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(54) **MOBILE COMPUTING DEVICE WITH INTEGRATED INPUT DEVICE**

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(*) Notice: This patent is subject to a terminal disclaimer.

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See application file for complete search history.

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(57) **ABSTRACT**

A handheld computer is disclosed. The handheld computer is configured with a housing, a display supported in the housing, and computing electronics supported in the housing and configured to communicate with the display. The handheld computer disclosed also includes an integrated input device configured to provide input to the handheld computer. The input device provides different input signals to the computing electronics dependent upon a directional movement provided by a user. The input device is configured to communicate more than four distinct directional movements from a user to the computing electronics.

Further, the handheld computer disclosed may include a joystick coupler which is integrated into a joypad. The joypad coupler is configured to receive at least a portion of the stylus which is configured to act as a joystick.

15 Claims, 1 Drawing Sheet

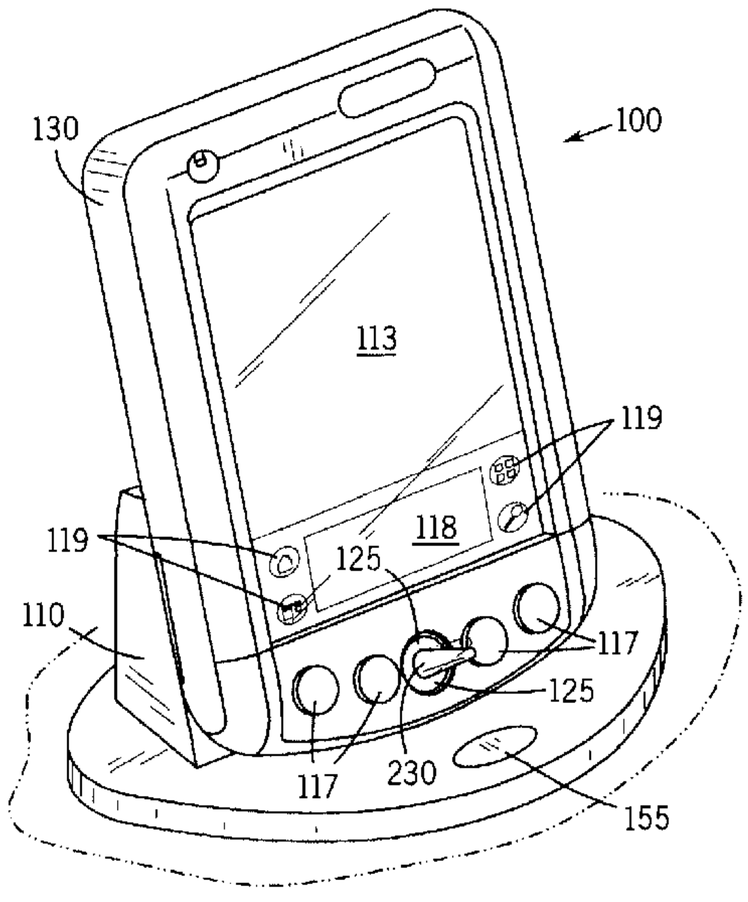

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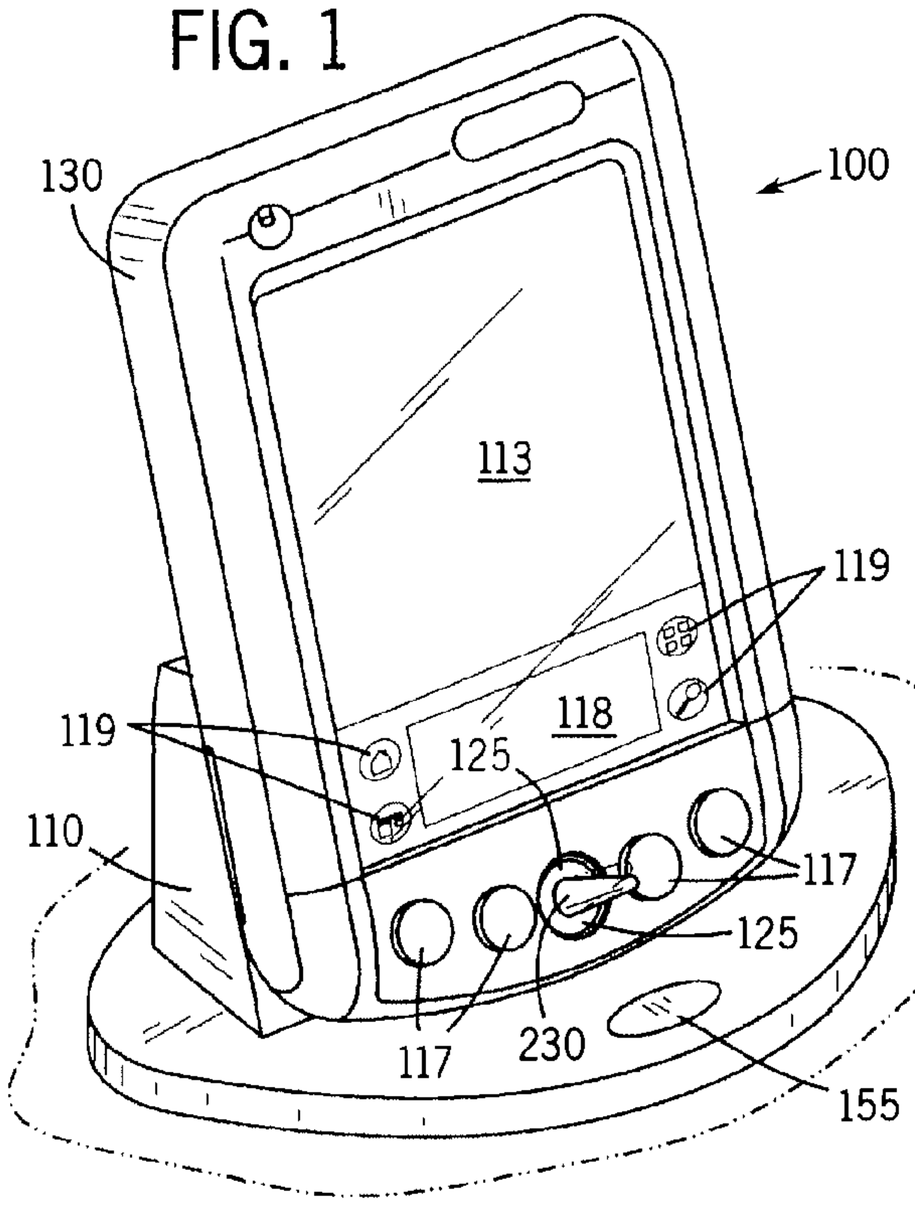
FIG. 1



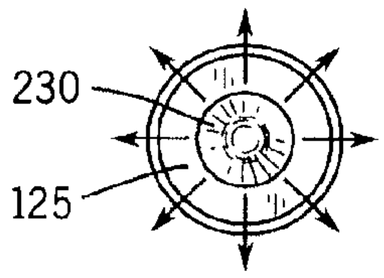


FIG. 6

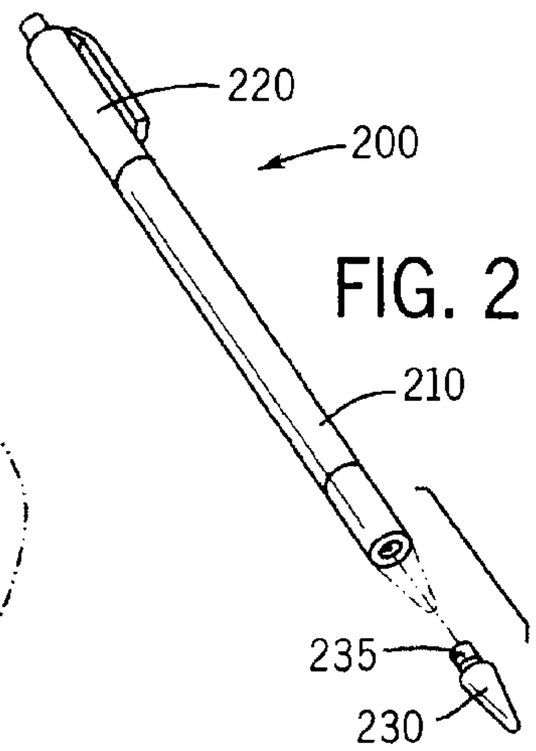


FIG. 2

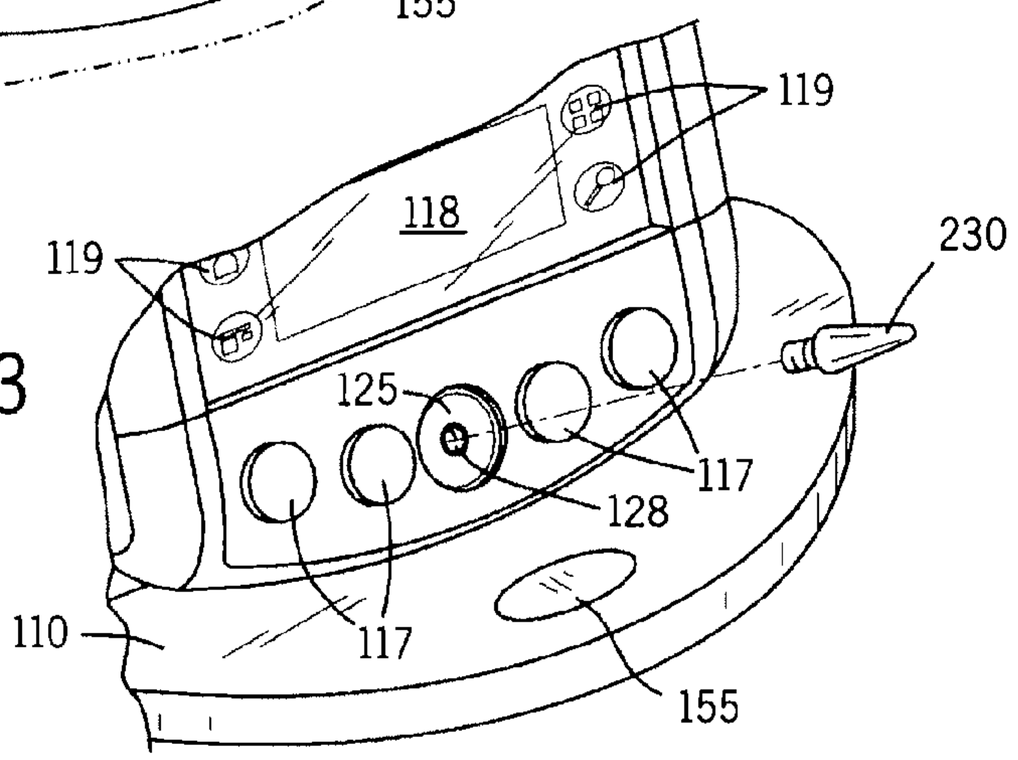
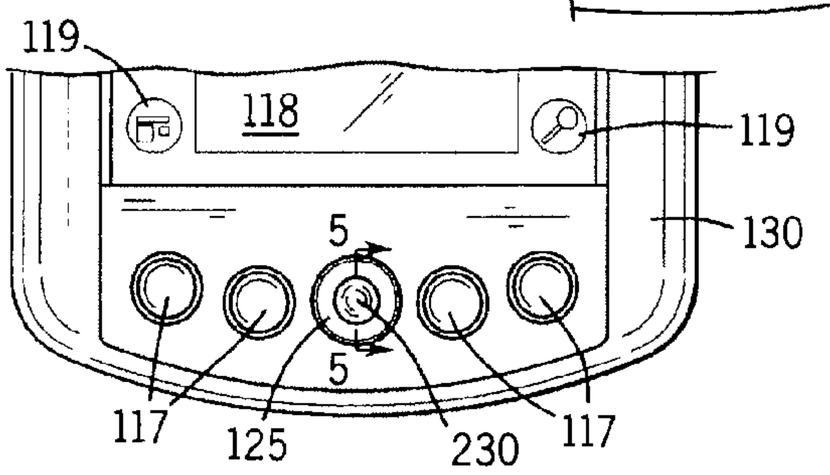


FIG. 3

FIG. 4



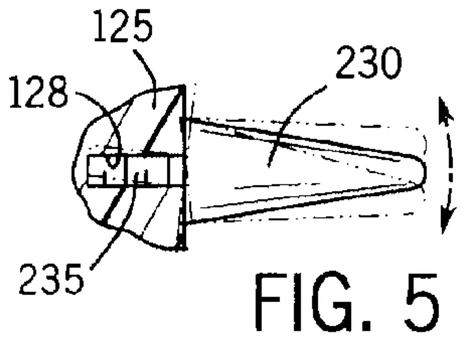


FIG. 5

MOBILE COMPUTING DEVICE WITH INTEGRATED INPUT DEVICE

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

Notice: More than one reissue application has been filed for the reissue of U.S. Pat. No. 6,806,865. The reissue applications are Reissue U.S. Pat. No. Re. 40,740 (application Ser. No. 11/585,995, filed Oct. 18, 2006), which is a reissue application of U.S. Pat. No. 6,806,865; and the present application, filed Mar. 6, 2009, which is a reissue application of U.S. Pat. No. 6,806,865, and a continuation application of Reissue U.S. Pat. No. Re. 40,740.

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of reissue application Ser. No. 11/585,995, filed Oct. 18, 2006 now U.S. Pat. No. Re. 40,740.

FIELD OF THE INVENTION

The invention relates to input devices typically used in handheld computing devices. In particular, the invention relates to an integrated joypad for a handheld computer. The integrated joypad is configured with a receptacle for receiving a graspable portion, such as a section of the stylus used with the handheld computer. The graspable portion of the stylus connected to the joypad receptacle is configured to form a joystick.

BACKGROUND OF THE INVENTION

Handheld computing devices, "palmtops", "palmhelds", personal digital assistants (PDAs), or handheld computers typically weigh less than a pound and fit in a pocket. These handhelds generally provide some combination of personal information management, database functions, word processing, and spreadsheets. Because of the small size and portability of handhelds, strict adherence to hardware constraints, such as input device hardware, must be maintained. It is conventional to have buttons on the handheld computer for providing user input to the handheld computer. Further, the buttons may be configured to be used for the playing of game software and/or navigating through application software.

Other conventional implementations of input devices for handheld computers include attachable joystick devices that may be attached onto the front face of the handheld computer.

Accordingly, there is a need for an integrated joypad for a handheld computer. Further, there is a need for an integrated joypad for a handheld computer which allows for the attachability of a portion of a stylus to create a joystick device.

The teachings herein below extend to those embodiments which fall within the scope of the appended claims, regardless of whether they accomplish one or more of the above mentioned needs.

SUMMARY OF THE INVENTION

An exemplary embodiment relates to a handheld computer. The handheld computer includes a housing and a display supported by the housing. The handheld computer also includes computing electronics supported by the housing and configured to communicate with the display. The handheld computer further includes an integrated input device configured to provide input to the handheld computer. The input device provides different input signals to the computing electronics dependent on a directional movement provided by a user. The input device is configured to communicate more than four distinct directional movements from a user to the computing electronics.

Another exemplary embodiment relates to a handheld computer. The handheld computer includes a housing, data processing electronics disposed within the housing, and a display disposed in the housing and coupled to the data processing electronics. The display includes a touch screen configured to be used with a stylus. The handheld computer also includes a joypad coupled to the data processing electronics and configured to communicate signals to the data processing electronics dependent on the direction in which the joypad is moved. The joypad is moveably integrated into the housing. Further, the handheld computer includes a joystick coupler integrated into the joypad. The joypad coupler is configured to receive at least a portion of the stylus which is configured to act as a joystick.

Further, an exemplary embodiment relates to a joystick device for a handheld computer. The handheld computer is configured to be used with a stylus. The joystick device includes an input device integrated into the handheld computer. The joystick device also includes a coupler integrated into the input device configured to couple at least a portion of the stylus to the input device.

Further still, an exemplary embodiment relates to a method of assembling a joystick for a handheld computer. The method includes providing a handheld computer with a joystick receptacle. The method also includes providing a stylus having a detachable portion. The method further includes detaching a detachable portion from the stylus. Further still, the method includes coupling the detachable portion to the receptacle.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more fully understood from the following detailed description, taken in conjunction with the accompanying drawings, wherein like reference numerals refer to like elements, in which:

FIG. **1** is an exemplary depiction of a handheld computer having an integrated joypad with a detachable joystick;

FIG. **2** is an exemplary depiction of a stylus having a detachable tip;

FIG. **3** is an exemplary depiction of a handheld computer with an integrated joypad and having the detachable joystick detached therefrom;

FIG. **4** is an exemplary front view of the input button array of the handheld computer with the joystick;

FIG. **5** is a cross sectional depiction of the joystick and joypad movement taken along line **5-5** of FIG. **4**; and

FIG. **6** is an exemplary diagram depicting discrete directions which a user may move the joystick.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

Referring to FIG. **1**, a handheld computer **100** is depicted, being optionally detachably coupled to an accessory device **110**, according to an exemplary embodiment. Handheld computer **100** may include Palm style computers manufactured by

Palm, Inc., of Santa Clara, Calif. Other exemplary embodiments of the invention may include Windows CE™ handheld computers, or other handheld computers and personal digital assistants, as well as cellular telephones, and other mobile computing devices. Further, handheld computer **100** may be configured with or without accessory device **110** or optionally with any of a variety of other accessory devices. As shown, accessory device **110** may be, but is not limited to, a desktop cradle used for synchronizing with a personal computer or other device.

Preferably, handheld computer **100** includes interactive hardware and software that performs functions such as maintaining calendars, phone lists, task lists, notepads, calculation applications, spreadsheets, games, and other applications capable of running on a computing device. Handheld computer **100**, shown in FIG. **1** includes a plurality of input functions, keys **117** and a display **113** having graphical user interface features. Display **113** may be provided with an interface that allows a user to select and alter displayed content using a pointer, such as, but not limited to, a stylus **200**, an example of which is depicted in FIG. **2**.

Referring again to FIG. **1**, in an exemplary embodiment, display **113** also includes a Graffiti™ (or other handwriting recognition software) writing section **118** for tracing alphanumeric characters as input. A plurality of input buttons **119** for performing automated or preprogrammed functions may be provided on a portion of display **113**. In a particular embodiment, display **113** is a touch screen display that is electronically responsive to movements of a stylus on the surface of display **113**.

Accessory device **110** may be one of several types of accessories, such as, but not limited to, a desktop synchronization cradle device for serial and/or wireless data communications, a Universal Serial Bus (USB) device, or other communication device. Accessory device **110** may include one or more ports for parallel and/or serial data transfer with other computers or data networks. Handheld computer **100** may use the accessory device **110** for the purpose of downloading and uploading software such as, but not limited to, game software and for synchronizing data on handheld computer **100** with a personal computer, for example. In an exemplary embodiment, accessory device **110** couples to handheld computer **100** through an electrical connector located at a bottom portion of handheld computer **100**. Button **155** on accessory **110** may effectuate an electrical connection between accessory device **110** and handheld computer **100** when the two are connected.

In an exemplary embodiment, handheld computer **100** may include an integrated joypad **125**. Integrated joypad **125** may be a finger or thumb actuated button (see FIG. **3**) which is moveable by a user in a plurality of directions. For example, integrated joypad **125** may be moveable in the up and down direction. In an alternative embodiment, integrated joypad **125** may be moveable in an up and down direction as well as a left and right direction. Further still, in an alternative embodiment, as indicated in FIG. **6**, integrated joypad **125** may be moved in eight discrete directions, including up, down, left, right, and diagonal directions. For example, if one defines the right-hand direction as a reference (0°), the button may be moveable in the directions corresponding to 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315°. Yet further still, joypad **125** may be configured to be moved in a continuum of directions from 0-360 degrees and communicate an analog signal to computing electronics of handheld computer **100**. Joypad **125** is electronically coupled to computing electronics and/or data processing electronics that are disposed within a housing **130** of handheld computer **100**. Joypad **125** is configured to communicate an electrical signal to the computing or data processing electronics of handheld computer **100**. The electrical signal corresponds to the direction in which the joypad is pressed.

In an exemplary embodiment, joypad **125** is integrated into handheld computer **100** such that it is movably supported by housing **130** or such that is movable within an aperture in housing **130**. Because joypad **125** is configured to communicate directional input by a user in a plurality of directions, joypad **125** is useful as an input device for game programs or other applications which may be running on handheld computer **100** and for navigating around display **113**.

Conventionally, for gaming, users utilize a plurality of keys **117** integrated into the housing of handheld computer **100** for providing directional input. However, keys **117** do not enable a user to provide a plurality of directional inputs, nor is there a direction (or location) associated with each key that is intuitive to a user in a way that a joypad such as joypad **125** or a joystick provides. Further, conventionally, users utilize a combination of inputs on a touch screen by a stylus as well as directional inputs from a plurality of buttons such as buttons **117** (see FIG. **4**) and directional buttons such as up and down buttons which may be conventionally integrated into handheld computer **100** for providing input to application programs and for navigating around display **113**. Therefore, an advantage of providing an integrated joypad is that it provides a simplified directional input device for handheld computer **100** while requiring only a small amount of space (real estate) on housing **130**, which is a common constraint of handheld computing devices.

In an exemplary embodiment, joypad **125** also includes a receptacle **128** for coupling of a graspable portion **230** (see FIG. **3**) extending from joypad **125** to form a joystick device. Receptacle **128** may include, but is not limited to, a threaded aperture, or any other type of mechanical connecting configuration allowing relatively simple attachment and detachment of a graspable (joystick) portion **230** therefrom.

Referring now to FIG. **2**, stylus **200** is depicted. Stylus **200** includes a body portion **210**, an end portion **220** and a tip portion **230**. During conventional use, a user grasps body portion **210** and writes with tip **230** on a touch screen, such as touch screen **113** (FIG. **1**). In an exemplary embodiment, tip **230** and/or end **220** may be removed from body **210** by, for example, unscrewing tip **230** or end **220** from body **210**. Tip **230** includes a threaded portion **235** for coupling and decoupling from body **210**. Shaft **235** may include any of a variety of coupling and decoupling structures, such as, but not limited to clips, balls, and other type of fastening structures. In an exemplary embodiment, either tip **230** or end **210** or any other section and/or portion of stylus **200** may be utilized as a graspable portion of a joystick which is inserted into receptacle **128** of joypad **125** as depicted in FIG. **3**. Further, receptacle **128** may be configured to receive any of a variety of other graspable portions, such as a dedicated joystick handle, a pen tip, or any of a variety of other substantially stiff elements that may be used as a graspable portion for a joystick.

FIGS. **1**, **4**, and **5** depict handheld computer **100** with tip **230** coupled to receptacle **128** of integrated joypad **125** such that the combination of joypad **125** and connected stylus tip **230** forms a joystick that is provided for directional input to handheld computer **100**. A user is able to control the movement of tip **230** with a single finger, multiple fingers or any parts of the hand. As tip **230** is moved in a direction (as depicted in FIG. **5**), joypad **125** is similarly tilted in the same direction and effectuates an electrical signal.

During use, should a user wish to transition from using the stylus as a writing or pointing device for handheld computer **100**, a user detaches tip **230** from stylus **200** by unscrewing tip

230 from body 210. The user then screws threaded portion 235 of tip 230 into receptacle 128. Receptacle 128 preferably has a screw thread therein configured to accept threaded portion 235.

While the detailed drawings, specific examples and particular formulations given describe exemplary embodiments, they serve the purpose of illustration only. The hardware and software configurations shown and described may differ depending on the chosen performance characteristics and physical characteristics of the computing devices. For example, the type of computing device, input device buttons, or configuration used may differ. The systems shown and described are not limited to the precise details and conditions disclosed. Furthermore, other substitutions, modifications, changes, and omissions may be made in the design, operating conditions, and arrangement of the exemplary embodiments without departing from the scope of the invention as expressed in the appended claims.

What is claimed is:

[1. A handheld computer, comprising:
a housing;
a display supported by the housing, the display being a touch screen display configured to be used with a stylus;
computing electronics supported by the housing and configured to communicate with the display; and
an integrated input device configured to provide input to the handheld computer, the input device providing different input signals to the computing electronics dependent on a directional movement provided by a user, the input device configured to communicate more than four distinct directional movements from a user to the computing electronics;
wherein the integrated input device includes a receptacle for coupling a graspable portion thereto, the input device providing input signals based on movement of the graspable portion when the graspable portion is coupled in the receptacle, at least a portion of the stylus is configured to be coupled to the integrated input device and a first portion of the stylus is configured to be unscrewed from a second portion of the stylus and the first portion of the stylus is configured to be screwed into the receptacle.]

[2. The handheld computer of claim 1, wherein the integrated input device is a pad.]

[3. The handheld computer of claim 1, wherein the integrated input device is a button.]

[4. The handheld computer of claim 1, wherein the receptacle includes an aperture.]

[5. A handheld computer, comprising:
a housing;
a display supported by the housing, the display being a touch screen display configured to be used with a stylus;
computing electronics supported by the housing and configured to communicate with the display; and
an integrated input device configured to provide input to the handheld computer, the input device providing different input signals to the computing electronics dependent on a directional movement provided by a user, the input device configured to communicate more than four distinct directional movements from a user to the computing electronics;
wherein the integrated input device includes a receptacle for coupling a graspable portion thereto, the input device providing input signals based on movement of the graspable portion when the graspable portion is coupled in the receptacle, at least a portion of the stylus is configured to be coupled to the integrated input device and a first portion of the stylus is configured to be unsnapped from a second portion of the stylus and the first portion of the stylus is configured to be snapped into the receptacle aperture.]

[6. A handheld computer, comprising:
a housing;
data processing electronics disposed within the housing;
a display disposed in the housing and coupled to the data processing electronics, the display including a touch screen configured to be used with a stylus;
a joypad coupled to the data processing electronics and configured to communicate signals to the data processing electronics dependent on the direction in which the joypad is moved, the joypad being movably integrated into the housing; and
a joystick coupler integrated into the joypad, the joystick coupler configured to receive at least a portion of the stylus which is configured to act as a joystick.]

[7. The handheld computer of claim 6, wherein the joystick coupler includes a screw thread.]

[8. The handheld computer of claim 6, wherein the joystick coupler includes a flexible fitting.]

[9. The handheld computer of claim 6, wherein the joypad is configured to communicate signals corresponding to eight discrete directional user inputs.]

[10. A method of assembling a joystick for a handheld computer, comprising:
providing a handheld computer with a joystick receptacle;
providing a stylus having a detachable portion;
detaching a detachable portion from the stylus; and
coupling the detachable portion to the receptacle.]

[11. The method of claim 10, wherein the joystick receptacle is part of a joypad integrated into the handheld computer.]

[12. The method of claim 10, wherein the receptacle includes a screw thread.]

[13. The method of claim 10, wherein the detachable portion is the stylus tip.]

14. A mobile computing device comprising:
a housing;
a display disposed within the housing;
an input device capable of being actuated and disposed within the housing, wherein the input device can be pressed in a continuum of directions to provide directional input, the continuum of directions including at least eight directions; and
computing electronics disposed within the housing and coupled to the display and the input device, the computing electronics being configured to receive signals from the input device in response to the input device being pressed in the continuum of directions, the computing electronics being further configured to run an electronic calendar application and a document viewing application,
wherein the mobile computing device comprises a cellular telephone.

15. The mobile computing device of claim 14, wherein the computing electronics provide inputs to the display based on the received signals.

16. The mobile computing device of claim 14, wherein the computing electronics are configured to synchronize personal information management data on the mobile computing device with a computer.

17. The mobile computing device of claim 14, wherein the display is a touch-sensitive display.

18. The mobile computing device of claim 14, wherein the mobile computing device is a handheld computing device.

19. A mobile computing device comprising:

a housing;

an input device capable of being actuated and disposed in the housing, wherein the input device can be pressed in a continuum of directions to provide directional input, the continuum of directions including at least eight directions; and

computing electronics disposed within the housing and coupled to the input device, the computing electronics configured to receive signals from the input device in response to the input device being pressed in the continuum of directions, the computing electronics being further configured to run a plurality of applications, the plurality of applications including at least an electronic calendar application or a document viewing application.

20. The mobile computing device of claim 19, further comprising a display,

wherein the computing electronics provide inputs to the display based on the received signals.

21. The mobile computing device of claim 19, wherein the mobile computing device comprises a cellular telephone.

22. The mobile computing device of claim 19, wherein the input device comprises a flat button that is circular in shape.

23. The mobile computing device of claim 20, wherein the display is a touch-sensitive display.

24. A handheld computer comprising:

a housing;

a display disposed within the housing;

an input device capable of being actuated and disposed within the housing, wherein the input device can be depressed in a continuum of directions to provide directional input, the continuum of directions including at least eight directions; and

computing electronics disposed within the housing and coupled to the input device, the computing electronics configured to receive signals from the input device in response to the input device being pressed in the continuum of directions, the computing electronics being further configured to run an electronic calendar application and a document viewing application.

25. The handheld computer of claim 24, wherein the display is a touch-sensitive display.

26. The handheld computer of claim 24, wherein the computing electronics are configured to provide inputs to the display based on receiving signals corresponding to the continuum of directions.

27. The handheld computer of claim 24, wherein the input device comprises a flat button that is circular in shape.

28. The handheld computer of claim 24, wherein the computing electronics are further configured to run a gaming application.

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