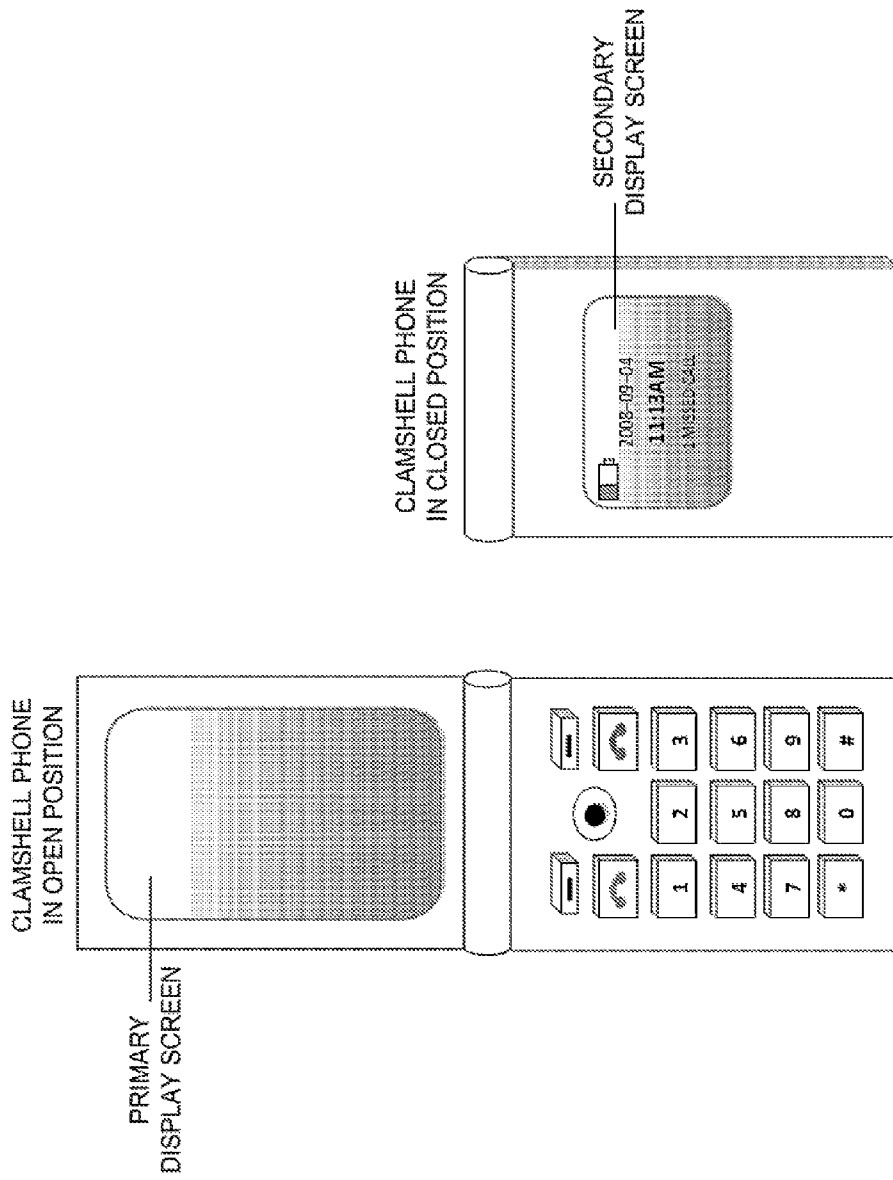


FIG. 1  
(PRIOR ART)

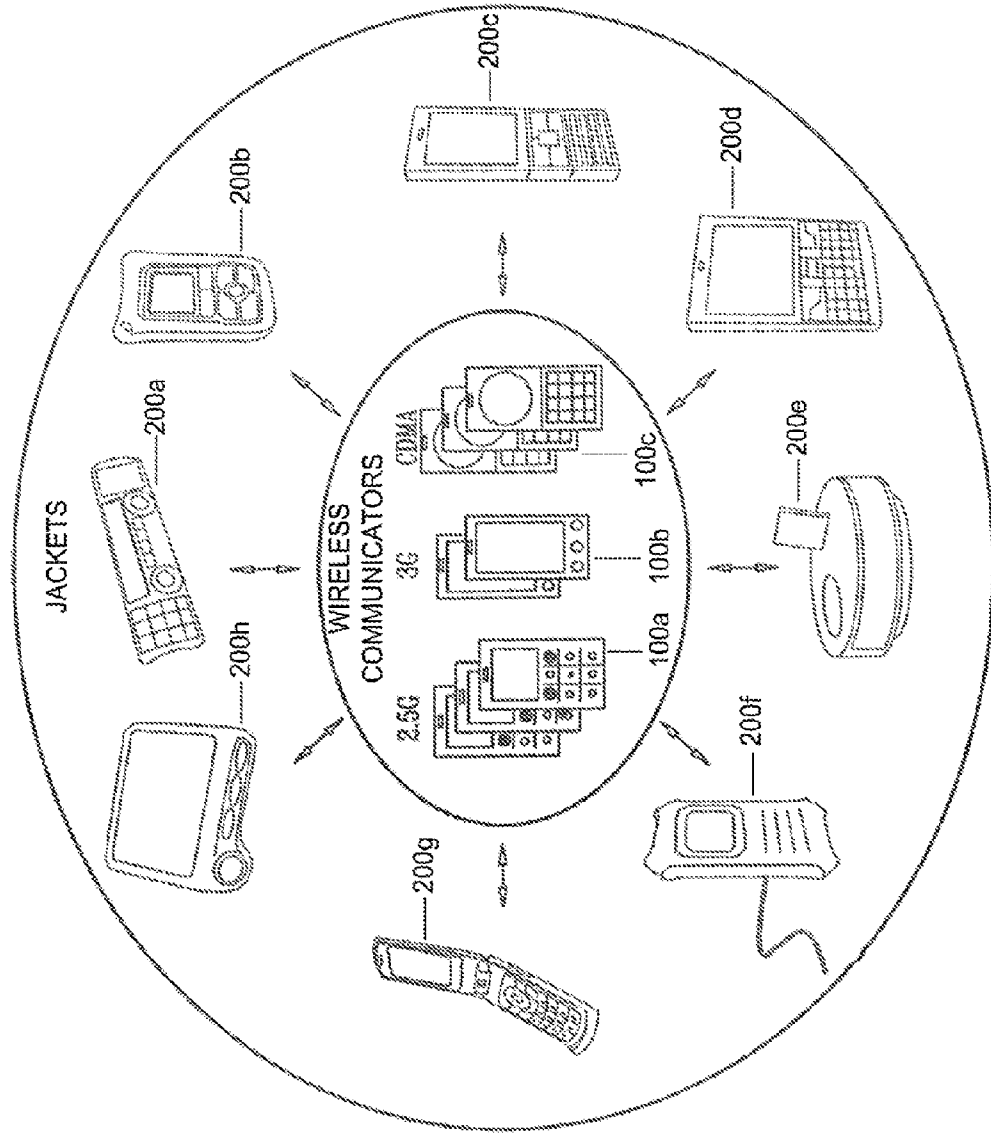


FIG. 2

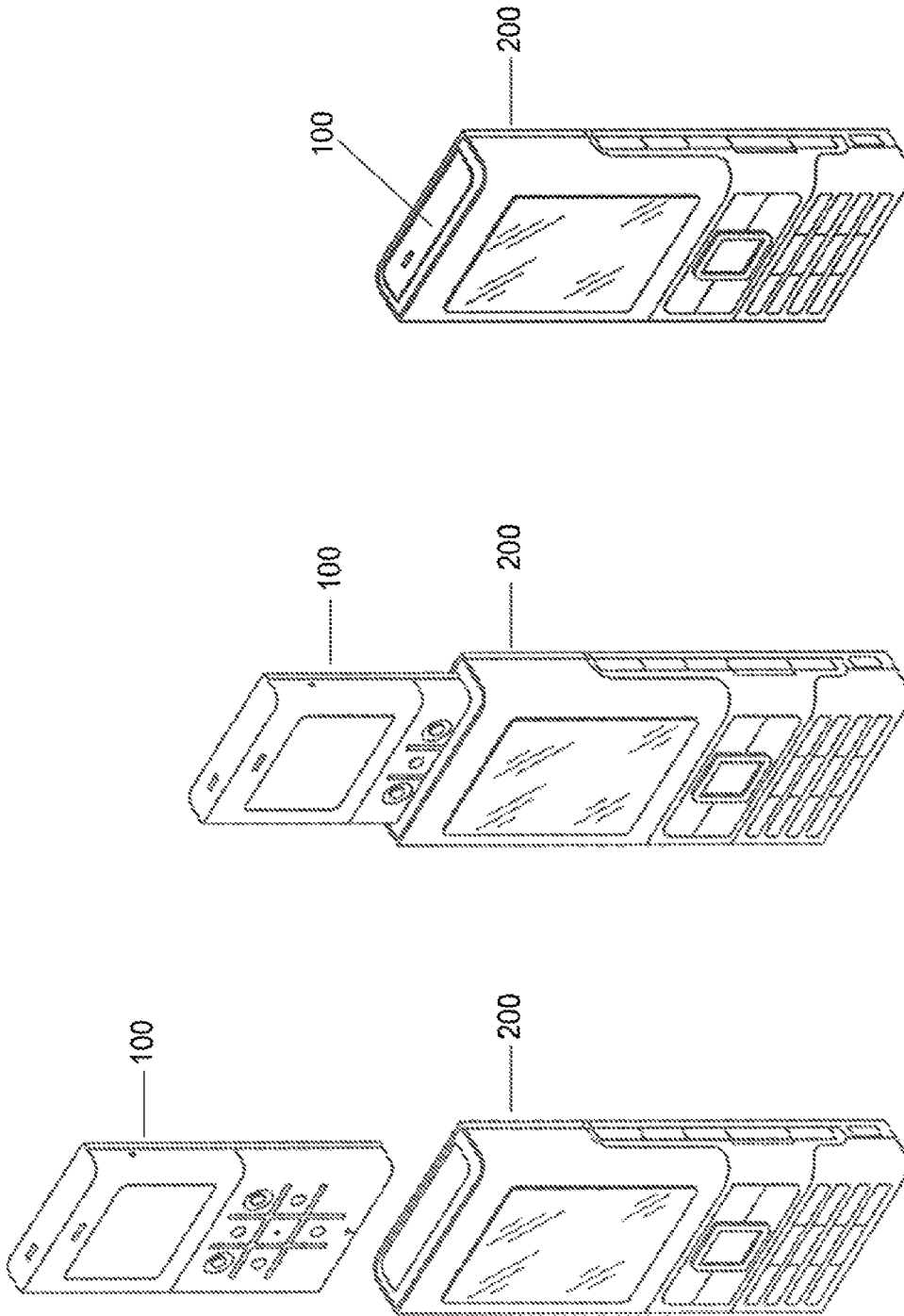


FIG. 3

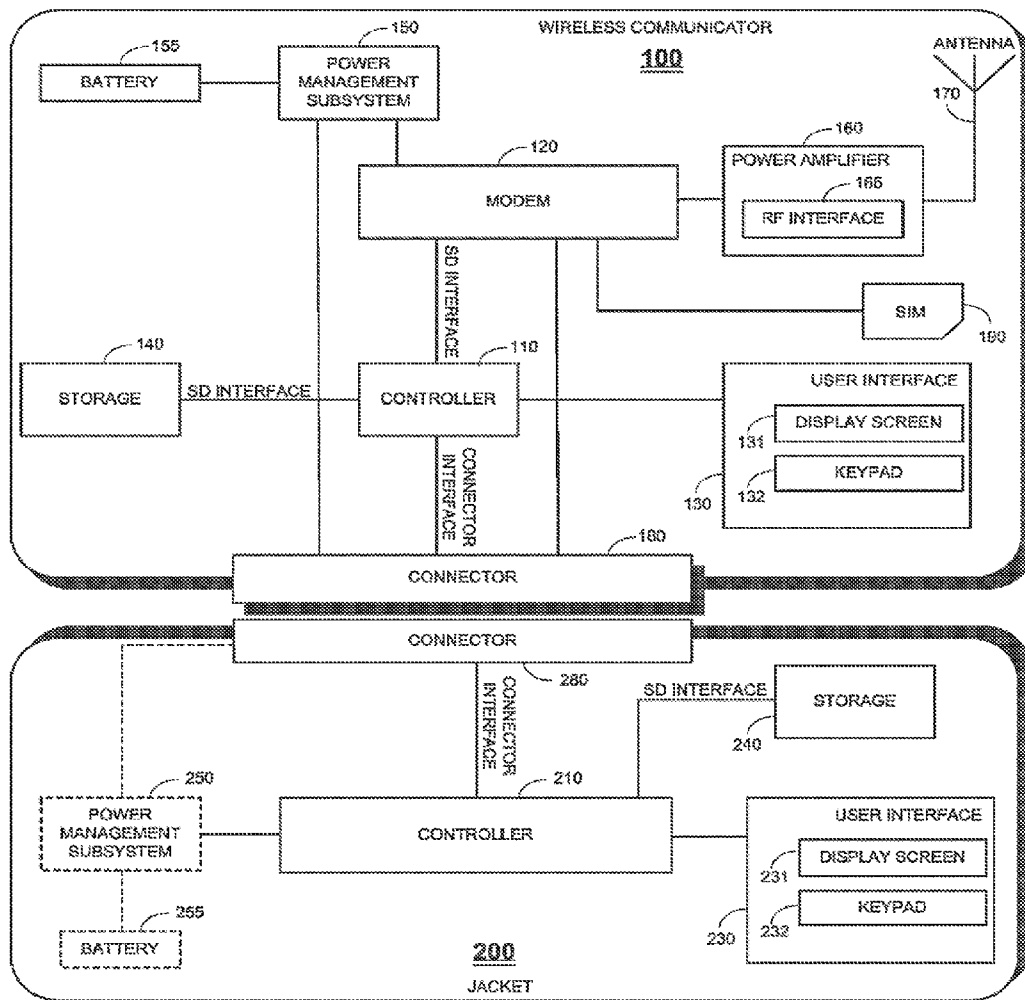


FIG. 4

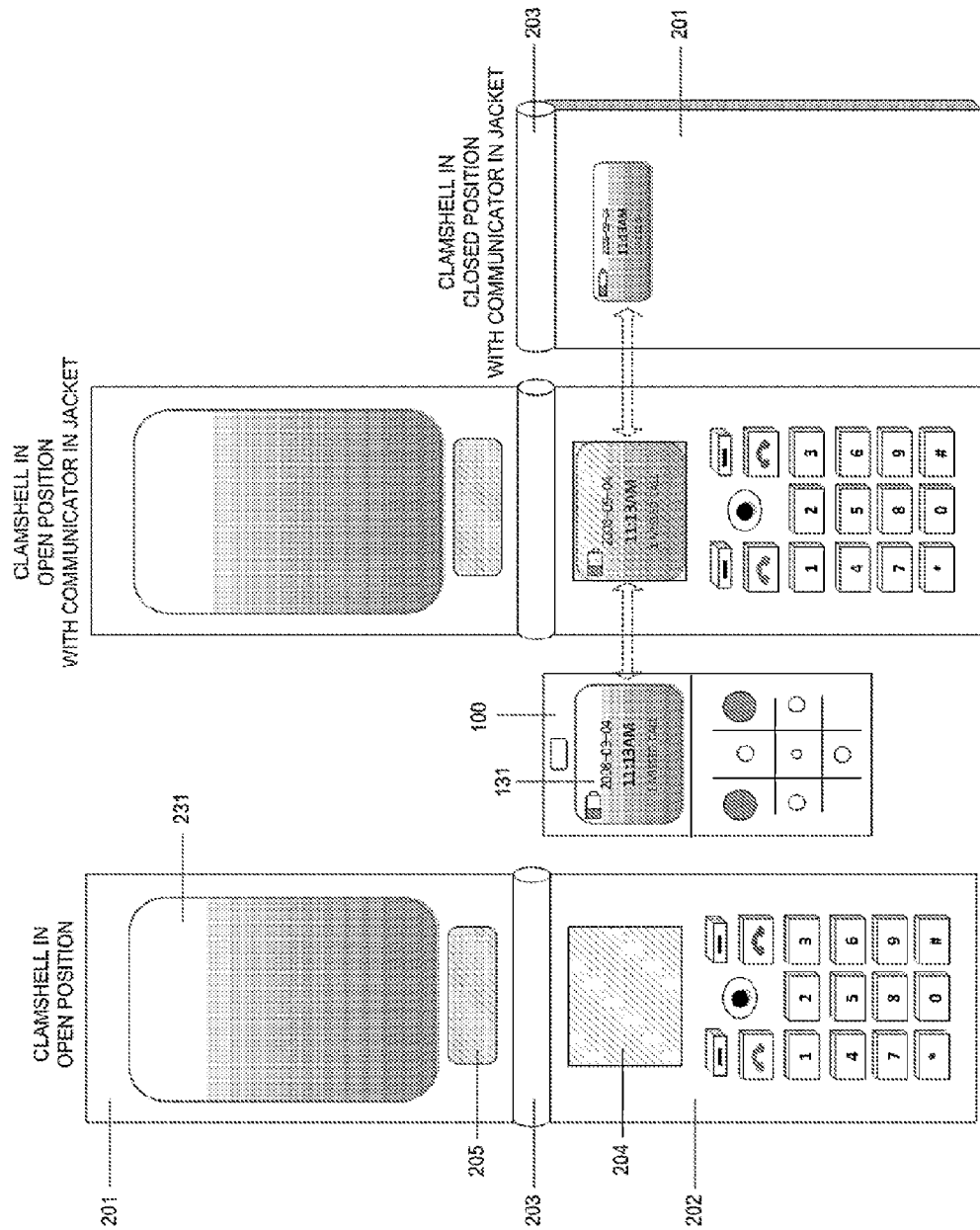


FIG. 5

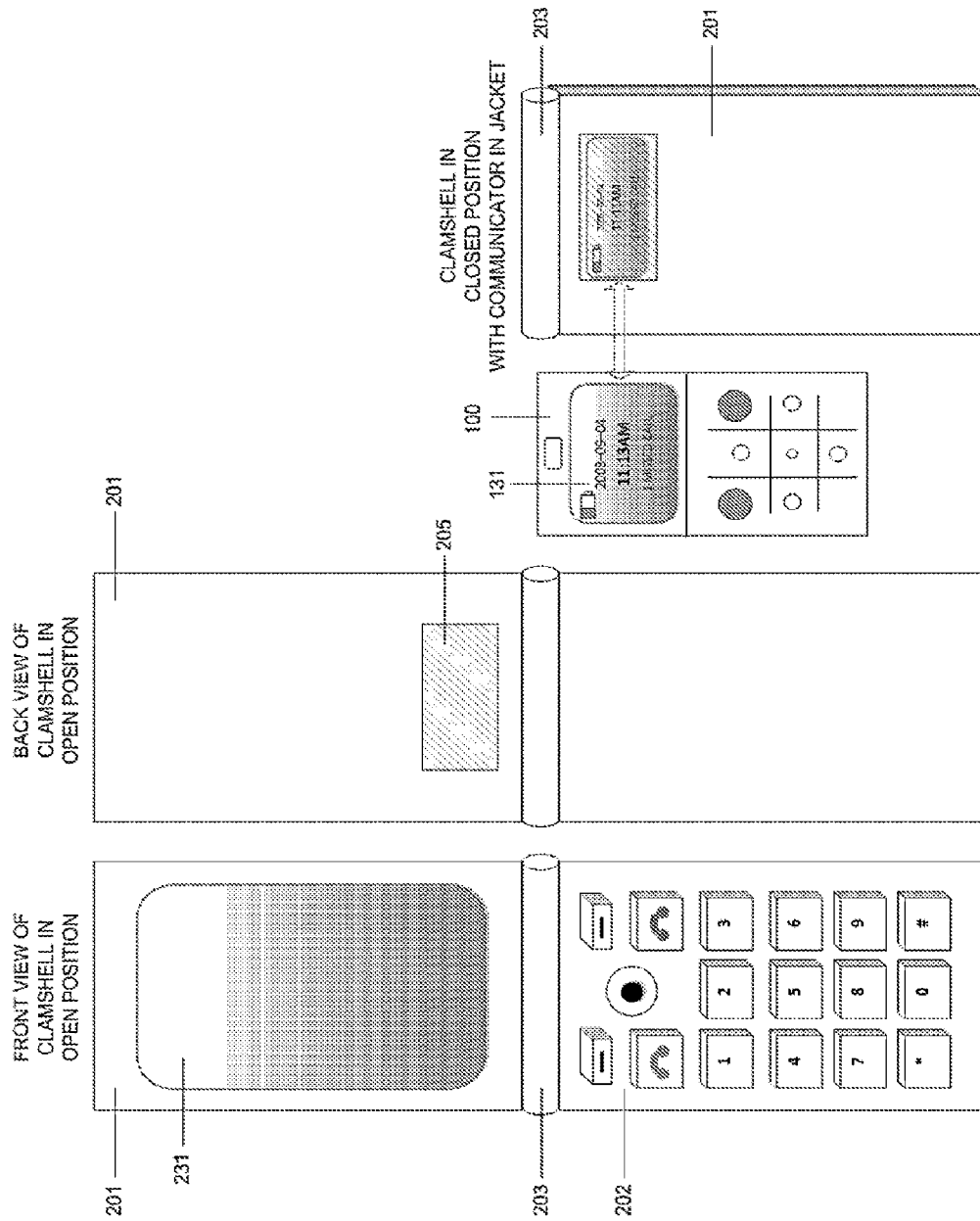


FIG. 6



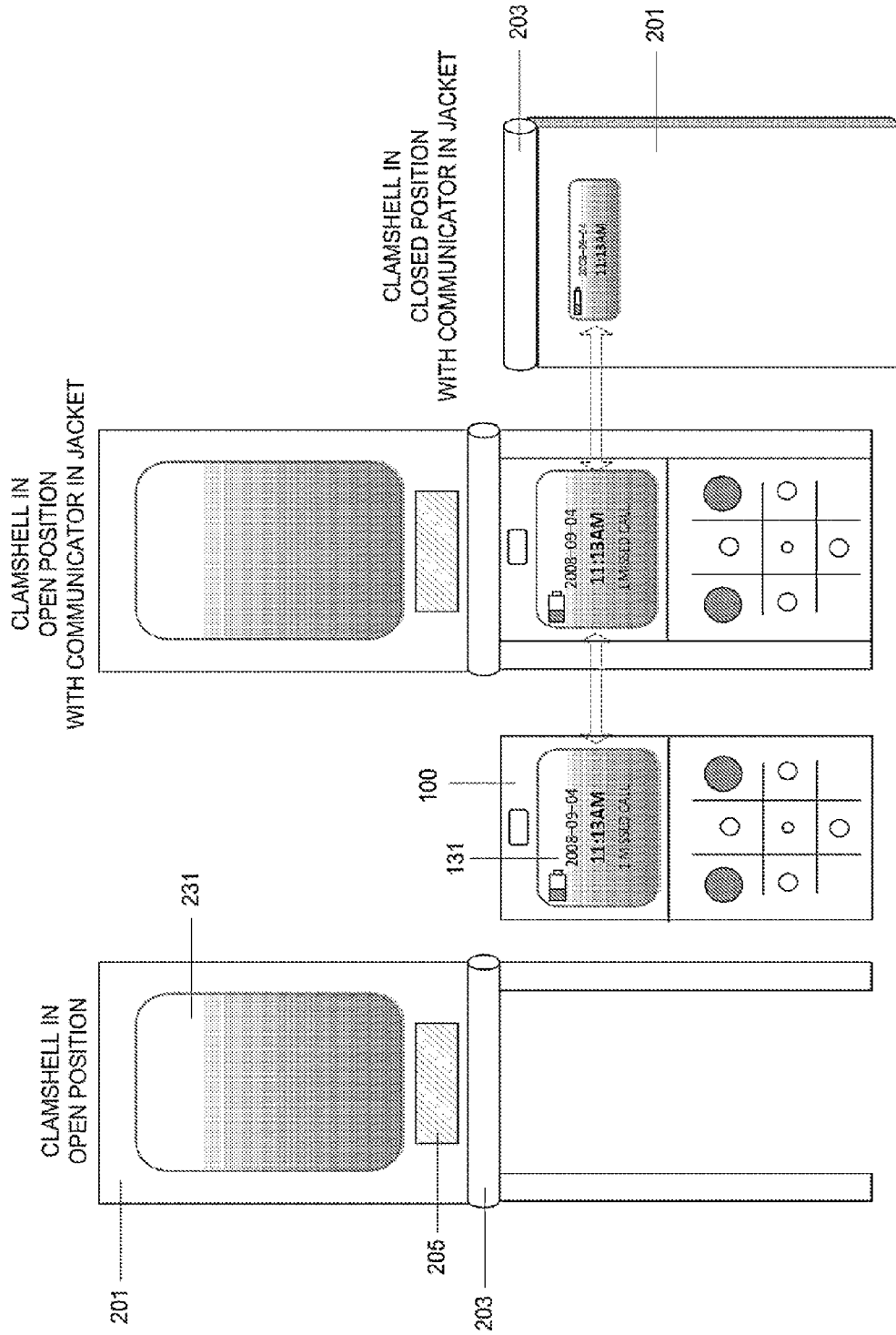


FIG. 7

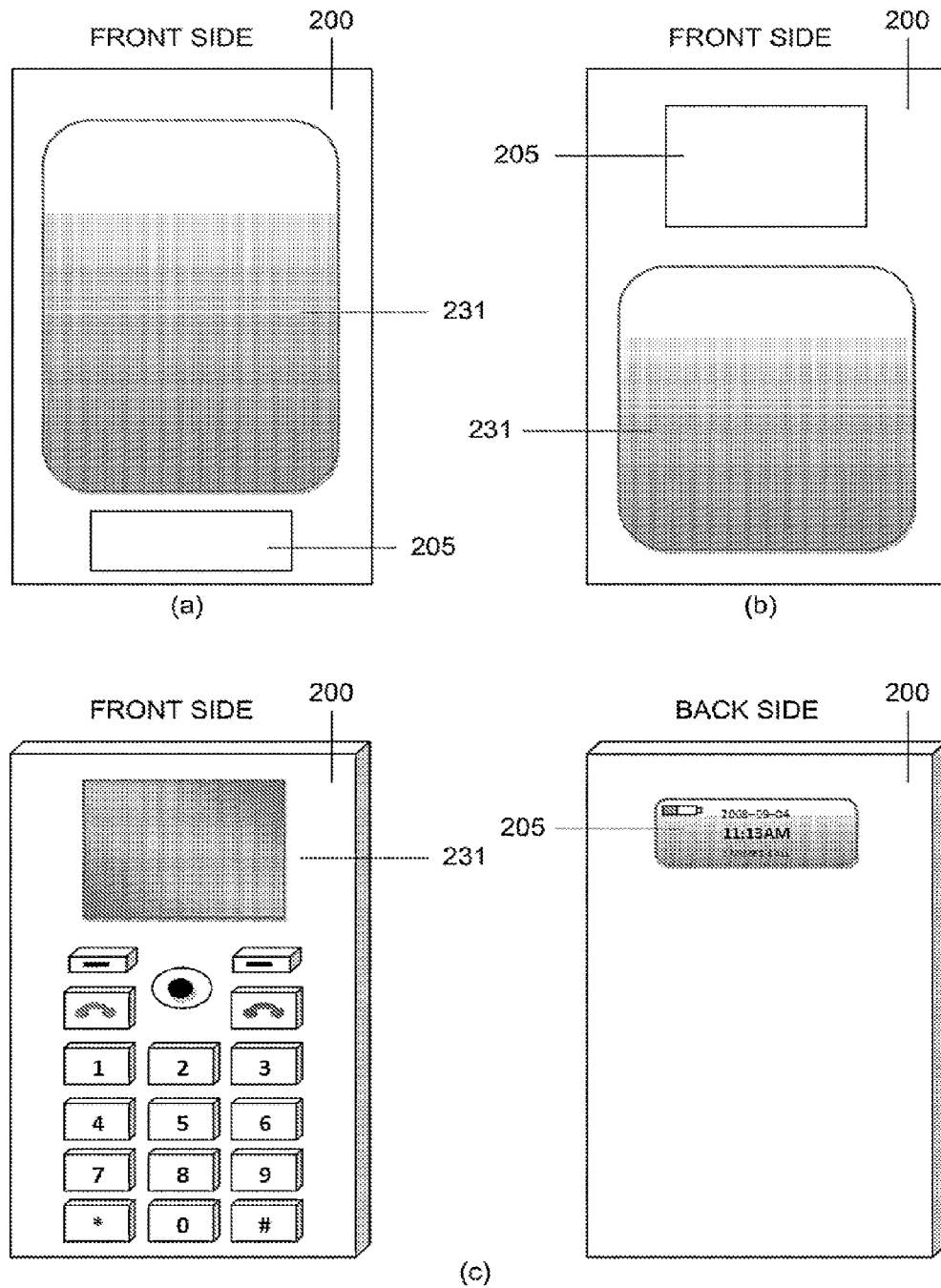


FIG. 8

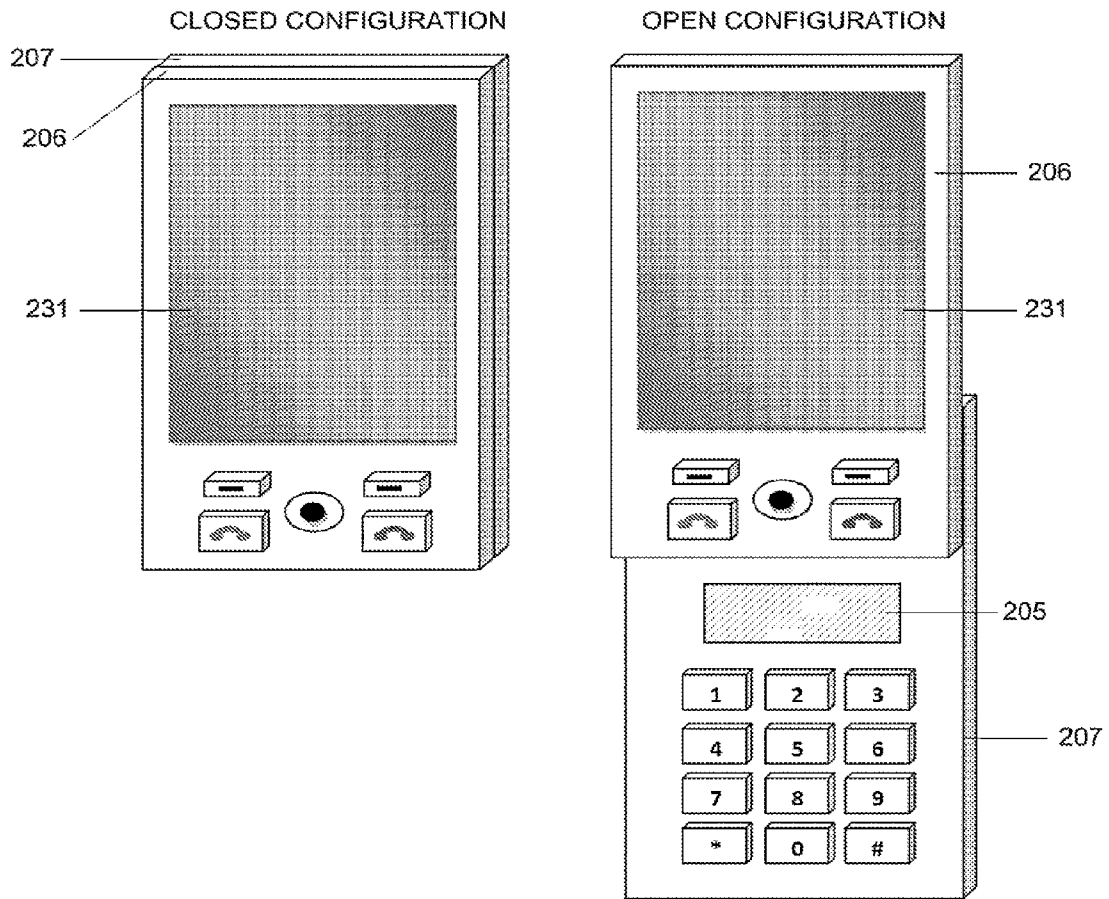


FIG. 9

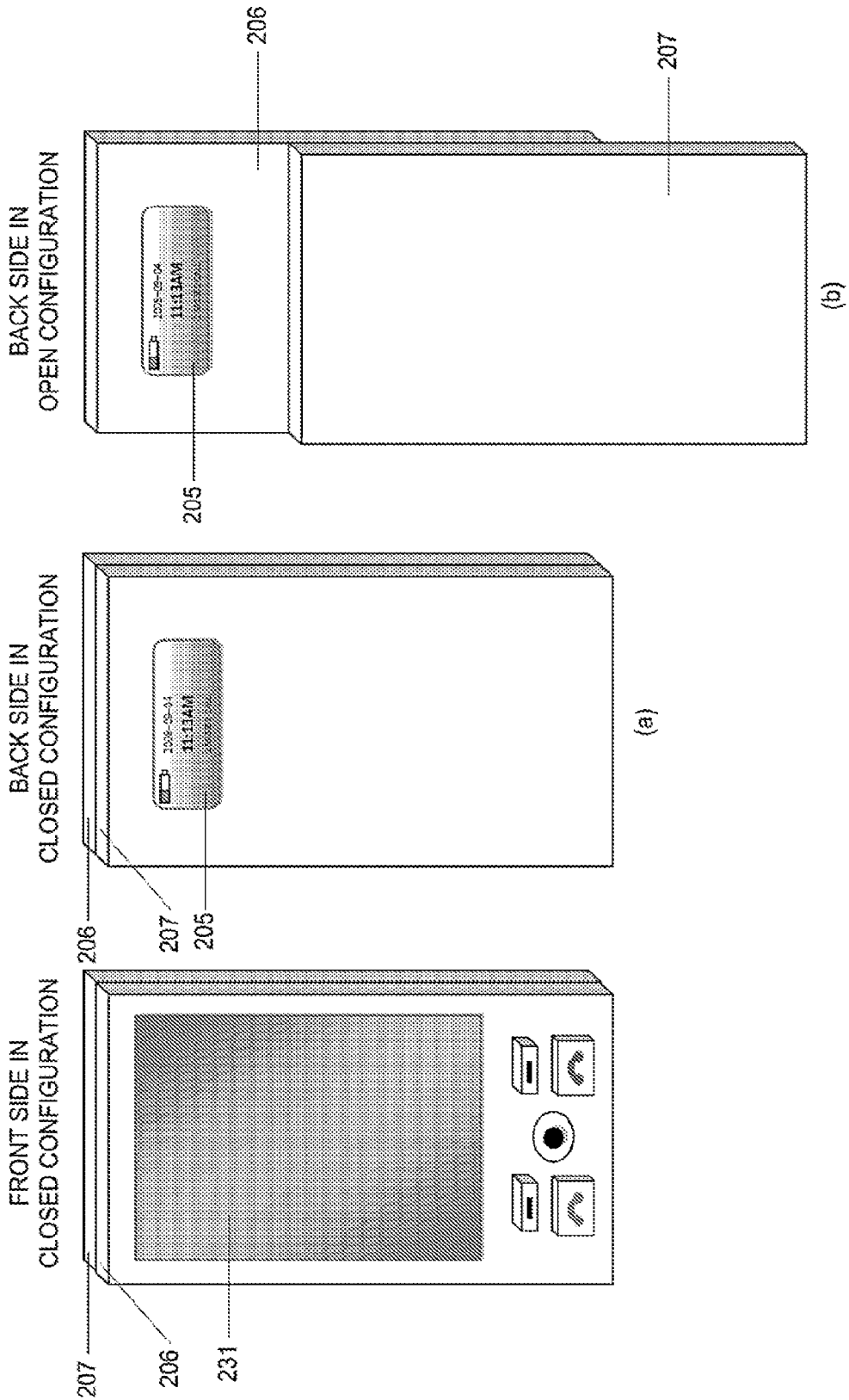


FIG. 10

**FOLDABLE MOBILE PHONE****CROSS REFERENCES TO RELATED APPLICATIONS**

This application is a continuation of U.S. application Ser. No. 12/615,454, entitled FOLDABLE MOBILE PHONE, filed on Nov. 10, 2009 by inventors Dov Moran, Eyal Bychkov, Itay Sherman and Uri Ron. U.S. application Ser. No. 12/615,454 claims benefit of U.S. Provisional Application No. 61/113,262, entitled FOLDABLE MOBILE PHONE, filed on Nov. 11, 2008 by inventors Dov Moran, Eyal Bychkov, Itay Sherman and Uri Ron.

**FIELD OF THE INVENTION**

The present invention relates to housings and user interfaces for mobile phones.

**BACKGROUND OF THE INVENTION**

Mobile phones are manufactured in a variety of form factors. There are bar-shaped mobile phones, slider mobile phones that swivel, and flip mobile phones, referred to as “clamshells”, that have generally two, but possibly more, sections that fold via a hinge. A “hinge” refers to a bearing that connects two solid objects, generally allowing only a limited angle of rotation between them. Hinges may be made of flexible material or of moving components.

The user interface of a clamshell phone is generally distributed over its two or more sections. When a clamshell phone is open, its user interface is fully exposed and accessible. When a clamshell phone is closed, the phone is not fully functional.

Many mobile phone manufacturers, such as Motorola, Inc. of Schaumburg, Ill., place a secondary screen on the rear side of the top section of a clamshell phone, which displays information to the user when the clamshell is closed. Information displayed on the secondary screen may include inter alia a date & time, a number of missed calls, incoming messages and battery status.

In this regard, reference is now made to FIG. 1, which is an illustration of a prior art clamshell phone with a primary display screen in the clamshell’s open position and a secondary display in the clamshell’s closed position. Such prior art clamshell phones offer great advantage in displaying information to a user while the phone is closed. However, a drawback with such prior art clamshell phones is the additional space required by the secondary display and the ensuing additional cost.

It would thus be of advantage to produce a more space and cost efficient clamshell phone with primary and secondary displays.

**SUMMARY OF THE DESCRIPTION**

Aspects of the present invention provide efficiently produced foldable clamshell phones with reduced space and cost requirements vis a vis prior art phones.

In one embodiment, the present invention involves a modular communicator and a jacket device. The modular communicator inserts inside a cavity of the jacket. When inserted, the modular communicator provides the jacket with wireless modem capability, and the jacket provides the modular communicator with an enhanced user interface. The modular communicator and the jacket each have their own display screens. When the modular communicator is inserted into the

jacket, the communicator’s display screen shows through an opening of the jacket casing, or through a transparent portion of the jacket casing.

The invention is applicable and advantageous to a variety of mobile phone form factors, including inter alia foldable mobile phones, bar-shaped mobile phones and slider mobile phones.

There is thus provided in accordance with an embodiment of the present invention a mobile phone, including a modular communicator including a modem for transmitting and receiving voice and data communications, a communicator connector for making electrical connection with a jacket for the communicator, when the jacket is pouched in the communicator, a communicator display screen for displaying information, and a communicator controller (i) for executing programmed instructions for operating the modem, (ii) for transmitting data to and receiving data from the communicator connector, and (iii) for generating the information displayed on the communicator display screen, and a jacket for the modular communicator, including a mechanical jacket housing including a top section and a bottom section connected by a hinge which enables the top section to fold over the bottom section, a pouch including a cavity into which the communicator may be pouched, and a transparent portion through which at least a portion of the communicator display shows when the communicator is pouched in the jacket and when the top section is folded over the bottom section, a jacket connector that mates with the communicator connector to make electrical connection with the communicator, when the communicator is pouched in the jacket, and a jacket controller for transmitting data to and receiving data from the communicator controller, via the jacket connector.

There is additionally provided in accordance with an embodiment of the present invention a mobile phone, including a modular communicator including a modem for transmitting and receiving voice and data communications, a communicator connector for making electrical connection with a jacket for the communicator, when the jacket is pouched in the communicator, a communicator display screen for displaying information, and a communicator controller (i) for executing programmed instructions for operating the modem, (ii) for transmitting data to and receiving data from the communicator connector, and (iii) for generating the information displayed on the communicator display screen, and a jacket for the modular communicator, including a mechanical jacket housing including a pouch including a cavity into which the communicator may be pouched, a transparent portion through which at least a portion of the communicator display shows when the communicator is pouched in the jacket, and a jacket display screen for displaying a graphical user interface, the graphical user interface being generated by the jacket controller, a jacket connector that mates with the communicator connector to make electrical connection with the communicator, when the communicator is pouched in the jacket, and a jacket controller for transmitting data to and receiving data from the communicator controller, via the jacket connector.

There is further provided in accordance with an embodiment of the present invention a mobile phone, including a modular communicator including a modem for transmitting and receiving voice and data communications, a communicator connector for making electrical connection with a jacket for the communicator, when the jacket is pouched in the communicator, a communicator display screen for displaying information, and a communicator controller (i) for executing programmed instructions for operating the modem, (ii) for transmitting data to and receiving data from the communi-

tor connector, and (iii) for generating the information displayed on the communicator display screen, and a jacket for the modular communicator, including a mechanical jacket housing including a front layer and a back layer coupled by a sliding mechanism that opens and closes the jacket housing by respectively raising and lowering the front layer relative to the back layer, a pouch comprising a cavity into which the communicator may be pouched, and a transparent portion through which at least a portion of the communicator display shows when the communicator is pouched in the jacket and when the jacket housing is open, a jacket connector that mates with the communicator connector to make electrical connection with the communicator, when the communicator is pouched in the jacket, and a jacket controller for transmitting data to and receiving data from the communicator controller, via the jacket connector.

### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more fully understood and appreciated from the following detailed description, taken in conjunction with the drawings in which:

FIG. 1 is an illustration of a prior art clamshell mobile phone with a primary display screen in the open position and a secondary display in the closed position;

FIG. 2 is an illustration of a communication system constructed and operative in accordance with an embodiment of the present invention;

FIG. 3 is an illustration of a modular communicator being inserted into a jacket, in accordance with an embodiment of the present invention;

FIG. 4 is a simplified block diagram of a modular communicator and a jacket in accordance with an embodiment of the present invention;

FIG. 5 is an illustration of a clamshell mobile phone with a primary display screen in the open position and a secondary display in the closed position, in accordance with a first embodiment of the present invention;

FIG. 6 is an illustration of a clamshell mobile phone with a primary display screen in the open position and a secondary display in the closed position, in accordance with a second embodiment of the present invention;

FIG. 7 is an illustration of a clamshell mobile phone with a display screen that shows through a jacket cover, in accordance with a third embodiment of the present invention;

FIG. 8 is an illustration of a bar-shaped mobile phone with a display screen that shows through a jacket cover, in accordance with an embodiment of the present invention;

FIG. 9 is an illustration of a slider mobile phone with a display screen that shows through a jacket cover, in accordance with a first embodiment of the present invention; and

FIG. 10 is an illustration of a slider mobile phone with a display screen that shows through a jacket cover, in accordance with a second embodiment of the present invention.

### DETAILED DESCRIPTION

Aspects of the present invention relate to foldable mobile phones.

In some embodiments, the present invention relates to a modular wireless communicator that may be coupled with a “jacket” in a manner referred to herein as “pouching”. A jacket is defined herein to mean a device that provides an enhanced user interface for the communicator, enriches the capabilities of the communicator, and is not able to operate independently when the communicator is not connected thereto. Pouching is defined herein to mean inserting the

wireless communicator inside of the jacket so that the communicator is at least partially obscured by the jacket, and such that the jacket mechanically supports the communicator when the jacket is held by a user. The wireless communicator may be operated as a standalone device, or in conjunction with the jacket when pouched therein.

Reference is now made to FIG. 2, which is an illustration of a communication system constructed and operative in accordance with an embodiment of the present invention. Shown in FIG. 2 are a plurality of modular wireless communicators **100a-100c**, including 2.5G communicators for a GSM network, 3G communicators for a GSM network, and CDMA communicators for a CDMA network. It will be appreciated by those skilled in the art that the networks illustrated in FIG. 2 are exemplary of a wide variety of networks and communication protocols that are supported by the communicators of the present invention, such networks and communication protocols including inter alia WiFi, Bluetooth and WiMax.

Also shown in FIG. 2 is a plurality of jackets **200a-200h**. In accordance with an embodiment of the present invention, each communicator **100a-100c** may be pouched in any of jackets **200a-200h**, so as to operate in combination therewith. Communicators **100a-100c** are substantially of the same form factor and, as such, are able to be pouched in each of jackets **200a-200h**.

Reference is further made to FIG. 3, which is an illustration of a modular wireless communicator **100** being pouched in a jacket **200**, in accordance with an embodiment of the present invention. Jacket **200** as shown in FIG. 3 includes a hollow cavity at the top for pouching of communicator **100** therein.

Reference is now made to FIG. 4, which is a simplified block diagram of communicator **100** and jacket **200** in accordance with an embodiment of the present invention. Communicator **100** includes nine primary components, as follows: a controller **110**, a modem **120** for sending and receiving voice and data, a user interface **130**, a memory storage **140**, a power management subsystem **150**, a power amplifier **160**, an antenna **170**, a connector **180** for connecting the communicator to jacket **200** when the communicator is pouched in jacket **200**, and a subscriber identification module (SIM) **190**.

Controller **110** executes programmed instructions that control the data flow between communicator **100** and jacket **200**. Modem **120** controls the communication functionality of communicator **100**. User interface **130** includes a display screen **131** and a keypad **132**. User interface **130** may optionally include additional components (not shown) such as a microphone, a headset audio jack, an earpiece, a mono speaker or stereo speakers, and a vibrator.

Power management subsystem **150** includes charging circuitry for charging a battery **155**. Power amplifier **160** includes a radio frequency (RF) interface **165**, and is connected to antenna **170**.

In accordance with an embodiment of the present invention, the interface between controller **110** and storage **140**, and the interface between controller **110** and modem **120** are both SD interfaces. The interface between controller **110** and connector **180** is a custom interface.

Jacket **200** includes four primary components, as follows: a controller **210**, a user interface **230**, a memory storage **240**, and a connector **280** for connecting the jacket to communicator **100** when communicator **100** is pouched in the jacket. Jacket **200** may include an optional power management subsystem **250** and an optional battery **255**.

User interface **230** includes a display screen **231** and a keypad **232**. User interface **230** may optionally include addi-

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tional components (not shown), such as a microphone, a headset audio jack, an earpiece, a mono speaker or stereo speakers, and a vibrator.

In accordance with an embodiment of the present invention, the interface between controller **210** and storage **240** is an SD interface. The interface between controller **210** and connector **280** is a custom interface.

Reference is now made to FIG. **5**, which is an illustration of a clamshell mobile phone with a primary display screen in the open position and a secondary display in the closed position, in accordance with a first embodiment of the present invention. The mobile phone has a top section **201** and a bottom section **202** connected by a hinge **203**, which enables top section **201** to be folded over bottom section **202** when the clamshell is closed.

In the embodiment shown in FIG. **5**, communicator **100** is pouched in bottom section **202**. Bottom section **202** has a portion **204** through which at least a portion of screen **131** shows, when communicator **100** is pouched in bottom section **202**. Portion **204** may be a partially transparent surface portion of bottom section **202**, or an opening in the surface of bottom section **202**. Moreover, top section **201** has a portion **205** that is positioned such that at least a portion of screen **131** shows through portion **205**, when communicator **100** is pouched in bottom section **202** and top section **201** is folded over bottom section **202**. Portion **205** may be a partially transparent surface portion of top section **201**, or an opening in the surface of top section **201**.

It will thus be appreciated by those skilled in the art that information on display screen **131** is visible when the clamshell phone of FIG. **5** is closed. As shown in FIG. **5**, such information may include inter alia a date & time, an indicator of one or more missed calls, and a battery status for battery **155** (FIG. **4**).

Reference is now made to FIG. **6**, which is an illustration of a clamshell mobile phone with a primary display screen in the open position and a secondary display in the closed position, in accordance with a second embodiment of the present invention. The mobile phone has a top section **201** and a bottom section **202** connected by a hinge **203**, which enables top section **201** to be folded over bottom section **202** when the clamshell is closed.

In the embodiment shown in FIG. **6**, communicator **100** is pouched in top section **201**. Top section **201** has a portion **205** through which at least a portion of screen **131** shows, when communicator **100** is pouched in top section **201**. Portion **205** may be a partially transparent surface portion of top section **201**, or an opening in the surface of top section **201**.

It will thus be appreciated by those skilled in the art that information on display screen **131** is visible when the clamshell phone of FIG. **6** is closed. As shown in FIG. **6**, such information may include inter alia a date & time, an indicator of one or more missed calls, and a battery status for battery **155** (FIG. **4**).

Reference is now made to FIG. **7**, which is an illustration of a clamshell mobile phone with a display screen that shows through a jacket cover, in accordance with a third embodiment of the present invention. In this embodiment, the bottom section of jacket **200** includes sliding guides for communicator **100** to slide into place so that connectors **180** and **280** (FIG. **4**) are mated. The mobile phone has a top section **201** connected by a hinge **203**, which enables top section **201** to be folded over the sliding guides.

Top section **201** has a portion **205** through which at least a portion of screen **131** shows, when communicator **100** is slid into place and the clamshell is closed. Portion **205** may be a

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partially transparent surface portion of top section **201**, or an opening in the surface of top section **201**.

The embodiments shown in FIGS. **5-7** are efficient foldable mobile phone with reduced space and cost requirements vis a vis prior art foldable phones, such as the phone shown in FIG. **1**.

In reading the above description, persons skilled in the art will realize that there are many apparent variations that can be applied to the embodiments described. Thus it will be appreciated that the present invention applies to foldable mobile phones with more than two sections, such as a three-section foldable, wherein a top and a bottom section fold over a middle section to close the phone.

It will further be appreciated that the present invention also applies to non-foldable mobile phones, including inter alia bar-shaped phones and slider phones. Reference is made to FIG. **8**, which is an illustration of a bar-shaped mobile phone with a display screen that shows through a jacket cover, in accordance with an embodiment of the present invention. The jacket **200** shown in FIG. **8** has a bar form factor, and includes jacket screen **231** and a portion **205** through which at least a portion of communicator screen **131** shows, when communicator **100** is pouched in jacket **200**.

Three configurations are shown in FIG. **8**; namely, (a) jacket screen **231** and portion **205** positioned on the front surface of jacket **200**, with jacket screen **231** above portion **205**; (b) jacket screen **231** and portion **205** positioned on the front surface of jacket **200**, with jacket screen **231** below portion **205**; and (c) jacket screen **231** positioned on the front surface of jacket **200**, and portion **205** positioned on the back surface of jacket **200**.

Reference is made to FIG. **9**, which is an illustration of a slider mobile phone with a display screen that shows through a jacket cover, in accordance with a first embodiment of the present invention. The jacket **200** shown in FIG. **9** has a slider form factor, and includes jacket screen **231** and a portion **205** through which at least a portion of communicator screen **131** shows, when communicator **100** is pouched in jacket **200**. Jacket **200** has a front layer **206** and a back layer **207**, which slide up and down relative to one another to open and close the jacket housing. Jacket screen **231** is positioned on front layer **206**, and portion **205** is positioned on a surface of back layer **207** that is concealed when jacket **200** is closed.

Reference is made to FIG. **10**, which is an illustration of a slider mobile phone with a display screen that shows through a jacket cover, in accordance with a second embodiment of the present invention. The jacket **200** shown in FIG. **10** also has a front layer **206** and a back layer **207**, which slide up and down relative to one another to open and close the jacket. Jacket screen **231** is positioned on front layer **206**. Two configurations are shown for portion **205**; namely, (a) portion **205** positioned on back layer **207** of jacket **200**, and (b) portion **205** positioned on a surface of front layer **206** that is concealed when the jacket is closed.

In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will, however, be evident that various modifications and changes may be made to the specific exemplary embodiments without departing from the broader spirit and scope of the invention as set forth in the appended claims. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

What is claimed is:

1. A mobile phone, comprising:

a processor operable to perform wireless communication, and to display related information on first and second display screens;

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a slideable housing for said processor, comprising front and back surfaces, wherein the front surface may be slid away from alignment with said back surface and may be slid towards alignment with said back surface;  
a first display screen coupled with said processor and mounted on the outer side of said front surface;  
a modular communicator, separate from the mobile phone, that may be inserted in and removed from said housing, comprising a second display screen coupled with said processor; and  
a transparent portion on the outer side of said back surface through which said second display screen shows through to the outside of said housing.  
2. The mobile phone of claim 1 wherein said processor displays a graphical user interface for the mobile phone on said first display screen.  
3. The mobile phone of claim 1 wherein said processor displays date and time information on said second display screen.

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4. The mobile phone of claim 1 wherein said processor displays information about missed phone calls on said second display screen.  
5. The mobile phone of claim 1 further comprising a battery for powering the mobile phone, and wherein said processor displays battery status for said battery on said second display screen.  
6. The mobile phone of claim 1 wherein said transparent portion is an opening in the outer side of said back surface.  
7. The mobile phone of claim 1 wherein said transparent portion is a partially transparent portion of the outer side of said back surface.  
8. The mobile phone of claim 1 wherein said modular communicator comprises wireless communication circuitry that is controlled by said processor.  
9. The mobile phone of claim 1 wherein said housing is not foldable.

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