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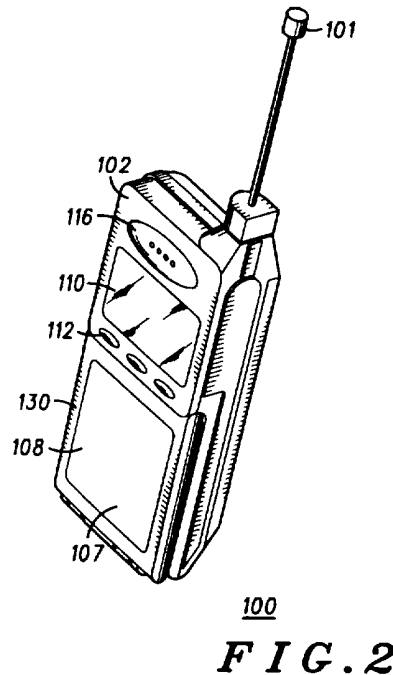
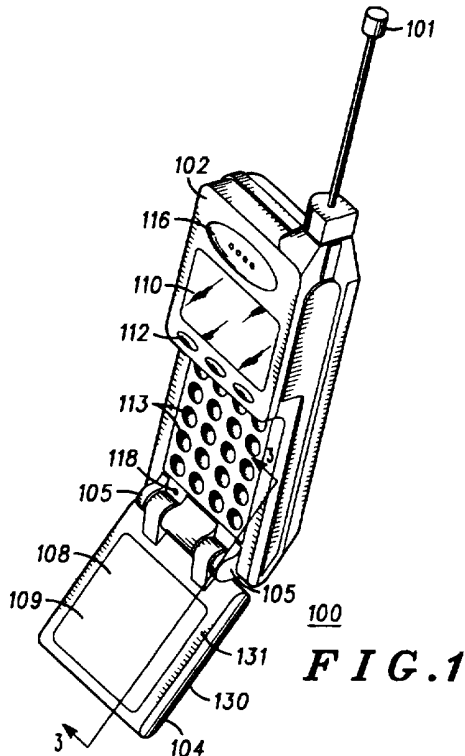
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GB 2328343 A GB 2291560 A EP 0802659 A

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UK CL (Edition R) H4J JK
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(54) Abstract Title
Mobile telephone incorporating a keyless input device system operable when phone is open or closed

(57) An electronic device, such as a mobile phone, 100 has a first housing section 102 and a second housing section 104 which are movably connected between an open position and a closed position. A display 110 is positioned on the first housing section 102 and a keyless input device system is carried by the second housing section 104. The keyless input device comprises either a capacitance or resistance sensing system and at least one of the keyless input device systems 108 is operable in the closed position and the open position.



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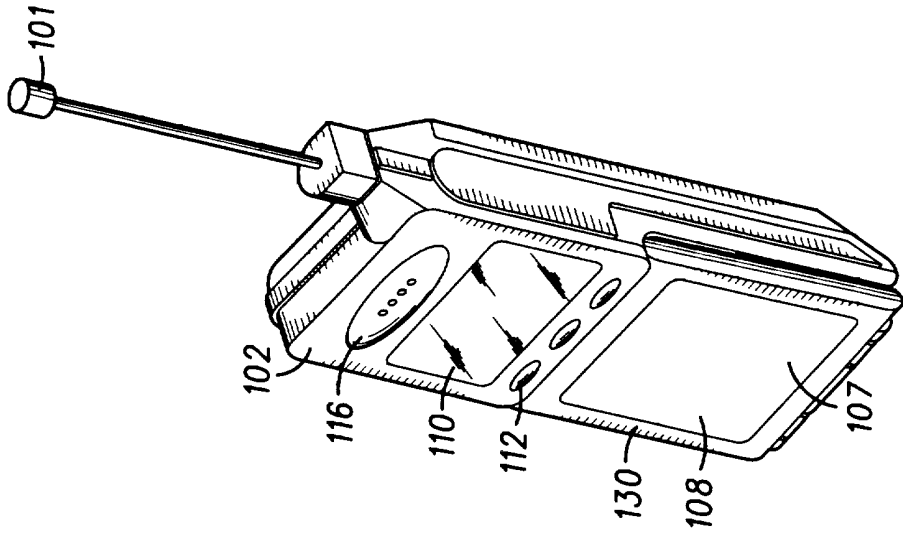


FIG. 2

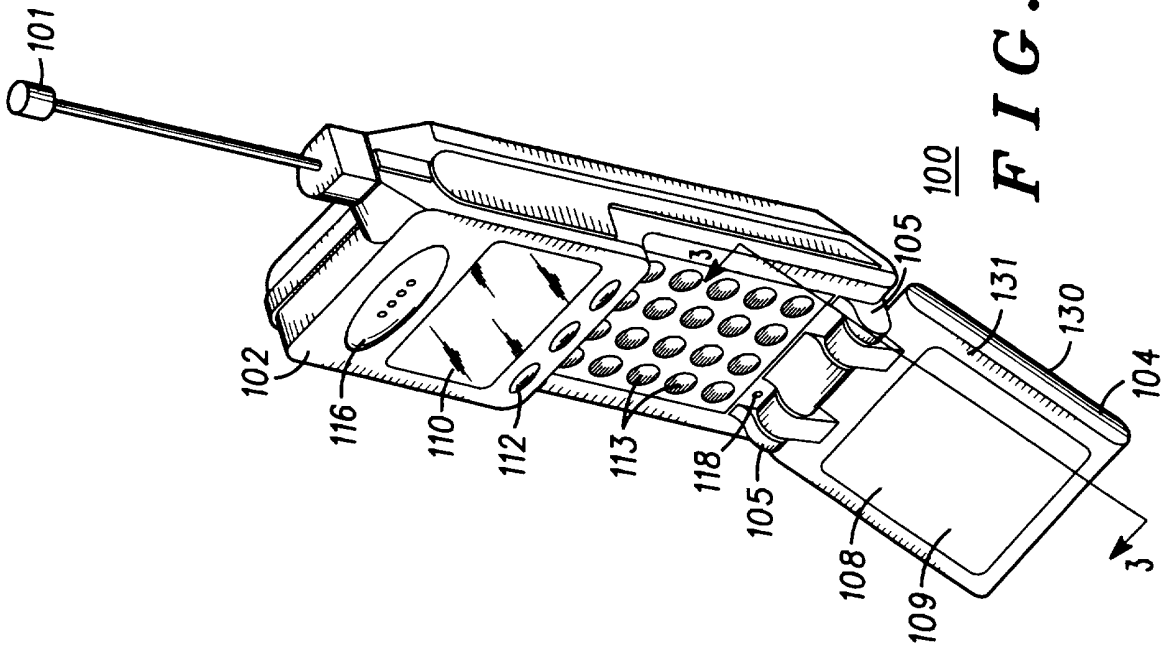


FIG. 1

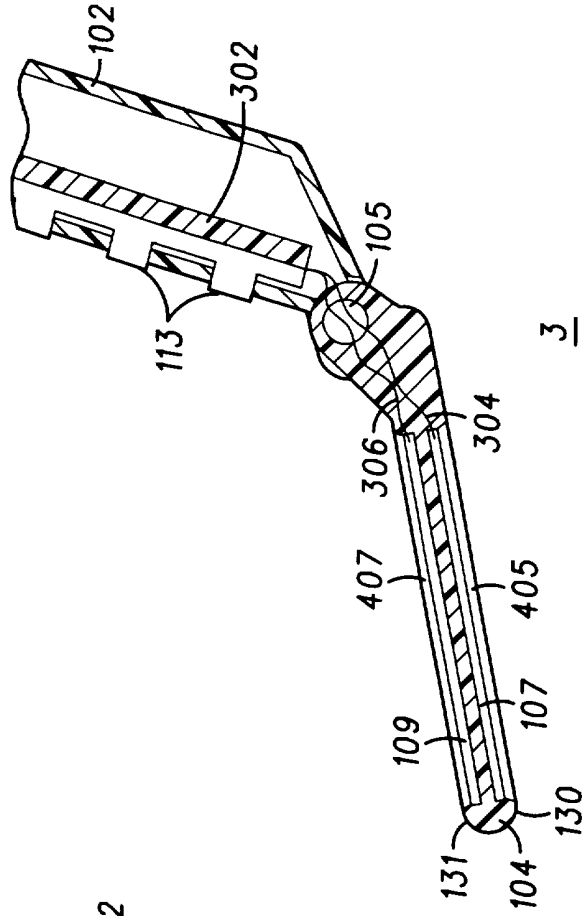


FIG. 4

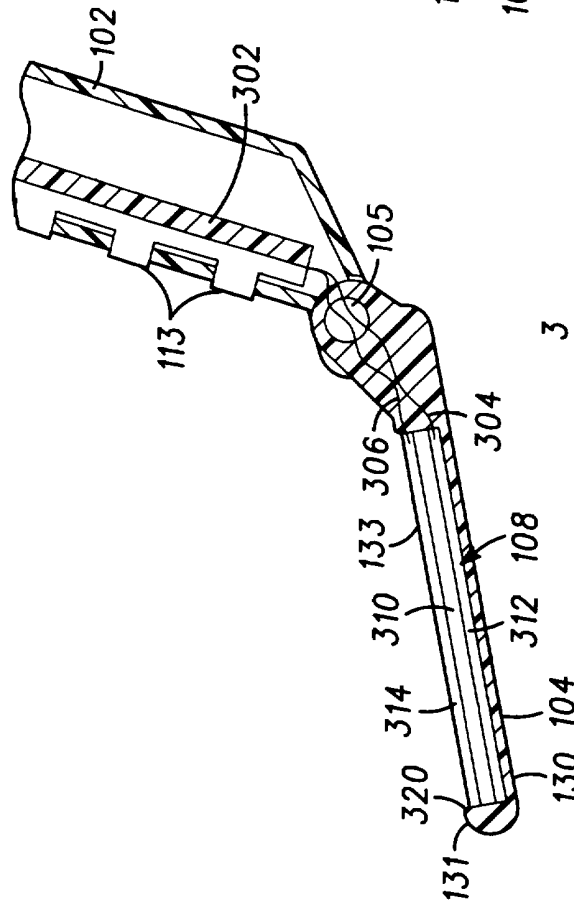
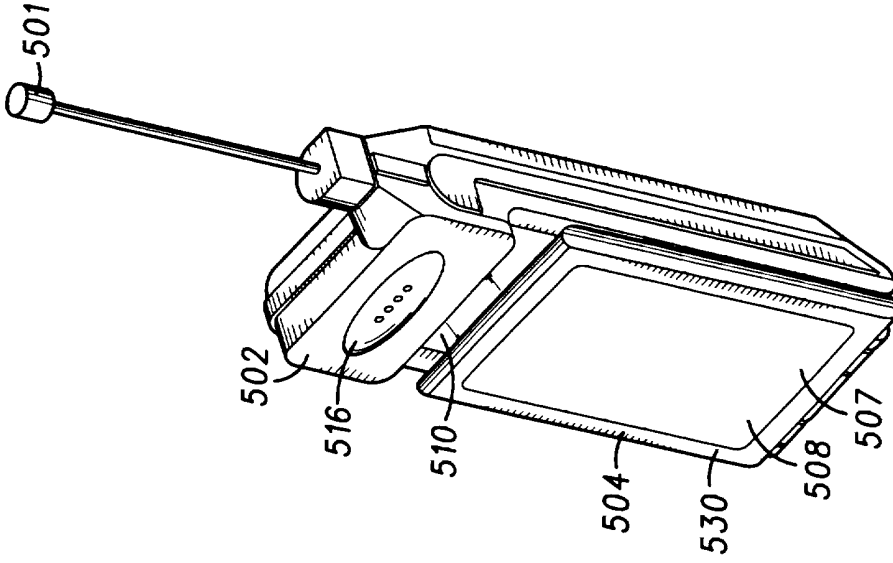
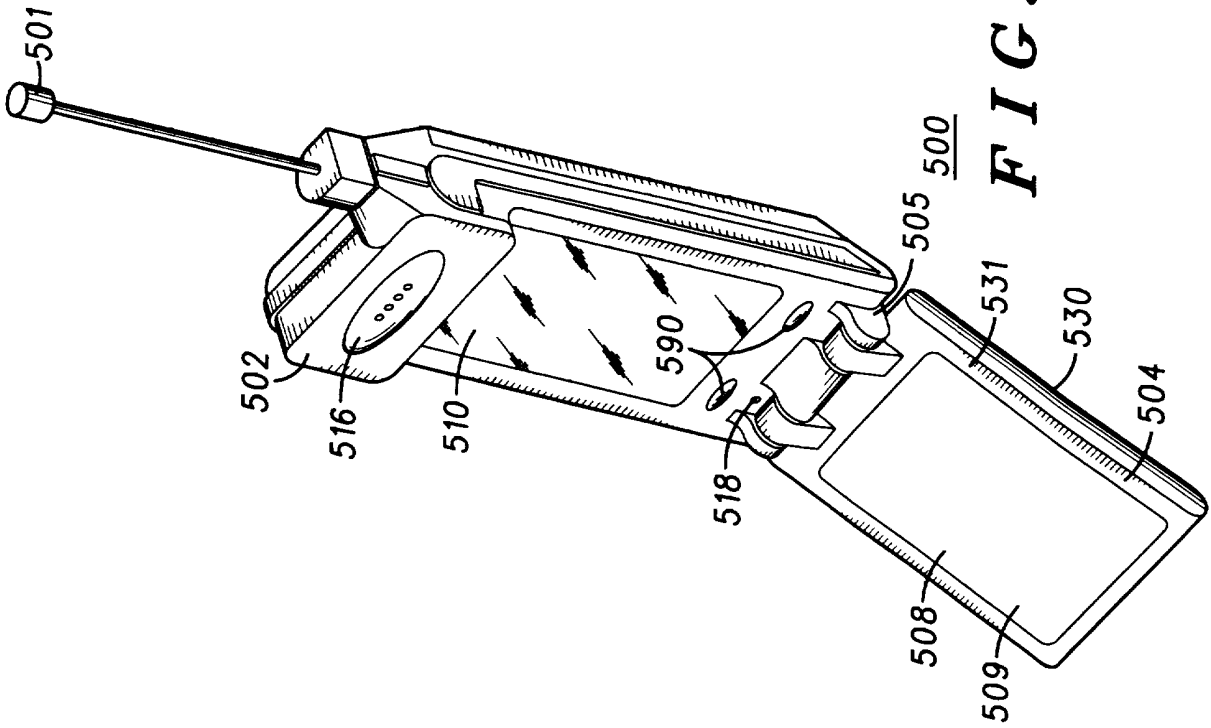


FIG. 3



500
FIG. 6



500
FIG. 5

PORTABLE COMMUNICATION DEVICE INCORPORATING A
KEYLESS INPUT DEVICE SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

5 This application is related to copending U.S. patent application serial no.
filed herewith by Akins et al. and entitled "DISPLAY WITH ALIGNED OPTICAL
SHUTTER AND BACKLIGHT CELLS APPLICABLE FOR USE WITH A
TOUCHSCREEN" (CS10024-Akins). The present application is also related to
copending U.S. patent application serial no. 08/837,172 filed on April 14, 1997 by
Charlier et al. And entitled "TWO-WAY COMMUNICATION APPARATUS
10 HAVING A TOUCHSCREEN-BASED USER INTERFACE." The related
applications are assigned to the assignee of the present application and are
incorporated herein in their entirety by this reference.

FIELD OF THE INVENTION

15 This invention relates generally to a communication apparatus and more
specifically to a communication apparatus with a keyless input device.

BACKGROUND OF THE INVENTION

20 The portable communication devices used in wireless communication
systems have become increasingly complex. For example, early portable
communication devices included a user interface carried by a single housing
section that incorporates a mechanical keypad. Openings in the housing
accommodate the mechanical keys of the keypad and a display. More recent
portable communication devices, however, have incorporate a second housing
section that is movably attached to the first housing section. The second
housing section can be used to protect the display and/or the keypad, and the
25 second housing section may also carry separate input devices.

Portable communication devices have also begun to incorporate larger
displays which are capable of displaying more information to the user. The

second housing section can be used to cover at least a portion of the large display when the portable communication device is in a closed position, thereby protecting the display from damage resulting from inadvertent contact. A portion of the display can be left exposed so that the user can view some information while the second housing section covers the rest of the display.

Furthermore, greater demands are being placed on portable communication devices for data input and manipulation. As the uses for portable communication devices increase beyond simple two-way voice communications to include applications such as portable internet access, mobile video telephony, and wireless email access, the demand for the ability to easily manipulate and access the data appearing on the display significantly increases. With the second housing section closed to cover the keypad and a portion of the display, the user cannot input information using the keypad. To circumvent this problem, some portable communication have keys that are exposed when the portable communication device is in the closed position. This allows for limited user input.

Accordingly, there is a need for a more versatile user input device for the second housing section. It is desirable that any such versatile input device be provided without significant increases in the size, weight, and cost of the portable communication device.

Brief Description of the Drawings

FIG. 1 is an outer view of a portable communication device wherein a second housing section is in an open position;

FIG. 2 is an outer view of the portable communication device of FIG. 1 wherein the second housing section is in a closed position;

FIG. 3 is a cross-sectional view of a portion of the portable communication device of FIGs. 1 and 2 wherein the second housing section has a capacitance sensing keyless input device;

FIG. 4 is a cross-sectional view of a portion of an alternate embodiment of the portable communication device of FIGs. 1 and 2 wherein the second housing section has a resistance sensing keyless input device;

FIG. 5 is an outer view of an alternate embodiment of the portable communication device wherein the second housing section is in the open position; and

5 FIG. 6 is an outer view of the alternate embodiment of the portable communication device wherein the second housing section is in the closed position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. 1 depicts a portable communication device 100 in an open position, and FIG. 2 depicts the portable communication device 100 in a closed position. The portable communication device 100 provides two-way voice communication, and can also include functions such as portable internet access, mobile video telephony, and wireless email access. In the illustrated embodiment, the portable communication device 100 is a wireless communication device such as a cellular telephone. The keyless input device system can also be used in other electronic devices, such as personal organizers, personal digital assistants, and input devices to interactive television.

15 The portable communication device 100 includes a housing having a first housing section 102 and a second housing section 104 movingly connected by a hinge 105, and the first housing section 102 and the second housing section 104 pivot between an open position and a closed position. Within the hinge 105 is a sensor switch for detecting movement by the second housing section 104 between the open position and the closed position. It will be obvious to those skilled in the art that other sensing means can be used, such as a reed switch and a magnet, to sense the position of the second housing section 104 relative to the first housing section 102.

25 A circuit (not shown) is positioned in the portable communication device 100 for control and functionality of the various components of the portable communication device 100. The second housing section 104 comprises a cover that at least partially covers a plurality of keys 113 carried by the first housing section 102.

30

An antenna 101 serves as a means for transmitting and receiving a radio frequency signal. A display 110 positioned on the first housing section 102 can be used for functions such as displaying names, telephone numbers, transmitted and received information, user interface commands, scrolled menus, and other information. A microphone 118 receives sound input from the user, and a speaker 116 transmits audio signals to the user.

The plurality of keys 113 provide dialing capability, menu scrolling, and other similar functions associated with portable communication devices. The plurality of keys 113 are included as part of a keypad membrane (not shown), sandwiched between two pieces of plastic to form the first housing section 102. A second plurality of keys 112 are part of the keypad membrane and serve as special function keys. The second plurality of keys 112 can be reserved for functions such as answering and terminating a call and dialing a previously entered telephone number. In addition, the second plurality of keys 112 can be used for functions such as navigating through display menus, scrolling through received messages, and maneuvering displayed internet information.

A keyless input device system 108 is carried by the second housing section 104. The keyless input device system 108 is usable in the open position (FIG. 1) and in the closed position (FIG. 2).

In an alternate embodiment, the keyless input device system comprises a first keyless input device 107 (FIG. 2) usable in the closed position and a second keyless input device 109 (FIG. 1) usable in the open position to provide a method for entering commands into the portable communication device 100.

When the portable communication device 100 is in the closed position (FIG. 2), the sensor switch within the hinge 105 sends a signal to a controller (not shown) located within the portable communication device 100 to indicate that the keyless input device system 108 is active from a first side 130 of the second housing section 104. When the portable communication device 100 is in the open position (FIG. 1), the sensor switch sends a signal to the controller to indicate that the keyless input device 108 is active from a second side 131 of the second housing section 104.

In the alternate embodiment, when the portable communication device is in the closed position (FIG. 2), the first keyless input device 107 is active. When

the portable communication device 100 is in the open position (FIG. 1), the sensor switch sends a signal to indicate that the second keyless input device 109 is active.

5 FIG. 3 is a cross-sectional view of a portion of the portable communication device 100. The second housing section 104 is formed to define a cavity 320, and the keyless input device system 108 is carried within the cavity 320. A portion 133 of the keyless input device system 108 on the second side 131 is left exposed. The keyless input device system 108 comprises a ground plane 310 that is sandwiched between a first electrode layer 312 and a second
10 electrode layer 314. In an alternate embodiment, the keyless input device system 108 is insert molded into the second housing section 104 so that the keyless input device system 108 is completely concealed by the second housing section 104.

15 An electronic connection is made between the first electrode layer 312, the ground plain 310, and the electronic circuitry carried on a circuit board 302. The electronic connection is made with a first flexible circuit 304. An electronic connection is also made between a second electrode layer 314, the ground plain 310, and the electronic circuitry on circuit board 302. The electronic connection is made with a second flexible circuit 306.

20 FIG. 3 also depicts a portion of the plurality of keys 113 making electrical contact with the electronic circuitry carried on the circuit board 302. The hinge 105 allows the first housing section 102 and the second housing section 104 to be movably connected.

25 Operation of the keyless input device system 108 from the first side 130 involves the placement of a human finger near the surface of the first electrode layer 312 to modify the mutual capacitance between the first electrode layer 312 and the ground plain 310. Operation of the keyless input device system 108 from the second side 131 involves the placement of the human finger near the surface of the second electrode layer 314 to modify the mutual capacitance
30 between the second electrode layer 314 and the ground plain 310.

The position of the human finger relative to a side of the keyless input device system 108 is determined based on the mutual capacitance changes at various locations along the surface of an electrode. The keyless input device

system 108 comprises a capacitance sensing system so that the position of a finger can be detected before it actually contacts the keyless input device system 108. That is why the second housing section 104 can substantially encapsulate the entire surfaces of the first electrode layer 312 and the second electrode layer 314. The keyless input device system 108 thus comprises a capacitance sensing system and can be implemented using the trackpad technology known by the trademark GLIDEPOINT technology and commercially available from Cirque Corporation located in Salt Lake City, Utah.

The first electrode layer 312 and the second electrode layer 314 are factory set to operate in a variable position mode or a fixed position mode. In the variable position mode of operation, there are no fixed/designated input points on the surface of an electrode layer so that the input range is continuous. This mode of operation is similar to the operation of a touchpad "mouse." In the fixed position mode of operation, there are designated input points on the surface to emulate keys of a keypad or "soft" keys. Markings on the surface of the second housing section 104 or on the surface of the keyless input device system 108 indicate the designated input points or areas.

The flexibility in setting the operation mode of the keyless input device 108 thus provides for many different embodiments of the portable communication device 100. For example, the portable communication device 100 can function as a cellular telephone in the closed position with the keyless input device system 108 operating as a keypad accessible from the first side 130. In the open position, the portable communication device 100 can operate as a wireless internet web browser with the keyless input device system 108 operating as a variable position mouse accessible from the second side 131. Other combinations of variable and fixed modes of operation for the two sides of the keyless input device system 108 will be evident to those skilled in the art.

In an alternate embodiment, the second housing section 104 carries a keyless input device system that is only operable from the first side 130 of the second housing section. Thus, the keyless input device system 108 comprises a single keyless input device that is usable when the second housing section is in the closed position. Therefore the capacitance sensing system comprises a

single electrode, and the single keyless input device is usable in the closed position to provide a method of entering commands into the electronic device.

FIG. 4 is a cross-sectional view of a portion of an alternate embodiment of the portable communication device 100. The first keyless input device 107, also referred to as a first touchpad, is mounted on the first side 130 of the second housing section 104. A second keyless input device 109, also referred to as a second touchpad, is carried on the second side 131 of the second housing section 104.

An electronic connection is made between the first keyless input device 107 and the electronic circuitry carried on the circuit board 302 with the first flexible circuit 304. An electronic connection is made between the second keyless input device 109 and the electronic circuitry carried on the circuit board 302 through the second flexible circuit 306.

FIG. 4 also depicts a portion of the plurality of keys 113 making electrical contact with the electronic circuitry carried on the circuit board 302. The hinge 105 allows the first housing section 102 and the second housing section 104 to be movably connected.

The first keyless input device 107 and the second keyless input device 109 are touch sensitive. For example, touching a particular area on the surface of the first keyless input device 107 modifies a resistance on that portion of the first keyless input device 107, thereby indicating a particular input. The position of the human finger is thus determined based on resistance changes at various locations along the surface of the first keyless input device 107 and the second keyless input device 109. The first keyless input device 107 and the second keyless input device 109 can comprise a resistance sensing system, a membrane switch, a force-sensing system such as a piezoelectric system, or be implemented using other types of technology.

A first display system 405 is coupled to the first keyless input device 107, and a second display system 407 is coupled to the second keyless input device 109. The display systems can comprise surface markings. Alternatively, the display systems can comprise multiple active layers for displaying information and markings. One such multiple layer display system is disclosed in the patent application titled "DISPLAY WITH ALIGNED OPTICAL SHUTTER AND

BACKLIGHT CELLS APPLICABLE FOR USE WITH A TOUCHSCREEN^N serial
no. filed herewith. CS10024-AKINS

5 The first keyless input device 107 and the second keyless input device
109 have the flexibility of being operable in both variable position and fixed
5 position modes of operation. For example, the first keyless input device 107 can
be electronically toggled by the user between the fixed position and the variable
position modes of operation. When the user desires to operate the portable
communication device 100 as a cellular telephone in the closed position, the first
10 keyless input device 107 can be set to the fixed position mode of operation to
emulate a keypad for phone number dialing. If the user wishes to scroll through
messages or information menus while the portable communication device 100 is
still in the closed position, the first keyless input device 107 can be set to the
variable position mode of operation and operate as a touchpad mouse.
15 Likewise, the second keyless input device 109 can be toggled between modes of
operation to serve various functions.

The flexibility in the operation of the first keyless input device 107 and the
second keyless input device 109 thus provides for several modes of operation of
the portable communication device 100. For example, the portable
communication device 100 can operate as a cellular telephone in the closed
20 position, with the user toggling the mode of operation of the first keyless input
device 107 between a mouse and a keypad. The portable communication
device 100 can operate as a controller for interactive television in the open
position, with the user toggling the mode of operation of the second keyless input
device 109 between a mouse and a keypad. The portable communication device
25 100 can also be set to operate in a handwriting recognition mode of operation,
where the first keyless input device 107 and the second keyless input device 109
can be used to enter handwriting, symbols, or gestures. Other modes of
operation and combinations will be evident to those skilled in the art.

30 In an alternate embodiment, the second housing section 104 carries only
one keyless input device 107 that is operable from the first side 130 of the
second housing section. Thus, the keyless input device 107 comprises a
resistance sensing system and is usable in the closed position to provide a
method of entering commands into the electronic device.

FIG. 5 depicts an alternate embodiment with the portable communication device 500 in the open position, and FIG. 6 depicts the portable communication device 500 in the closed position. The portable communication device 100 can still provide two-way voice communication and perform data transfer functions such as internet connectivity, email, and FAX capability. In addition, however, the portable communication device 500 of the alternate embodiment carries a display 510 capable of displaying a large amount of information. Besides a cellular telephone, the portable communication device 500 can comprise devices such as a personal organizer, a personal digital assistant, or an input device to interactive television.

The portable communication device 500 includes a housing having a first housing section 502 and a second housing section 504 movably connected by a hinge 505, and the first housing section 502 and the second housing section 504 pivot between an open position and a closed position. A sensing system within the portable communication device detects the position of the second housing section 504 relative to the first housing section 502. A circuit (not shown) is positioned in the portable communication device 500 for control and functionality of the various components comprising the portable communication device 500.

The antenna 501 serves as a means for transmitting and receiving a radio frequency signal. The display 510 positioned on the first housing section 502 can be used for functions such as displaying both text and video information. The microphone 518 is for receiving voice and sound input by the user for transmission, and the speaker 516 is for transmitting audio signals to the user.

A keyless input device system 508 is carried by the second housing section 504. The keyless input device 508 is usable in the closed position (FIG. 6) and in the open position (FIG. 5).

The second housing section 504 comprises a cover that at least partially covers a plurality of keys 590 carried by the first housing section 502. The plurality of keys 590 are used for such functions as toggling operation of the keyless input device 508 and entering commands. The plurality of keys 590 are included as part of a keypad membrane (not shown), sandwiched between two pieces of plastic to form the first housing section 502.

In a preferred embodiment, the construction, operation, and functionality of the keyless input device system 508 is substantially identical to that of the keyless input device system 108 shown in FIGs. 1, 2, and 3, which employs a capacitance sensing system. As with the keyless input device system 108 shown in FIGs. 1,2, and 3, the keyless input device system 508 comprises a single device that is accessible from the first side 530 and the second side 531. When the portable communication device 500 is in the closed position, the sensing system (not shown) sends a signal to a controller (not shown) within the portable communication device 500 to indicate that the keyless input device system 508 is active from the first side 530 of the second housing section 104. When the portable communication device 500 is in the open position, the keyless input device system 508 is active from a second side 531 of the second housing section 504.

Alternatively, the portable communication device 500 can comprise a first keyless input device 507 (FIG. 6) usable in the closed position and a second keyless input device 509 (FIG. 5) usable in the open position (similar to the first and second keyless input devices 107 and 109, respectively, of Figs. 1, 2, and 4). When the portable communication device 500 is in the closed position, first keyless input device 507 is active. When the portable communication device 500 is in the open position, the second keyless input device 509 is active.

The keyless input device system and keyless input devices provide significant increases in the usability of portable communication devices. When the second housing section is in the closed position, utilization of second housing section surface area is optimized. A cellular telephone having two housing sections can be employed to protect a display and/or keypad, and significant input capability is still possible with the cellular telephone in the closed position. The ability to operate the keyless input devices and systems disclosed in both a variable and fixed position modes adds flexibility to the design of the cellular telephone. The ability for the user to change the input devices from fixed position mode to variable position mode allows for a more intuitive, efficient, and flexible user interface.

While specific embodiments of the keyless input device system and keyless input devices are described above, other embodiments could be

employed by one skilled in the art. The electronic devices employing the keyless input device system and keyless input devices should be limited only by the appended claims.

Claims

- 1 1. An electronic device comprising:
2 a housing having first housing section and a second housing section which are
3 movingly connected between an open position and a closed position;
4 a circuit positioned in the housing;
5 a display positioned on the first housing section; and
6 a keyless input device carried by the second housing section, the keyless input
7 device usable in the closed position to provide a method of entering
8 commands into the electronic device.
- 1 / 2. The electronic device as in claim 1 wherein the second housing section at
2 least partially covers the display in the closed position
- 1 3. The electronic device as in claim 1, wherein the second housing section at
2 least partially covers a plurality of keys carried by the first housing section.
- 1 4. The electronic device as in claim 1, wherein the keyless input device
2 comprises a capacitance sensing system.
- 1 5. The electronic device as in claim 4, wherein the keyless input device
2 comprises a resistance sensing system.
- 1 / 6. The electronic device as in claim 1, further comprising a second keyless
2 input device coupled to the first keyless input device, the second keyless input
3 device operable in the open position.
- 1 7. The electronic device as in claim 6, wherein the first keyless input device is
2 carried on a first side of the second housing section and the second keyless
3 input device is carried on a second side of the second housing section.
- 1 8. The electronic device as in claim 7, wherein the first and second keyless input
2 devices are resistance sensing systems.

1 9. The electronic device as in claim 7, further comprising markings on at least
2 one of the surfaces of the first and second keyless input devices for indicating
3 defined input areas.

1 10. The electronic device as in claim 7 wherein one of the first and second
2 keyless input devices is operable in a variable position mode.

1 11. The electronic device as in claim 7 wherein one of the first and second
2 keyless input devices is operable in a fixed position mode.

1 ✓ 12. A portable communication device comprising:
2 a housing having first housing section and a second housing section which are
3 movably connected between an open position and a closed position;
4 a circuit positioned in the housing; and
5 a keyless input device system carried by the second housing section, the keyless
6 input device system operable in the open position and in the closed position.

1 ✓ 13. A cellular telephone comprising:
2 a first housing section;
3 a second housing section movably connected to the first housing section, the
4 second housing section settable to an open position relative to the first
5 housing section and a closed position relative to the first housing section;
6 a circuit positioned in the housing;
7 a first keyless input device carried by the second housing section and activated
8 when the second housing section is in the closed position; and
9 a second keyless input device carried by the second housing section and
10 activated when the second housing section is in the open position.

1 ✓ 14. The cellular telephone as in claim 13 wherein the first keyless input device is
2 operable from a first side of the second housing section and the second keyless
3 input device is operable from a second side of the second housing section.



INVESTOR IN PEOPLE

Application No: GB 0005671.3
Claims searched: All

14

Examiner: Carol Ann McQueen
Date of search: 5 May 2000

**Patents Act 1977
Search Report under Section 17**

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4J (JK)

Int Cl (Ed.7): H04B 1/38, H04M 1/02

Other: ONLINE: EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X, Y	GB 2328343 A (MORIYA) Whole document	X: 1, 2, 6 & 12, Y: 13
Y	GB 2291560 A (TYNESKI) Whole document	13
A	EP 0802659 A1 (LUCENT) Whole document	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.