Exhibit 1006

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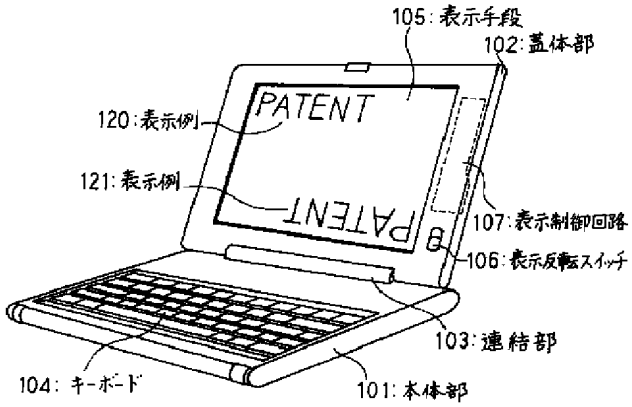
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(54)【発明の名称】　電子機器装置及びパーソナルコンピュータ

(57)【要約】
【目的】キーボードを使用できる形態を保持しながら、ペン入力操作やマウス操作主体の利用環境に適した形態を採ることのできるパーソナルコンピュータを提供すること。
【構成】前面にキーボード１０４を有する本体部１０１と、前面に表示手段１０５を有する蓋体部１０２と、両者の前面を向かい合わせる状態で、本体部の一端と蓋体部の一端とを連結し、かつ両者を開閉可能とする連結機構１０３とからなり、この連結機構１０３は、本体部１０１に対して蓋体部１０２を１８０度を越えた角度に開き得る構造であるパーソナルコンピュータ。表示手段１０５の表示を天地逆にするための表示反転スイッチ１０６があることが好ましい。

図１



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【特許請求の範囲】
【請求項１】前面にキーボードを有する本体部と、前面に表示手段を有する蓋体部と、該本体部の前面と該蓋体部の前面とを向かい合わせる状態で、本体部の一端と蓋体部の一端とを連結し、かつ両者を開閉可能とする連結機構とからなる電子機器装置において、上記連結機構は、上記本体部に対して上記蓋体部を１８０度を越えた角度に開き得る構造であることを特徴とする電子機器装置。
【請求項２】請求項１記載の電子機器装置において、上記表示手段は、表示される記号が天地逆に表示されるための切替手段を備えたことを特徴とする電子機器装置。
【請求項３】請求項１記載の電子機器装置において、上記連結機構は、上記本体部に対して上記蓋体部を実質的に０度から３６０度の範囲の任意の角度にし得る構造であることを特徴とする電子機器装置。
【請求項４】請求項３記載の電子機器装置において、上記表示手段は、表示される記号が天地逆に表示されるための切替手段を備えたことを特徴とする電子機器装置。
【請求項５】請求項１から４のいずれかーに記載の電子機器装置において、上記キーボードは、キーボードからの入力を無効とするための第２の切替手段を備えたことを特徴とする電子機器装置。
【請求項６】請求項１から４のいずれかーに記載の電子機器装置において、上記本体部は、本体部が鉛直線に対して所定の範囲の角度にあることを検出する検出手段を有し、上記キーボードは、該検出手段の検出した値に基づいて、キーボードからの入力を無効とするための第３の切替手段を備えたことを特徴とする電子機器装置。
【請求項７】前面にキーボードを有し、電子回路を格納する本体部と、前面に表示手段を有する蓋体部と、該本体部の前面と該蓋体部の前面とを向かい合わせる状態で、本体部の一端と蓋体部の一端とを連結し、かつ両者を開閉可能とする連結機構とからなるパーソナルコンピュータにおいて、上記連結機構は、上記本体部に対して上記蓋体部を１８０度を越えた角度に開き得る構造であることを特徴とするパーソナルコンピュータ。
【請求項８】請求項７記載のパーソナルコンピュータにおいて、上記表示手段は、表示される記号が天地逆に表示されるための切替手段を備えたことを特徴とするパーソナルコンピュータ。
【請求項９】請求項７記載のパーソナルコンピュータにおいて、上記連結機構は、上記本体部に対して上記蓋体部を実質的に０度から３６０度の範囲の任意の角度にし得る構造であることを特徴とするパーソナルコンピュータ。
【請求項１０】請求項９記載のパーソナルコンピュータにおいて、上記表示手段は、表示される記号が天地逆に表示されるための切替手段を備えたことを特徴とするパーソナルコンピュータ。
【請求項１１】請求項７から１０のいずれかーに記載のパーソナルコンピュータにおいて、上記キーボードは、キーボードからの入力を無効とするための第２の切替手段を備えたことを特徴とするパーソナルコンピュータ。
【請求項１２】請求項７から１０のいずれかーに記載のパーソナルコンピュータにおいて、上記本体部は、本体部が鉛直線に対して所定の範囲の角度にあることを検出する検出手段を有し、上記キーボードは、該検出手段の検出した値に基づいて、キーボードからの入力を無効とするための第３の切替手段を備えたことを特徴とするパーソナルコンピュータ。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、小型化により可搬性を高めた電子機器装置及びパーソナルコンピュータに関する。
【０００２】
【従来の技術】近年、情報処理装置等の電子機器装置の小型化の進展は著しく、とりわけ、パーソナルコンピュータは、その大きさ、重量の点で、携帯可能なまでに小型化されてきた。
【０００３】この様な従来の携帯型パーソナルコンピュータの一般的な形態は、（１）操作部を有する本体部と、（２）表示部を有する蓋体部と、（３）上記本体部と蓋体部とを連結すると共に、連結部を軸として蓋体を回動させて開閉可能にする構構とで構成される匡体構造を持つ。通常、携帯時等の未使用時には本体部と蓋体部とは向かい合わさる形で閉じられている。使用時にはこの蓋体部を１２０度程度に開けて操作するようになっている。この様な携帯型パーソナルコンピュータは、俗にラップトップ型コンピュータとも呼ばれ、近年省スペースの卓上型コンピュータとして数多く商品化され、利用されている。なお、この種の電子機器装置に関連するものには、例えば、特開平３－１０９６２２、特開平３－２９２５２０等がある。
【０００４】
【発明が解決しようとする課題】上記従来技術は、ペン入力操作やマウス操作主体のユーザーインターフェースを有する利用形態には適した形態でないという問題があった。近年、パーソナルコンピュータの利用環境が変わりつつあり、そのひとつは、マウス操作を主体とする操作環境の提供であり、さらには、ペン入力による操作環境の提供である。上記従来技術は、あくまでもキーボード入力による操作環境に適したものであった。なお、このような問題は、携帯型ワードプロセッサ等のパーソナルコンピュータ以外の電子機器装置においても同様である。
【０００５】本発明の目的は、キーボードを使用できる形態を保持しながら、ペン入力操作やマウス操作主体の利用環境に適した形態を採ることのできる電子機器装置

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及びパーソナルコンピュータを提供することにある。
【０００６】
【課題を解決するための手段】上記目的を達成するために、本発明の電子機器装置は、前面にキーボードを有する本体部と、前面に表示手段を有する蓋体部と、この本体部の前面とこの蓋体部の前面とを向かい合わせる状態で、本体部の一端と蓋体部の一端とを連結し、かつ両者を開閉可能とする連結機構とからなり、本体部に対して蓋体部が１８０度を越えた角度に開き得るように、連結機構の構造を構成したものである。
【０００７】また、本発明のパーソナルコンピュータは、前面にキーボードを有し、電子回路を格納する本体部と、前面に表示手段を有する蓋体部と、この本体部の前面とこの蓋体部の前面とを向かい合わせる状態で、本体部の一端と蓋体部の一端とを連結し、かつ両者を開閉可能とする連結機構とからなり、本体部に対して蓋体部が１８０度を越えた角度に開き得るように、連結機構の構造を構成したものである。
【０００８】いずれの装置においても、上記連結機構は、本体部に対して蓋体部を実質的に０度から３６０度の範囲の任意の角度にし得る構造であることが好ましい。また、上記表示手段は、表示される記号が天地逆に表示されるための切替手段を備えることが好ましい。さらに、本体部に対して蓋体部を３６０度開き、蓋体部を表側にして用いる等のとき、蓋体部になんらかの力が加わると、裏側になっている本体部のキーボードから意図しないデータが誤って入力される場合があり得る。それを防止するためキーボードからの入力を無効とするための第２の切替手段を備えることが好ましい。また、この切替手段は、本体部の鉛直線に対してなす角度から自動的に切り替わるようにしてもよい。
【０００９】
【作用】上記のように構成することでキーボードを有する本体部と表示手段を有する蓋体部とをほぼ３６０度開き、キーボードと表示手段とが背中合わせとなるようにすることが出来る。そのような、ほぼ３６０度開いた状態では、キーボードも表示手段も機器の表面に露出する形となるので、表示手段を利用者に対面するように手で持てば、ペン入力環境にまさに好適な形態となる。しかも、必要とあれば、機器を裏返すことにより、利用者は、キーボードを操作することもできる。
【００１０】あるいはまた、本体部と蓋体部とを約３４０度に開くことが出来る。この状態だと、連結部分を上に、本体部の一端と蓋体部の一端とを下にした形で、机上に立てることが出きる。このとき、表示手段に表示される文字・図形等は、上下及び左右が逆となるため、利用者が表示内容を即座に読みとることは難しい。そこで、表示を天地逆にする。このようにして机上に立てて用いればマウス操作に好適な形態となる。
【００１１】
【実施例】本発明の一実施例を図面を用いて説明する。図１は、本発明を適用した携帯用パーソナルコンピュータの斜視図である。本体部１０１は、コンピュータ本体の電子回路を格納している。蓋体部１０２は、コンピュータの表示手段１０５をその全面に備え、使用時には、引き起こして表示手段が利用する人に対面するようになっている。表示手段１０５は、本コンピュータの表示部であり、ペン入力環境時には、入力手段ともなる。キーボード１０４は、コンピュータの入力部で、従来の使用においては中心となる入力部である。
【００１２】連結部１０３は、本体部１０１の一端とヒンジで繋がれている。また一方で、連結部１０３は、蓋体部１０２の一端ともヒンジで繋がれている。表示反転スイッチ１０６は、利用者によって操作されるスイッチで、ノーマル状態とリバース状態の２状態をとることが出来る。その状態は、表示制御回路１０７に入力されている。表示制御回路１０７は、本体部１０１に格納されているコンピュータ本体回路の制御により、表示手段１０５への出力を制御する電子回路である。表示制御回路１０７は、表示反転スイッチ１０６の状態により、表示手段への表示を天地逆にできる。つまり、表示反転スイッチ１０６がノーマル状態にあるときは、その表示は表示例１２０の如くに行われる。一方、表示反転スイッチ１０６がリバース状態にあるときは、その表示は表示例１２１の如く天地逆に、すなわち、表示面中心の鉛直線を中心として１８０度回転して行われる。
【００１３】次に、本発明で重要な役割を果たす連結機構の詳細を図２を用いて説明する。連結機構は、連結部１０３、本体支持軸１１０及び蓋体支持軸１１１を有する。本体支持軸１１０は、本体部１０１に設けられた本体支持部１１２と連結される。本体部１０１は、軸１５０を中心に自由に回転することが出来る。蓋体支持軸１１１は、蓋体部１０２に設けられた蓋体支持部１１３と連結される。蓋体部１０２は、軸１５１を中心に自由に回転することが出来る。
【００１４】次に、図２で説明した連結機構の働きにより、本体部１０１及び蓋体部１０２がどの様に回転するかを図３を用いて説明する。通常、携帯時等の未使用時には、本体部１０１と蓋体部１０２は図２を用いて説明した連結機構の働きによりキーボード１０４と表示手段１０５が向かい合うようにして閉じることが出来る。一方、使用時には蓋体部１０２は軸１５１を中心に回転させることにより、本体部１０１より起きあがらせて開けることが出来る。適当な角度、例えば回転１５２により蓋体部１０２を約１２０度開けるならば、蓋体部１０２は蓋体部位置１５５に位置する。これは、図１に示した形態であり、利用者はキーボード１０４と表示手段１０５とに自然な形で対面しながら本コンピュータを操作できる。
【００１５】いま、蓋体部１０２を回転１５３により１

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８０度開けるならば、蓋体部１０２は蓋体部位置１５６に位置する。さらにそこで、連結部１０３を軸１５０を中心とする回転１５４により１８０度回転させ、軸１５１を軸位置１５７に移動させると、蓋体部１０２は、蓋体部位置１５８に位置する。このようにして、蓋体部１０２は図２を用いて説明した連結機構の働きによりほぼ３６０度回転させることが出来る。この状態では、表示手段１０５は表示手段位置１５９に位置する。すなわち、キーボード１０４も表示手段１０５も、コンピュータの表面に出ているので、必要とあれば利用者はキーボード１０４を操作することもできるし、表示手段１０５を使用することもできる。

【００１６】図３を用いて説明したように、本発明のパーソナルコンピュータは、本体部１０１と蓋体部１０２とをほぼ３６０度開けた状態にすることが出来る。図４は、このときの状態を示した斜視図であり、ペン入力によるコンピュータ利用に適した形態になっている。本図では、利用者に対して連結部１０３が手前側になっている。この時は表示手段１０５の表示向きは表示例１２０の如くで問題ない。しかしながら、利用者によっては、利用者に対して連結部１０３が向こう側になっていたほうが好まれる場合もある。その場合、表示反転スイッチ１０６をリバース状態にすることにより、表示手段１０５の表示向きを表示例１２１の如くにすれば良い。

【００１７】すでに説明してきたように、本発明によれば、本体部１０１と蓋体部１０２とをほぼ０度から３６０度の範囲で任意の角度に開けることが出来る。図５は、本体部１０１と蓋体部１０２とをおよそ３４０度開けた状態の利用形態を示すものである。この場合、表示反転スイッチ１０６をリバース状態に設定することにより表示手段１０５の表示向きを表示例１２１の如くにする。そして、連結部１０３を上方向にして机上に設置する。この時、キーボード１０４は利用者からみて完全に裏側になってしまうので、利用者は簡単にキーボード１０４を操作することは出来ないが、マウス１３０を接続して、マウス主体操作環境ならば大きな問題ではない。この様にして机上に設置した場合、コンピュータの占める机上面積は、図１に示した設置方法と比べて大幅に少なくすることが出来る。

【００１８】なお、図４に示した状態でパーソナルコンピュータを用い、表の表示手段１０５に多少強い力が加えられたときなど、裏側になっているキーボードから意図しないデータが誤って入力される場合があり得る。それを防止するためキーボードからの入力を無効とするための切替手段（図示せず）を設けておくことが好ましい。

【００１９】また、この切替手段は自動的に作動するようにしてもよい。例えば、本体部が鉛直線に対して所定の範囲の角度にあることを検出する検出手段を本体部に設け、この検出手段の検出した値に基づいて、キーボードからの入力を無効とするような構成としてもよい。

【００２０】

【発明の効果】本発明は、以上述べたように構成されているので次のような効果がある。

（１）従来通りのキーボード主体の利用形態と、ペン入力主体、マウス操作主体の利用形態に適した形態とのすべてを実現することができた。

（２）マウス操作主体で利用する場合、より少ない机上占有面積で済むようにできた。

（３）外部表示手段を利用する場合、利用者の正面に外部表示手段を無理なく設置できた。

【図面の簡単な説明】

【図１】本発明の一実施例のパーソナルコンピュータの斜視図である。

【図２】本発明の一実施例のパーソナルコンピュータの連結機構の構成図である。

【図３】図３に示した連結機構の動作説明図である。

【図４】本発明の一実施例のパーソナルコンピュータの一利用形態を説明する斜視図である。

【図５】本発明の一実施例のパーソナルコンピュータの他の利用形態を説明する斜視図である。

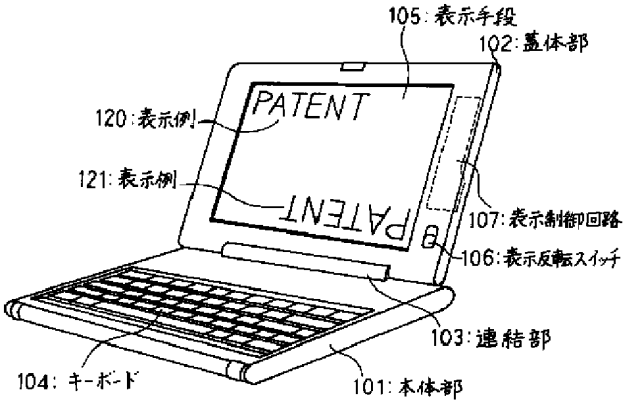
【符号の説明】

１０１…本体部
１０２…蓋体部
１０３…連結部
１０４…キーボード
１０５…表示手段
１０６…表示反転スイッチ
１０７…表示制御回路
１１０…本体支持軸
１１１…蓋体支持軸
１１２…本体支持部
１１３…蓋体支持部
１２０、１２１…表示例
１３０…マウス
１５０、１５１…軸
１５２、１５３、１５４…回転
１５５、１５６、１５８…蓋体部位置
１５７…軸位置
１５９…表示手段位置

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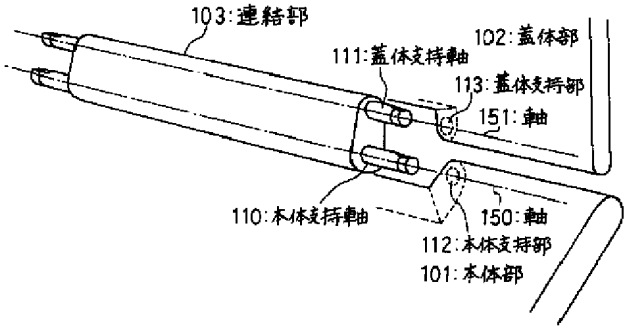
【図１】

図１



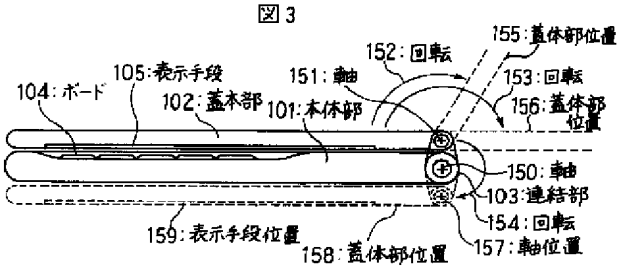
【図２】

図２



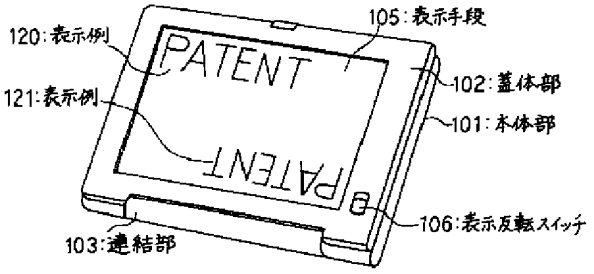
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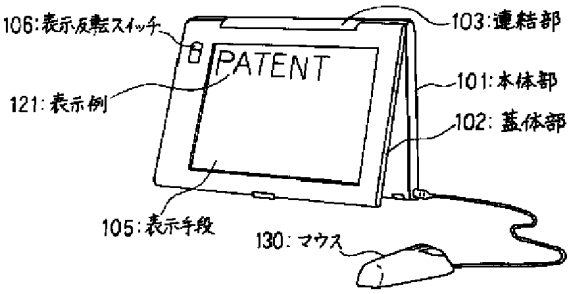
【図４】

図４



【図５】

図５



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Exhibit 1007

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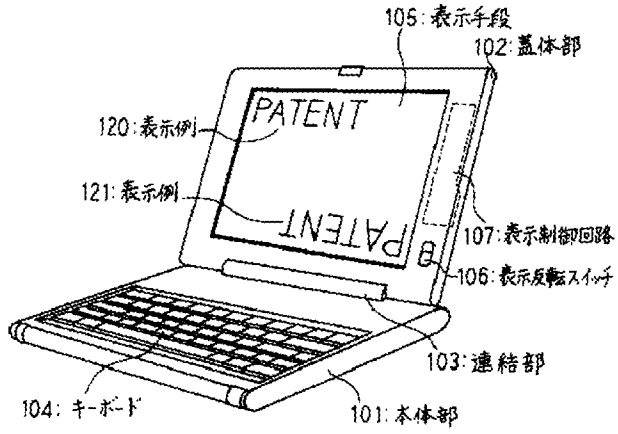
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(57) [Abstract]

[Purpose] To provide a personal computer which can adopt a mode suitable for a user environment centered on a pen input operation and a mouse input operation while retaining a mode which can use a keyboard.

[Configuration] It is a personal computer made up of a main part 101 provided with a keyboard 104 on the front, a cover part 102 provided with a display means 105 on the front and a coupling mechanism 103 used to couple one end of the main part and one end of the cover part with both the display device 105 and the cover part 102 facing main part 101 and which can open and close both of these. This coupling mechanism 103 is structured so that it can open the cover part 102 so that it exceeds 180° relative to main part 101. It should have a display reverse switch 106 so that display means 105 can be switched upside down.

図1



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[Claims]

[Claim 1] An electronic machine and device characterized as being in a state wherein a main part having a keyboard on the front side, a cover part having a display means on the front side and a front side of said main part and the front side of said cover part facing each other; made up of a coupling mechanism wherein one end of the main part and one end of the cover part are coupled; the invention characterized as said coupling mechanism being a structure wherein it can open said cover part to an angle relative to said main part which exceeds 180°.

[Claim 2] The electronic machine and device described in Claim 1 wherein said display means is provided with a switching means used so that the symbols displayed can be displayed at the top and then turned upside down.

[Claim 3] The electronic machine and device described in Claim 1 wherein said coupling mechanism is a structure which can essentially place the abovementioned cover part relative to the abovementioned main part within a range from 0° to 360°c.

[Claim 4] The electronic machine and device described in Claim 3 wherein said display means is provided with a switching device which makes it possible for the symbols displayed to be displayed at the top and then turned upside down.

[Claim 5] The electronic machine and device described in any of Claims 1 through 4 wherein said keyboard is provided with a second keyboard which invalidates input from the keyboard.

[Claim 6] The electronic machine and device as described in any of Claims 1 through 4 wherein it is provided with a detection means used to detect when the main part is at an angle within a predetermined range relative to a perpendicular line and the abovementioned keyboard is provided with a third switching means used to invalidate the input from the keyboard based on the value detected by said detection means.

[Claim 7] A personal computer characteristic in that it is provided with a keyboard on the front, a coupling mechanism which couples one end of the main part and one end of the cover part in a state wherein the main part which stores the electronic circuit, the cover part which is provided with a display means on the front and the front of said main part and the front of said cover part are facing one another so that both can be opened and closed; said coupling mechanism consists of a structure which can open the cover part at an angle relative to the cover part which exceeds 180°.

[Claim 8] The personal computer as described in Claim 7 wherein said display means is provided with a switching means used so that the symbols displayed can displayed at the top and then turned upside down.

[Claim 9] The personal computer described in Claim 7 wherein the abovementioned linking mechanism is a structure which is made so that it places the abovementioned cover part essentially at any angle relative to the main part within 0° to 360°.

[Claim 10] The personal computer described in Claim 9 wherein the display means is provided with a switching means used so that the symbols displayed can be displayed at the top and then turned upside down.

[Claim 11] The personal computer as described in any of Claims 7 through 10 wherein the abovementioned keyboard is provided with a second switching means which invalidates input from the keyboard.

[Claim 12] The personal computer as described in any of Claims 7 through 10 wherein the abovementioned main part is provided with a detection means used to detect when the main part is at an angle within a predetermined range relative to a perpendicular line. The abovementioned keyboard is provided with a third switching means used to invalidate input from the keyboard based on the value detected by the detection means.

[Detailed Description of Invention]

[0001]

[Field of Industrial Use] The present invention relates to an electronic machine and device and a personal computer with enhanced portability as it has been miniaturized.

[0002]

[Prior Art] In recent years, there has been outstanding miniaturization of information processing machines and other electronic machines and devices and especially personal computers which are large and heavy. These have been miniaturized so that they can be carried around.

[0003] The general mode of this type of prior art portable personal computer features (1) a main part which is provided with an operating part; (2) a cover part which is provided with a display part; and (3) a box-like structure which couples said main part and cover part and at the same time rotates the cover with the coupling part as a shaft and structured so that it can open and close. When not in use, it is usually carried about closed so that the main part and the cover part face one another. When it is used, the cover part can be opened to approximately 120° and operated. This type of portable personal computer is popularly known as a lap-top computer and in recent years many of these have been brought to market and used as a space-saving table-top computer. Further, Laid-Open Patent Application H3-109622 and Laid-Open Patent Application H3-292520 and the like.

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[0004] [Problems Which the Present Invention is Intended to Resolve] The above-mentioned prior art was problematical in that it was not a shape which is suitable for use which has a user interface which is based on pen input operation and mouse input operations. In recent years, the usage environment of the personal computer has been changing. One of those changes involves an operating environment based on mouse input. Another change involves an operating environment based on pen input. The abovementioned prior art was persistently suitable for a keyboard-based operating environment. Furthermore, this problem was the same for electronic machines and devices other than portable word-processors and other personal computers.

[0005] It is the objective of the present invention to provide an electronic machine and device and a personal computer which adopt a shape which is suitable for a user environment centered on pen input operations and mouse operations while maintaining a shape which can used as a keyboard.

[0006]

[Means Used to Resolve the Problems] In order to attain the abovementioned objective, the electronic machine and device in the present invention are made up of a coupling mechanism which couples a main part which is provided with a keyboard on the front, a cover part which is provided with a display means on the front and couples one end of the main part and one end of the cover part so that the front of this main part and the front of this cover part and is configured of a coupling mechanism structure so that the cover part can be opened relative to the main part which exceeds 180°.

[0007] The personal computer in the present invention is configured of a coupling mechanism structure which is made up of a main part used to store the electronic circuit, a cover part which is provided with a display means on the front and a coupling mechanism which couples one end of the main part and one end of the cover part with the front of this main part and the front of this cover part facing one another so that both of these can be opened and closed and so that the cover main part can be opened to an angle relative to the main part which exceeds 180°.

[0008] In both of the devices, the abovementioned coupling mechanism should have a structure such that the cover part can essentially assume any angle relative to the main part within a range of 0° to 360°. The abovementioned display means should also be provided with a switching means which makes it possible for the symbols displayed to be displayed at the top and then switch to the bottom. It also opens the cover part 360° relative to the main part. When the cover part is used on the front, when some force is exerted on the cover part, unintended data from the keyboard of the main part which is on the back side may sometimes be inputted by mistake. A second switching means should be provided in order to invalidate the input from the keyboard in order to prevent that. This switching means is set so that it switches automatically from an angle relative to the vertical line of the main part.

[0009]

[Actions] The main part which has a keyboard and the cover part which has a display means open approximately 360° by virtue of this configuration and the keyboard and the display means can be joined together at the back. In this type of state where it is approximately 360° open, the keyboard and the display device can protrude to the front of the machine. As a result, when the display means is grasped with the hand so that it faces the user, it is further suitable for a pen-based input environment. Moreover, should the need arise, the user can manipulate the keyboard by turning the machine over.

[0010] Also, the main part and the cover part can be opened to approximately 340°. In this state, with the linking part on the top and one end of the main part and one end of the cover part on the bottom, can be placed so that it stands on the table. At this time, the characters and diagrams which are displayed on the display device are such that the top and bottom and left and right can be reversed so that it is difficult for the user to immediately read the display details. Therefore, the display can be turned upside down. Thus, if used by placing on top of a table, it is in a state where it is suitable for operating with a mouse.

[0011]

[Practical Embodiment] A practical embodiment of the present invention will be explained based on figures. Figure 1 is an inclined view of the portable personal computer which applies the present invention. Main part 101 is used to store the electronic circuit of the computer. Cover part 102 is provided with computer display means 105 around the entire surface. When in use, the display means which is pulled up faces the user. Display means 105 is the display part of the computer. It is also an input means when used in a pen input environment. Keyboard 104 is a computer input part and serves as an input part which is the center when used in the prior art.

[0012]

Coupling part 103 is fastened by a hinge and one end of main part 101. Meanwhile, coupling part 103 is fastened by a hinge and one end of cover part 102. Display reverse switch 106 is a switch which is operated by the user and can be placed in two states, a normal state and a reverse state. This state is inputted to display control circuit 107. Display control circuit 107 is an electronic circuit used to control output to display means 105 by controlling the computer circuit which is stored in main part 101. Display control circuit 107 can turn the display upside down to the display means by using the mode of display reverse switch 106. This means that when display reverse switch 106 is in normal mode, the display is carried out as indicated in display example 120. Meanwhile, when display reverse switch 106 is in reverse mode, it can be turned upside

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down as indicated in display example 121, that is, it can be rotated 180° centered on the vertical line of the display surface.

[0013] Next, the coupling mechanism which carries out an important role in the present invention will be explained in detail based on Figure 2. The coupling mechanism is provided with coupling part 103, support shaft 110 and support part 112 which is placed on main part 101. Main part 101 can rotate freely around shaft 150. Cover support shaft 111 is coupled to cover support part 113 which is placed on cover part 102. Cover part 102 can rotate freely around shaft 151.

[0014] Next, how main part 101 and cover part 102 rotate thanks to the movement of the coupling mechanism explained in Figure 2 will be explained based on Figure 3. Usually when they are not being used for the portable computer, main part 101 and cover part 102 can close so that keyboard 104 and display means 105 face each other thanks to the movement of the coupling mechanism explained based on Figure 2. Meanwhile, when it is being used, cover part 102 rotates around shaft 151 so that it is lifted up from main part 101 and can be opened. When cover part 102 is opened at a suitable angle, for example, 120°, by rotation 152, cover part 102 is positioned at cover part position 155. This is the mode indicated in Figure 1. The user can operate the computer while facing keyboard 104 and display means 105 in a natural mode.

[0015] Now, when cover part 102 is opened 180° thanks to rotation 153 [sic], cover part 102 is positioned at cover part position 156. Then, when coupling part 103 is rotated 180° thanks to rotation 154 [sic] centered on shaft 150 and shaft 151 is moved to shaft position 157, cover part 102 is positioned at cover part position 158. Thus, cover part 102 can rotate nearly 360° thanks to the movement of the coupling mechanism explained based on Figure 2. In this state, display means 105 is positioned in display means position 159. This means that keyboard 104 and display means 105 protrude onto the surface of the computer so that the user can operate keyboard 104 and can use display means 105 if necessary.

[0016] As was explained based on Figure 3, the personal computer in the present invention can place main part 101 and cover part 102 in a state where they can be opened to nearly 360°. Figure 4 is an inclined view indicating the state at this time which enables pen input for the user of the computer. In this figure, coupling part 103 is in a forward position so that it faces the user. At this time, the display orientation of display means 105 is that indicated in display example 120 and presents no problems. However, some users prefer coupling part 103 to be facing them from a distance. In this case, by placing display rotation switch in reverse mode, the display orientation of display means 105 should be that indicated in display example 121.

[0017] As has already been explained, according to the process of the present invention, main part 101 and cover part 102 can be opened to any angle within a range of nearly 0° to 360°. Figure 5 indicates the user mode of the state of opening of main part 101 and cover part 102 at approximately 340°. In this case, display reverse switch 106 is set to reverse mode so that the display orientation of display means 105 is set as in display example 121. Then, coupling part 103 is placed upward and placed on the table. At this time, keyboard 104 is completely on the back side when seen by the user. The user cannot easily operate keyboard 104, however, if mouse 130 is connected and it is a mouse centered operating environment, it does not present any great problems. Thus, when placed on top of a table, the area taken up by the computer on the table can be greatly reduced. This contrasts to the placement method indicated in Figure 1.

[0018] Furthermore, when some force is exerted on display means 105 of the chart using the personal computer in the state indicated in Figure 4, there are cases in which unintended data are mistakenly inputted from the keyboard which is on the back side. A switching means (not shown in figure) should be set in place to invalidate input from the keyboard to prevent this.

[0019] This switching means may also be devised so that it operates automatically. For example, it may be configured so that a detection means used to detect that the main part is at an angle within a predetermined range is placed on the main part and so that input from the keyboard is invalidated based on a value which has been detected by this detection means.

[0020]

[Effect of Invention] The present invention is configured as indicated above so that it has the following effects.

(1) The usage configurations of the prior art keyboard main core, the configuration which is suitable for the usage configuration of the pen-entry main core and the mouse operation main core have all be realized.

(2) When used with the mouse operation main core, one can get by with a smaller space taken up on a tabletop.

(3) When the external display means is used, the external display means can be easily placed in front of the user.

[Brief Explanation of Figures]

[Figure 1] An inclined view of the personal computer in the preferred embodiment of the present invention.

[Figure 2] A diagram of the coupling mechanism of the personal computer in the preferred embodiment of the present invention.

[Figure 3] A figure explaining the action of the coupling

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mechanism indicated in Figure 3.

[Figure 4] An inclined view which explains how the personal computer in the preferred embodiment of the present invention.

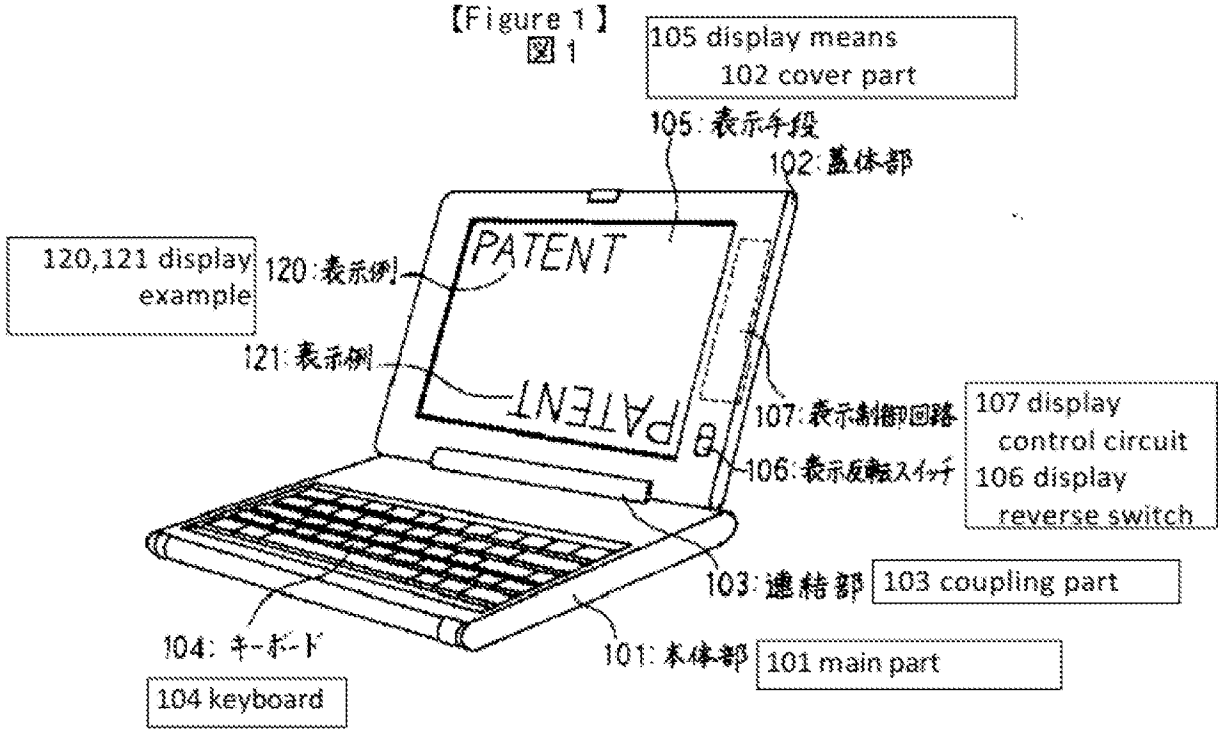
[Figure 5] An inclined view which explains another way of using the personal computer in the preferred embodiment of the present invention.

[Explanation of Symbols]

101....main part
102...cover part
103...coupling part
104....keyboard
105...display means
106..display reverse switch
107..display control circuit
110...main support shaft
111...cover support shaft
112..main support part
113..cover support part
120, 121...display example
130...mouse
150, 151...shaft
152, 153, 154..rotation
155, 156, 158...cover part position
157...shaft position
159...display means position

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【Figure 1】
図 1



【Figure 2】
図 2

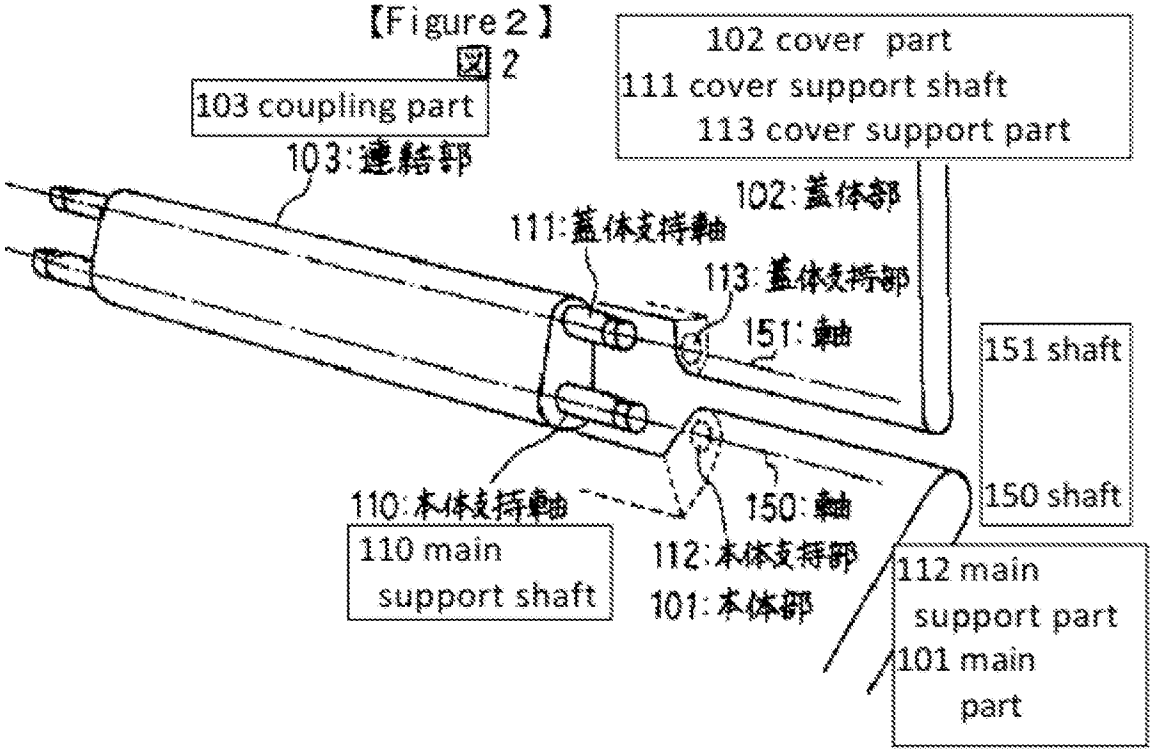
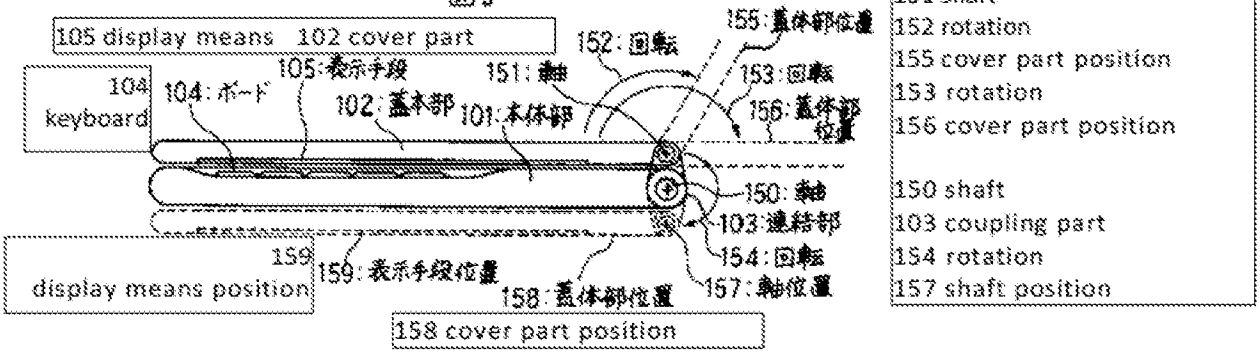


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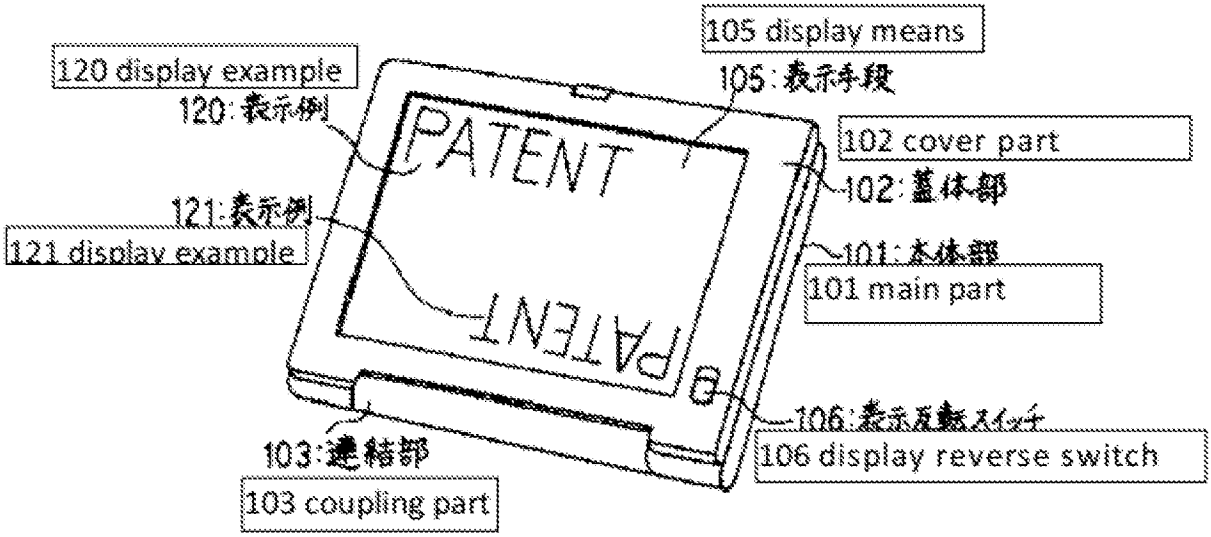
[Figure 3]

図3



[Figure 4]

図4



[Figure 5]

図5

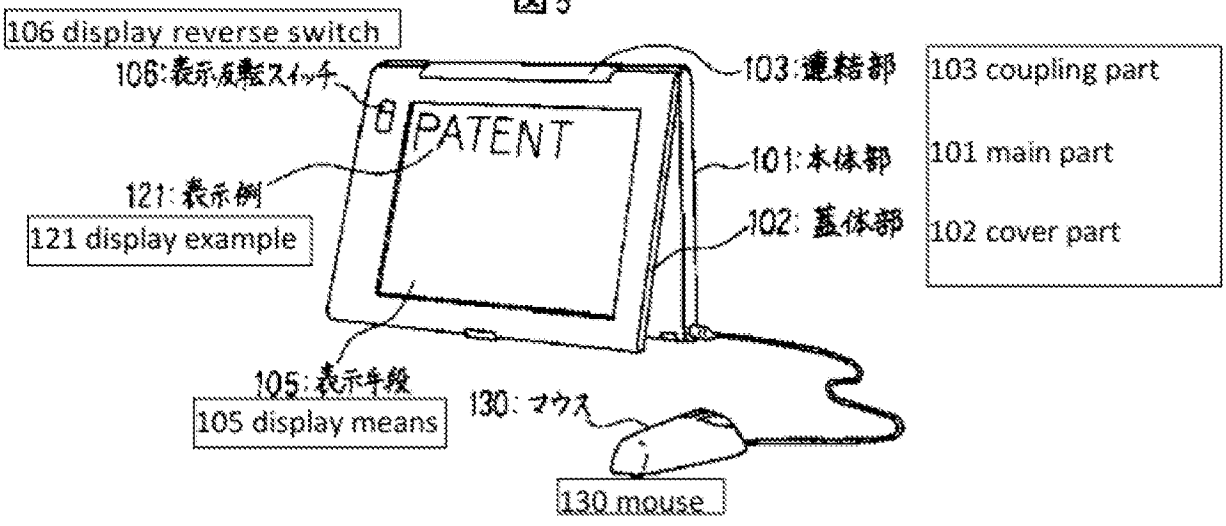


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Executed on: 12/29/2021

Signed: Michael Newton

Mr. Michael Newton

Exhibit 1014

US006492974B1

(12) **United States Patent**
Nobuchi et al.

(10) **Patent No.: US 6,492,974 B1**
(45) **Date of Patent: *Dec. 10, 2002**

(54) **SMALL-SIZED PORTABLE INFORMATION PROCESSING APPARATUS**

(75) Inventors: **Atsunobu Nobuchi**, Kawasaki (JP); **Hideaki Kamikakoi**, Kawasaki (JP); **Katsuichi Gotou**, Kawasaki (JP)

(73) Assignee: **Fujitsu Limited**, Kawasaki (JP)

(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/832,184**

(22) Filed: **Apr. 8, 1997**

(30) **Foreign Application Priority Data**

Oct. 8, 1996 (JP) 8-267235

(51) **Int. Cl.**[7] **G09G 5/08**

(52) **U.S. Cl.** **345/156**; 345/168; 345/173

(58) **Field of Search** 345/104, 156, 345/168, 173, 901

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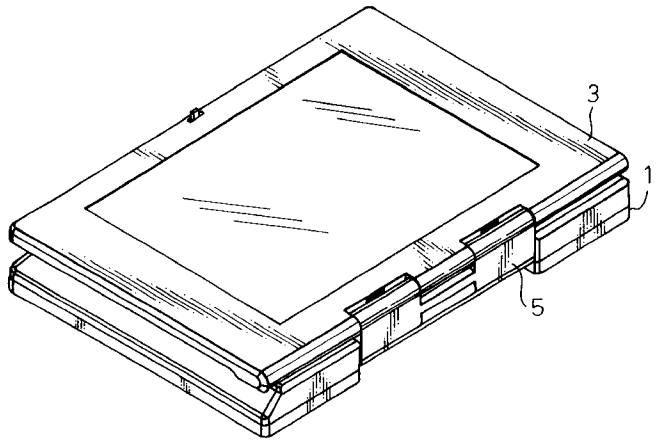
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Primary Examiner—Amare Mengistu
(74) *Attorney, Agent, or Firm*—Staas & Halsey LLP

(57) **ABSTRACT**

An information processing apparatus includes a body having a display panel pivotally attached to the body, the panel having a plural, selectable data display orientations. A detector detects a size of an angle between the display panel and the body and a selector selects a corresponding one of the data display orientations in accordance with the size of the detected angle, affording automatic change of the data display orientations in accordance with respective, different desired configurations of the apparatus.

28 Claims, 14 Drawing Sheets



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5,359,550	A	10/1994	Chen	364/708.1
5,375,076	A	12/1994	Goodrich et al.	364/708.1
5,410,447	A	4/1995	Miyagawa et al.	361/681
5,436,792	A	7/1995	Leman et al.	361/686
5,481,430	A	1/1996	Miyagawa et al.	361/681
5,555,157	A	9/1996	Moller et al.	361/683
5,594,619	A	1/1997	Miyagawa et al.	361/681
5,644,516	A	7/1997	Podwalny et al.	364/708.1
5,666,694	A	9/1997	Slow et al.	16/368
5,719,799	A	2/1998	Isashi	
5,898,600	A *	4/1999	Isahshi	348/552
5,936,619	A *	8/1999	Nagasaki et al.	345/205

* cited by examiner

Fig.1

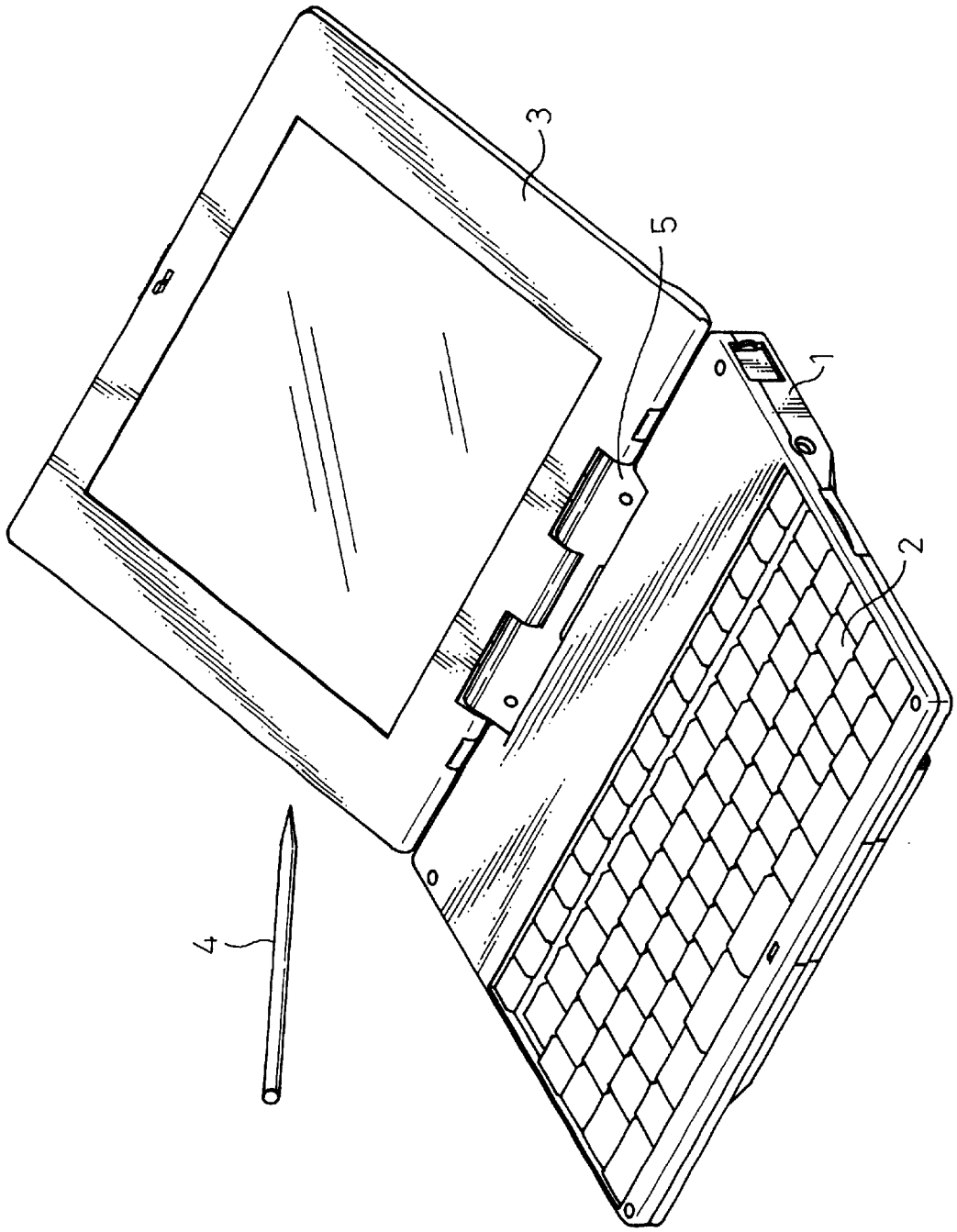


Fig. 2

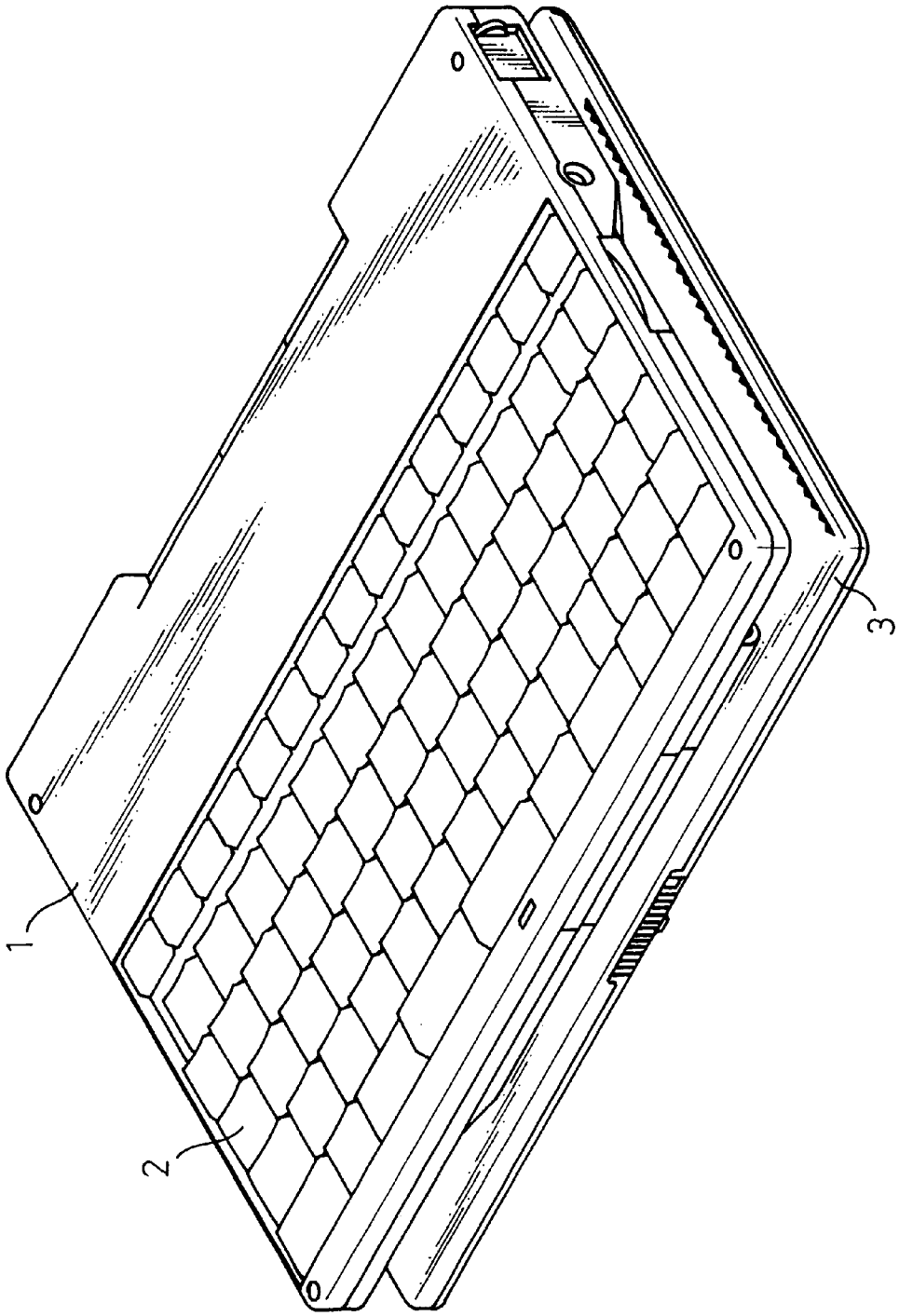
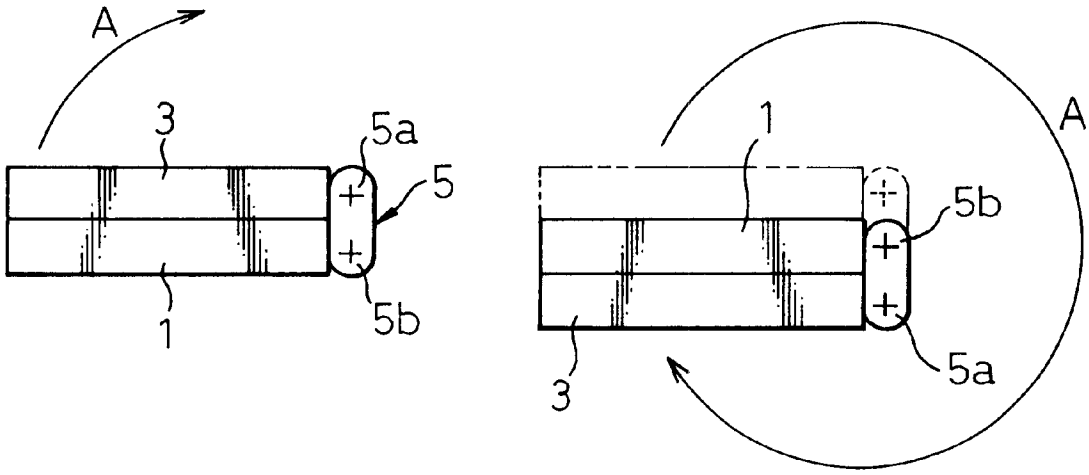


Fig.3(a) Fig.3(b)



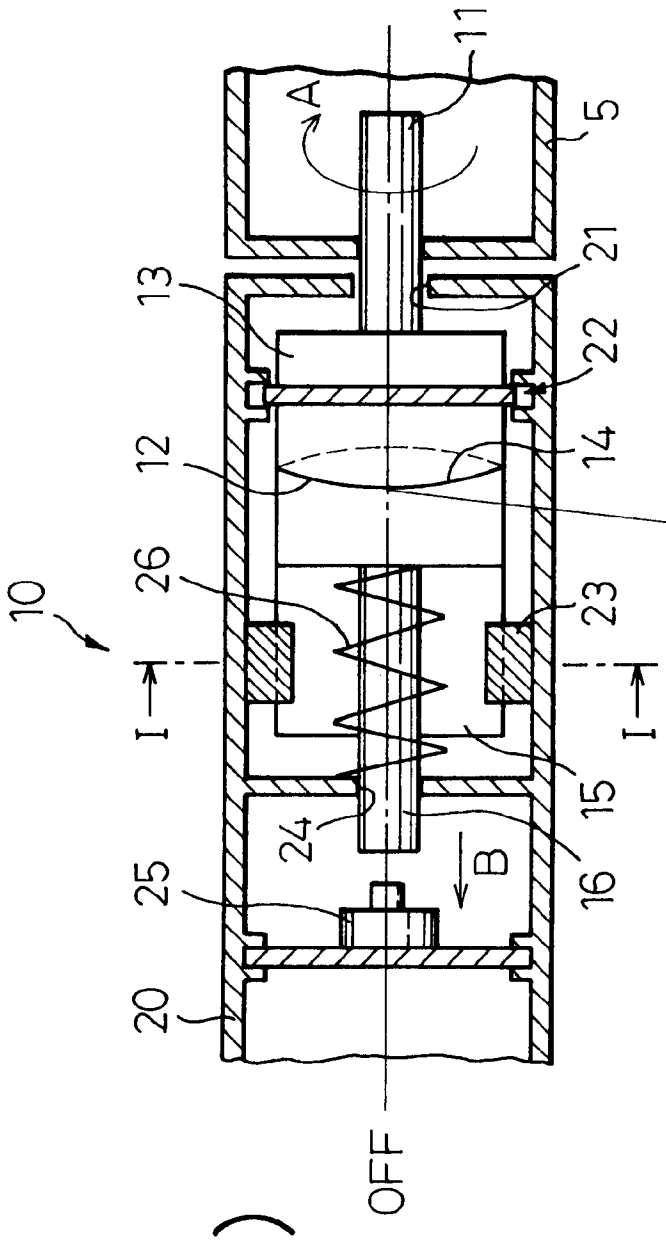

11
A
5
21
13
22
12
14
26
10
23
I
I
15
24
B
16
25
20
OFF

Fig. 4(a)

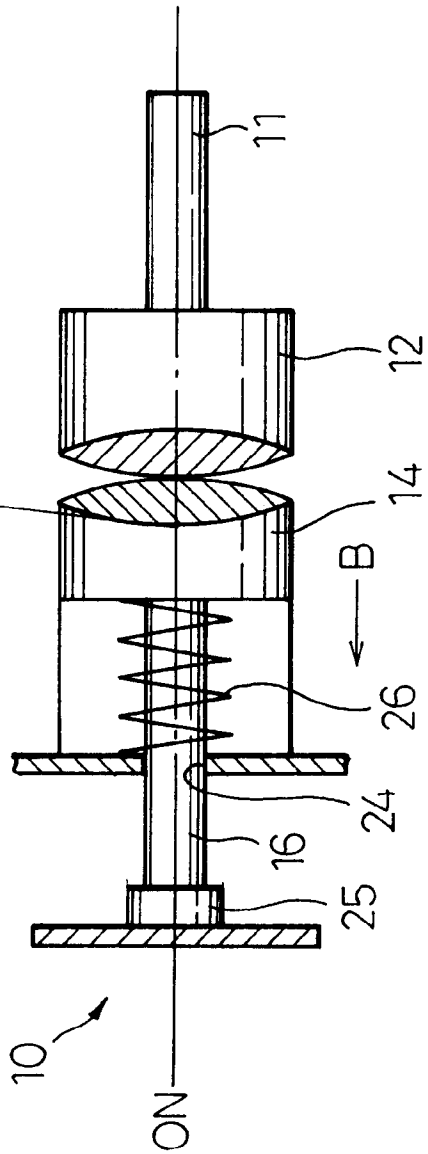

11
12
14
B
26
24
16
25
10
ON

Fig. 4(b)

Fig.5

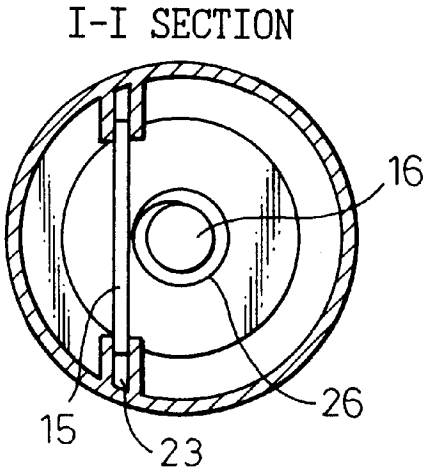


Fig.6(a)

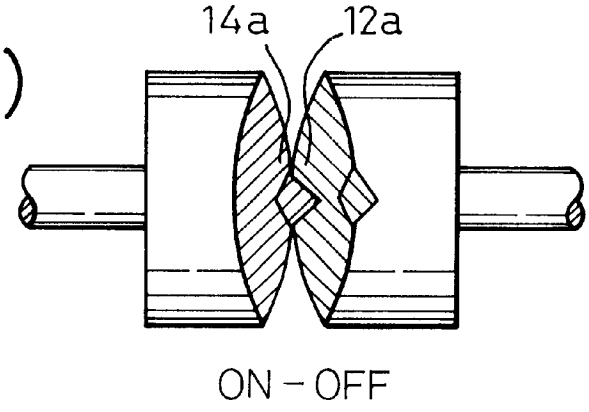


Fig.6(b)

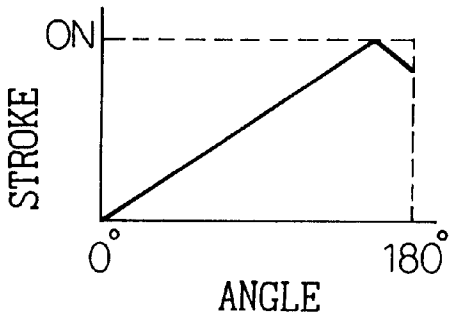


Fig.7

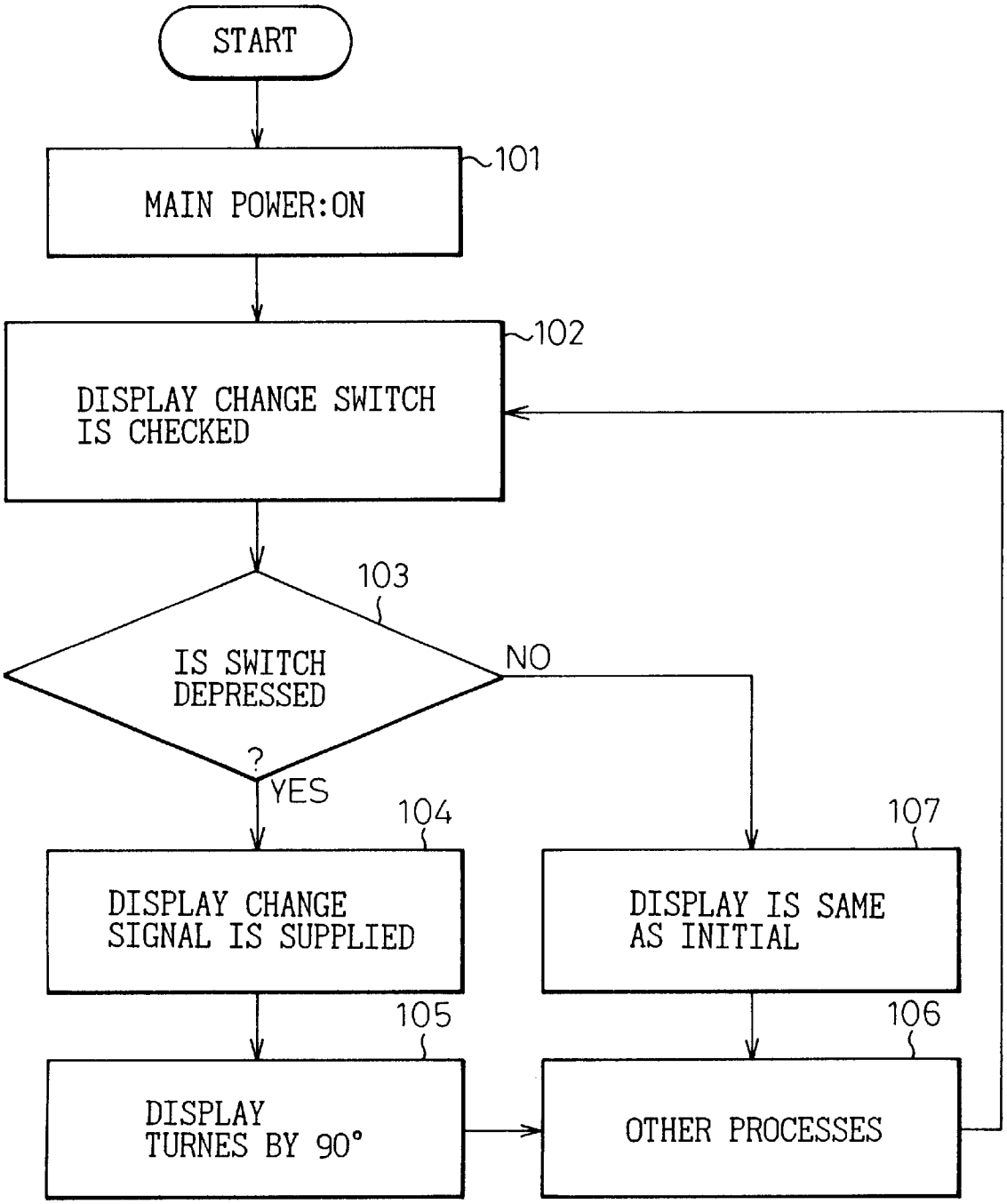

START
MAIN POWER:ON
101
DISPLAY CHANGE SWITCH IS CHECKED
102
IS SWITCH DEPRESSED ?
103
NO
YES
DISPLAY CHANGE SIGNAL IS SUPPLIED
104
DISPLAY IS SAME AS INITIAL
107
DISPLAY TURNES BY 90°
105
OTHER PROCESSES
106

Fig.8

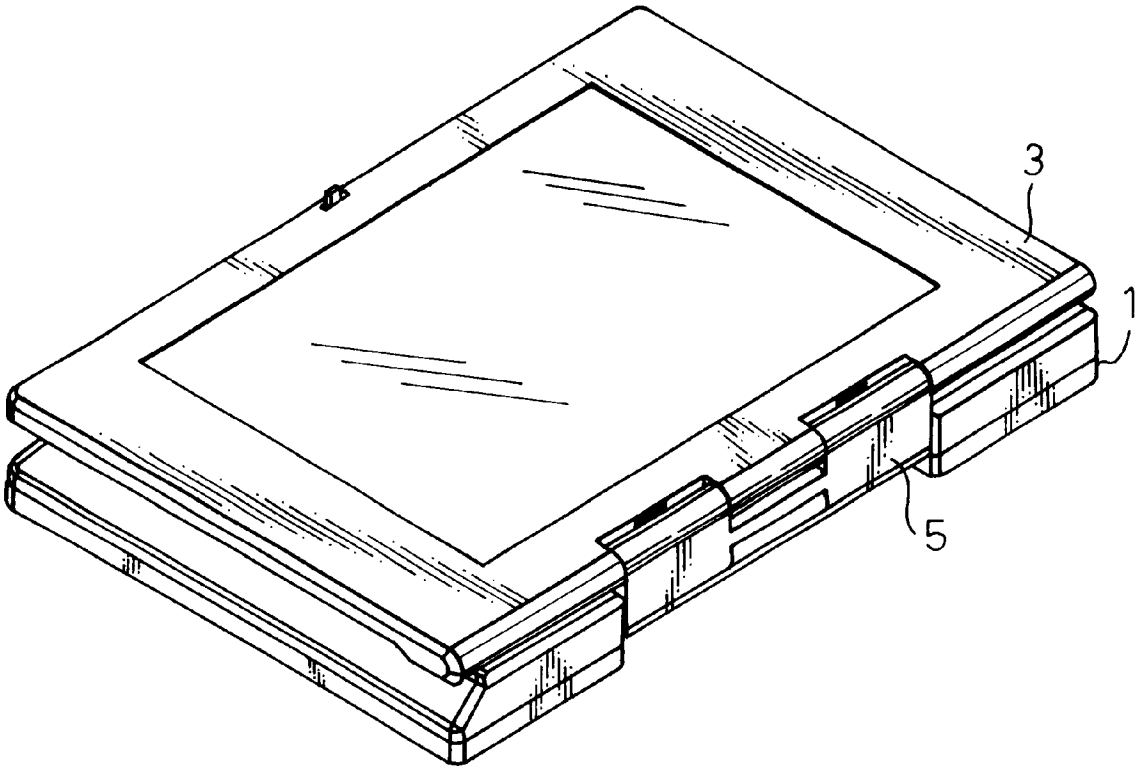


Fig.9(b)

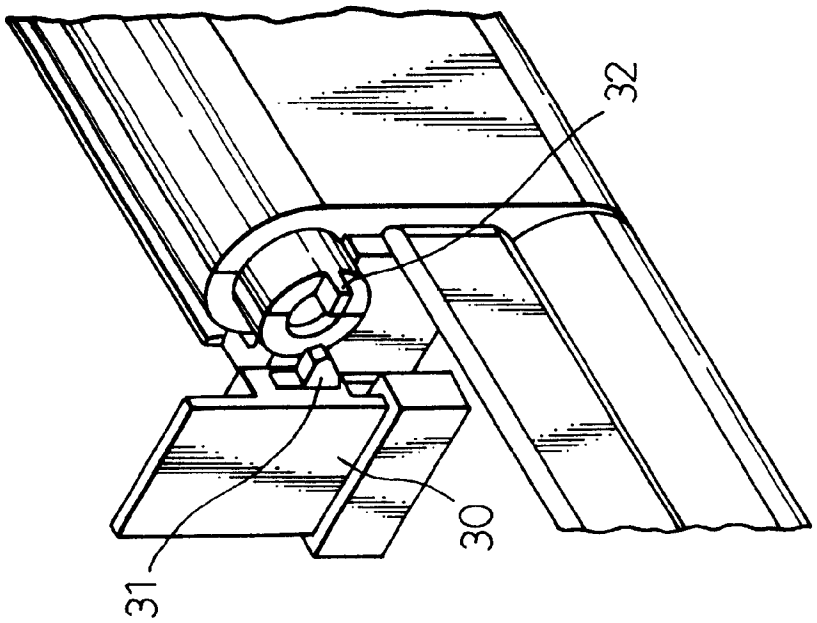


Fig.9(a)

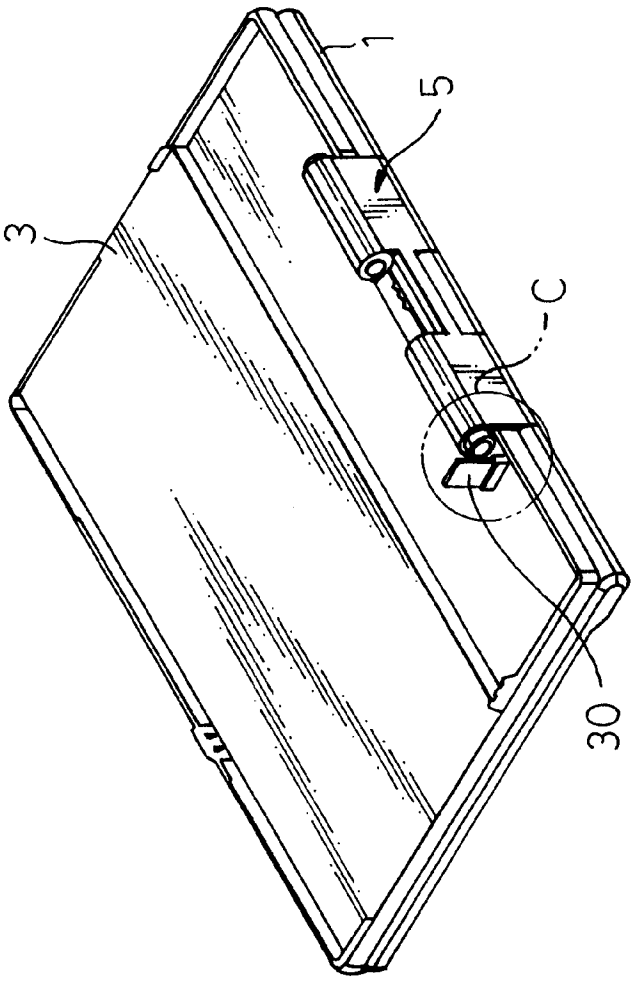


Fig.10

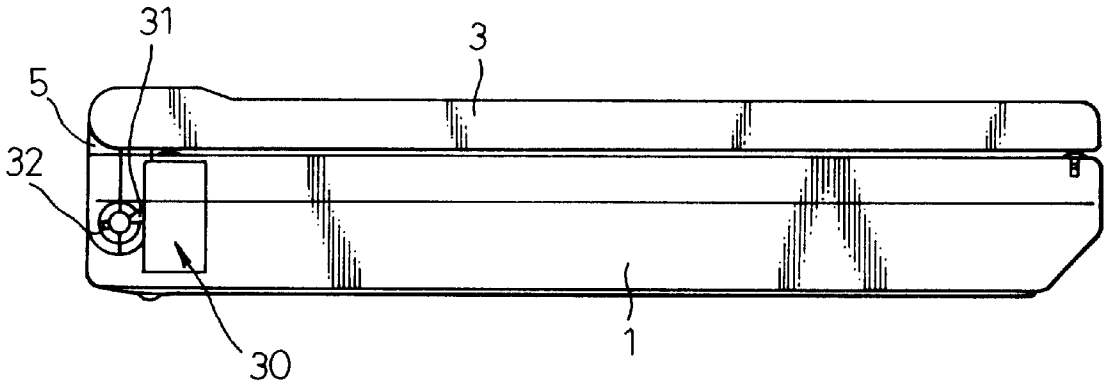


Fig.11(b)

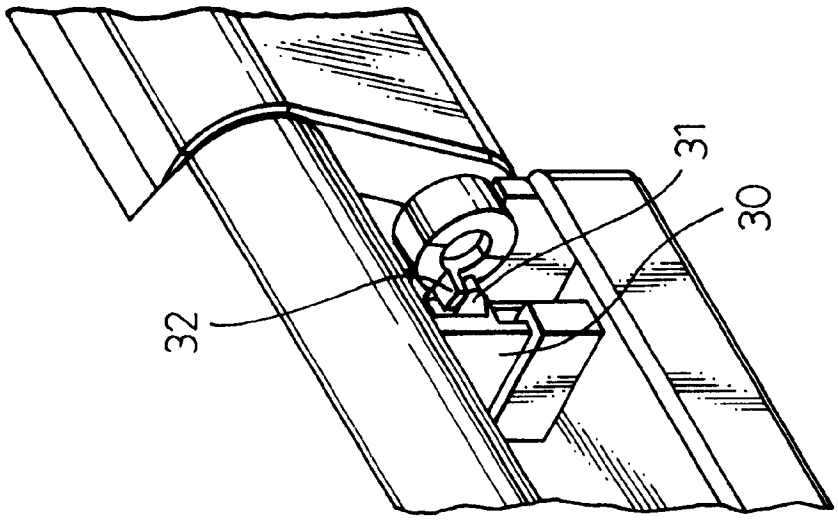


Fig.11(a)

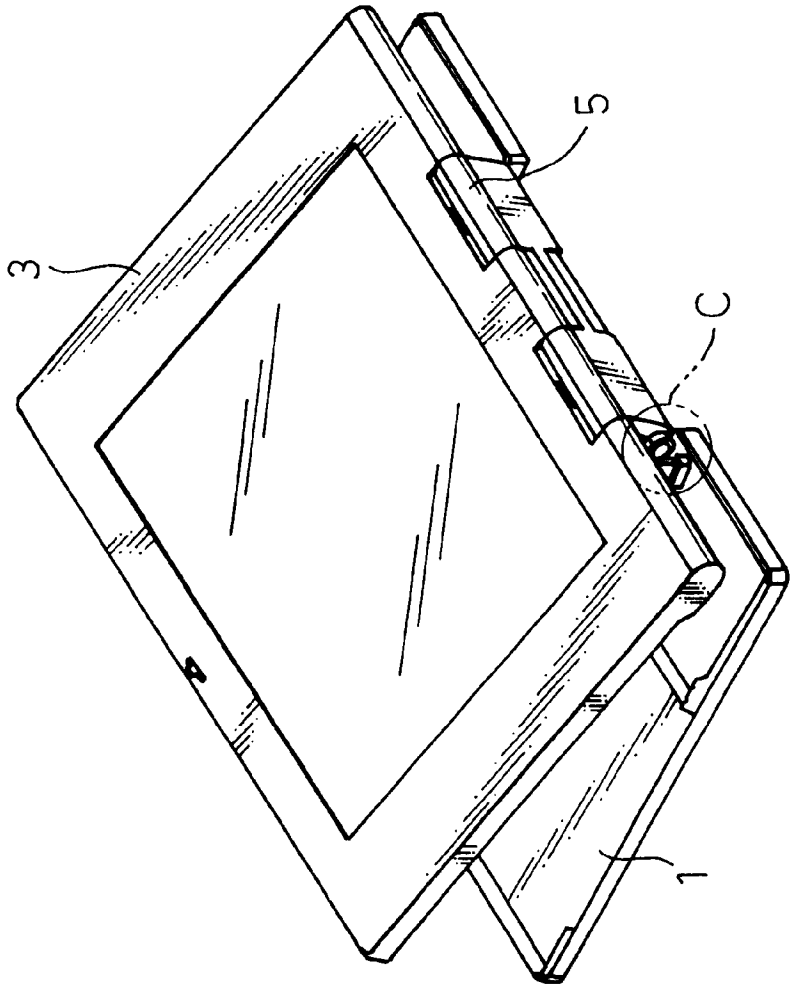


Fig.12

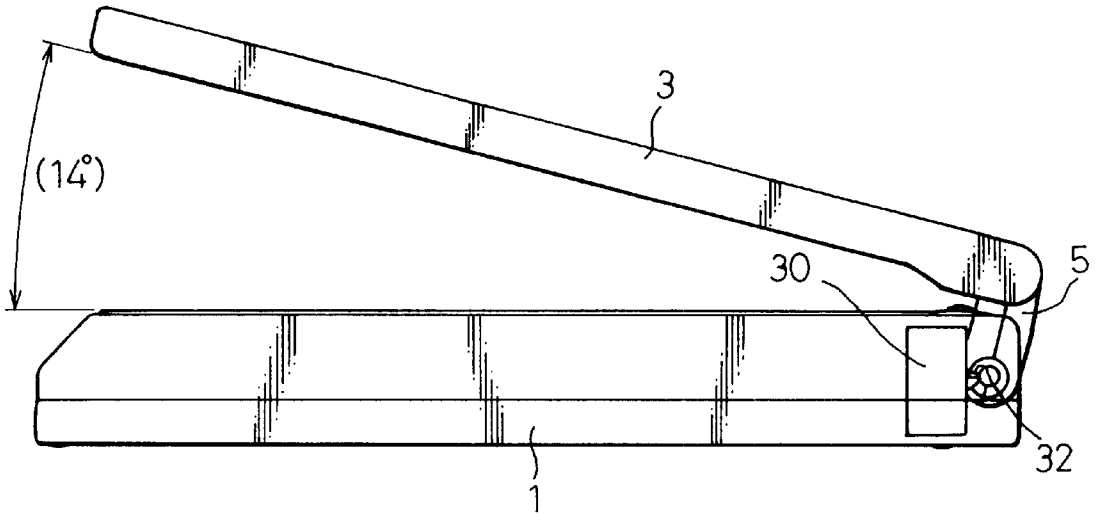


Fig.13

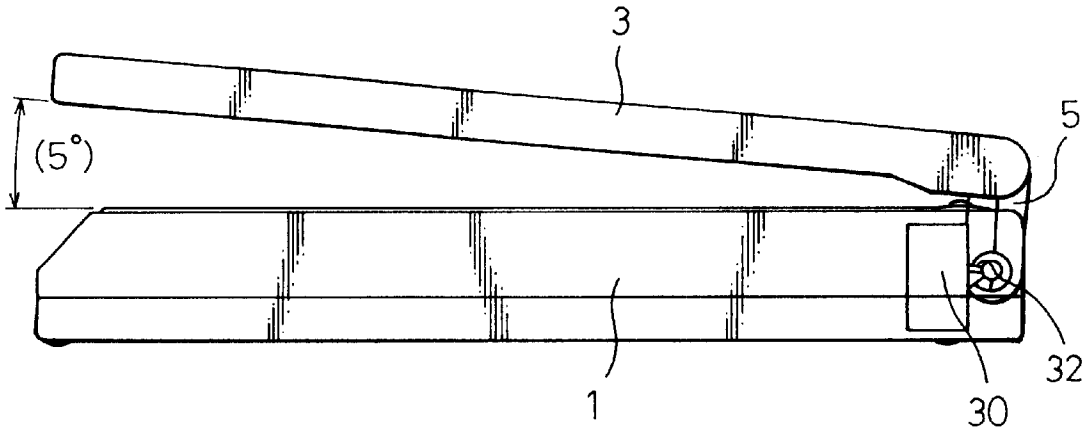


Fig.14

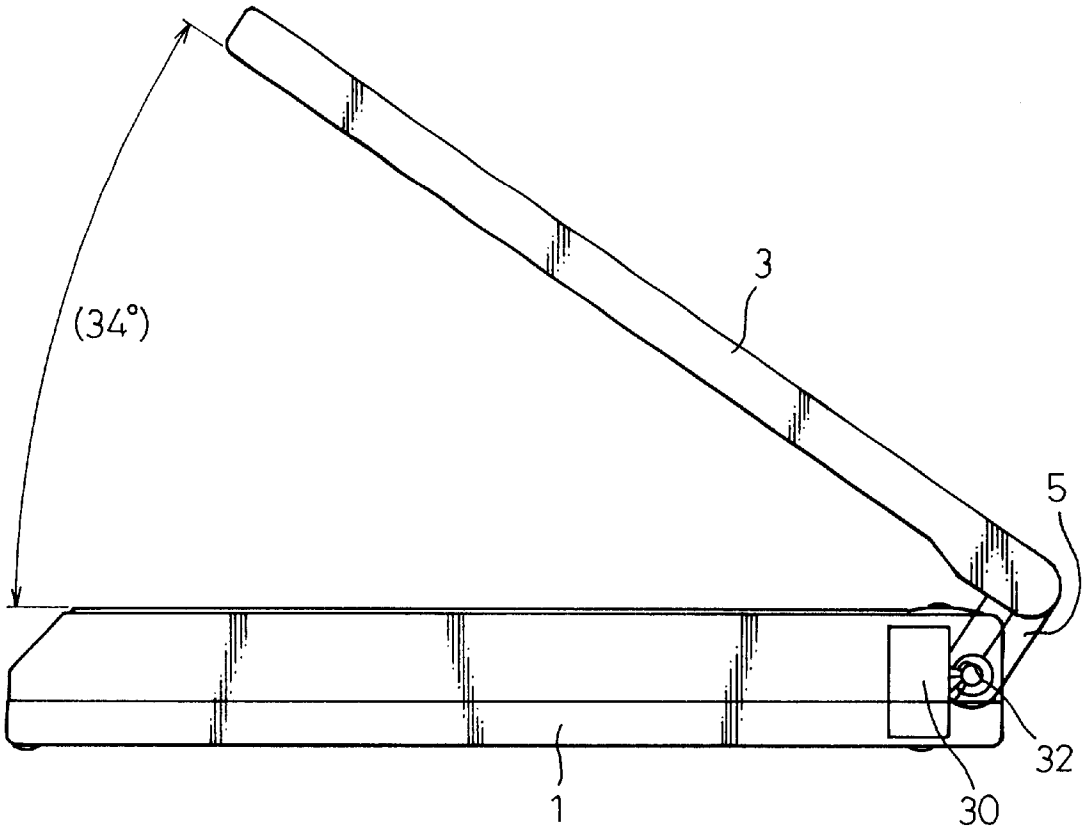


Fig. 15

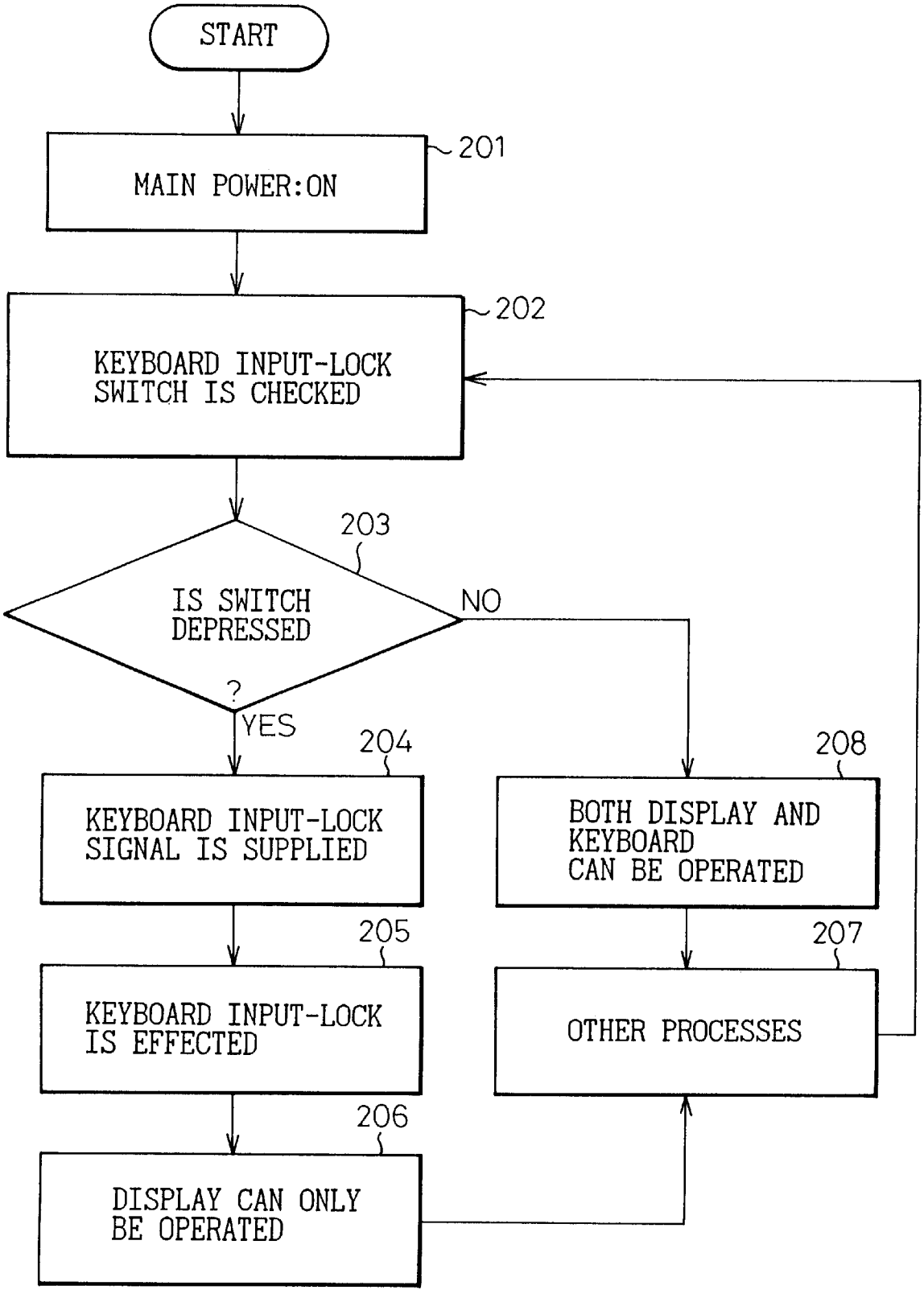

START
MAIN POWER:ON
201
KEYBOARD INPUT-LOCK SWITCH IS CHECKED
202
IS SWITCH DEPRESSED ?
203
NO
YES
KEYBOARD INPUT-LOCK SIGNAL IS SUPPLIED
204
KEYBOARD INPUT-LOCK IS EFFECTED
205
DISPLAY CAN ONLY BE OPERATED
206
BOTH DISPLAY AND KEYBOARD CAN BE OPERATED
208
OTHER PROCESSES
207

Fig.16(a)

PRIOR ART

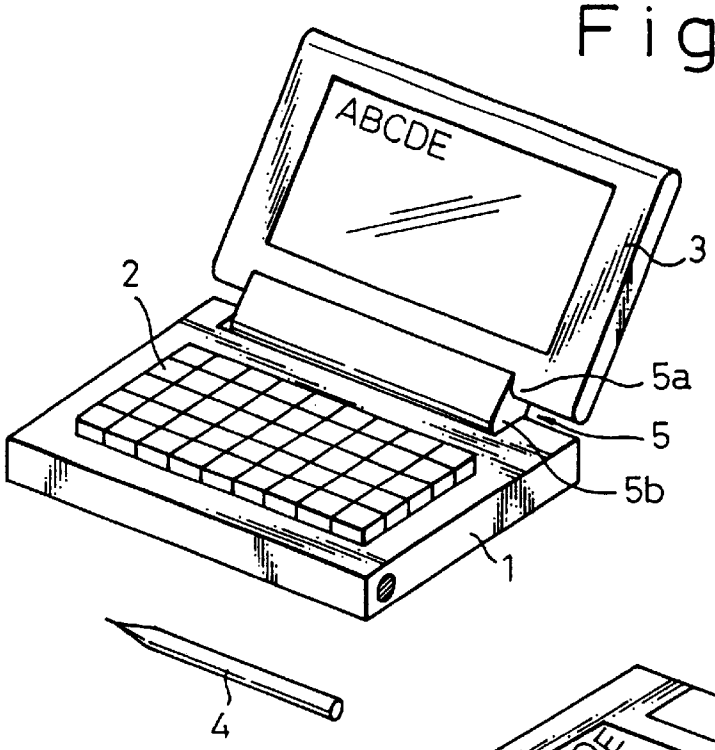


Fig.16(b)

PRIOR ART

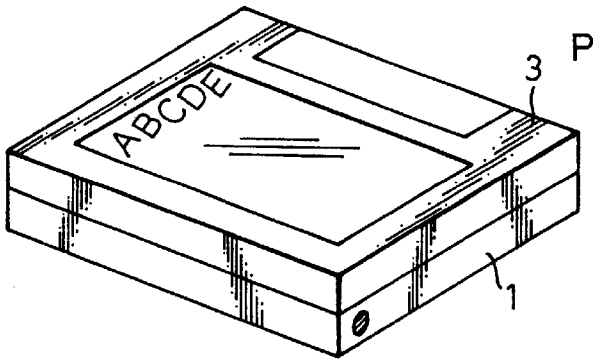


Fig.17(a)

PRIOR ART

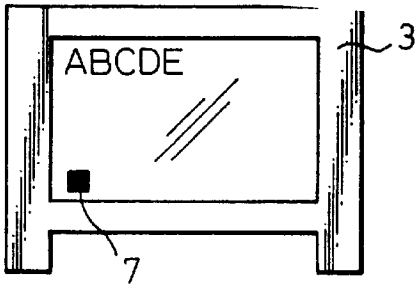
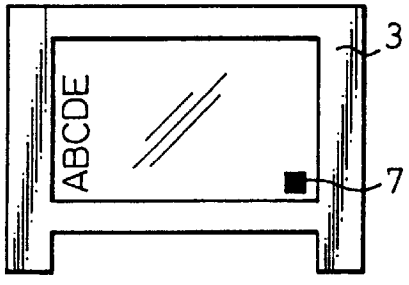


Fig.17(b)

PRIOR ART



SMALL-SIZED PORTABLE INFORMATION PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a small-sized portable information processing apparatus. More particularly, this invention relates to a small-sized portable information processing apparatus, such as a portable calculation machine, a portable computer, a portable word processor, an electronics note book or the like, having an information indication display, such as a liquid crystal display, or the like.

2. Description of the Related Art

It is required that a small-sized portable information processing apparatus be easily operated with a pen or the like operating element as well as being small-sized, lightweight, and easily portable. Therefore, an apparatus body, i.e., a housing, or case, is provided with a keyboard integral therewith. A liquid crystal display, which functions as a touch input panel, is pivotably attached to the apparatus body by means of a hinge, so that the liquid crystal display can be pivotably moved by approximately 360° with respect to the apparatus body. In such an apparatus, it is possible to input through the keyboard while watching the display and also possible to directly input to the liquid crystal display through a pen or the like after the liquid crystal display is pivotally moved (i.e., rotated) by 360° with respect to a closed position relatively to the apparatus body.

FIGS. **16**(*a*) and **16**(*b*) are perspective views of such a portable apparatus known in the prior art, in which FIG. **16**(*a*) shows the liquid crystal display opened to an obtuse angle position, relatively to the closed position with respect to the apparatus body so that the keyboard can be operated and FIG. **16**(*b*) shows that the liquid crystal display is pivotably moved by 360° with respect to the closed position thereof so that the liquid crystal display can face upwards to allow direct input thereto by a pan or the like. As shown in these drawings, the apparatus comprises an apparatus body **1**, a keyboard **2** integrally provided on the top of the apparatus body, a liquid crystal display **3** having its display surface as a touch panel and a hinge member **5** having two pivot shafts **5***a* and **5***b*.

As shown in these drawings, the liquid crystal display **3** is connected to the apparatus body **1** by means of the hinge member **5** having two pivot shafts **5***a* and **5***b*. More particularly, the rear edge of the liquid crystal display **3** is connected to one pivot shaft **5***a* of the hinge member **5** and the other pivot shaft **5***b* is connected to the rear edge of the apparatus body **1**.

As shown in FIG. **16**(*a*), when the liquid crystal display **3** is rotated to a predetermined angle (an obtuse angle) with respect to the keyboard **2**, it is possible to input through the keyboard while watching the display. Also, as shown in FIG. **16**(*b*), it is also possible to pivotably move the liquid crystal display by 360° with respect to the apparatus body **1** from its closed position so that information can be directly input through the pen **4** to the liquid crystal display **3** which functions as a touch panel.

The liquid crystal display **4** is substantially rectangular in shape. Therefore, in a state of FIG. **16**(*a*), it is preferable to set the apparatus so that the operator can input through the keyboard **2** while watching the liquid crystal display **3**. On the contrary, in a state of FIG. **16**(*b*), it is preferable to set the apparatus so that the operator can input through the liquid crystal display **3** using a pen **4** or the like.

Therefore, as shown in FIGS. **17**(*a*) and **17**(*b*), a display changing actuation position **17** is conventionally provided in the liquid crystal display **3** so that, when the operator touches this position with a tip of the pen **4**, the orientation of the liquid crystal display **3** is turned by 90°. If the position is touched again, the orientation of the liquid crystal display **3** is turned back to the initial state.

Another actuation position for keyboard lock or operation invalidation is also provided in the liquid crystal display **3** so that, when the operator touches this actuation position with the pen **4**, the function of the keyboard is locked or all or part of the operations are invalidated. If this actuation position is touched again, the keyboard lock or operation invalidation is released.

In this known portable information processing apparatus, the operator must use a pen **4** to touch the display changing position **17** every time the operator intends to change the liquid crystal display **3**. Also, the operator must use the pen **4** to touch the display changing position **17** to change the display back to the initial state. Such an operation necessarily is somewhat troublesome.

Unexamined Patent Publications (Kokai) Nos. 62-6295 and 62-17786 suggest a small-sized image display apparatus in which a matrix panel (liquid crystal display) is rotatable by 360° with respect to the apparatus body and the panel is changed to either light transmitting type or light reflecting type in accordance with the luminous intensity exerted on the matrix panel.

In these prior art, although the matrix panel is automatically changed to either light transmitting type or light reflecting type in accordance with the luminous intensity exerted on the panel, this image display changing apparatus is not of a type in which the display is automatically changed in accordance with the state of use.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to provide a small-sized portable information processing apparatus, in which the liquid crystal display can automatically be changed without using a pen or the like, but by only rotating the liquid crystal display with respect to the apparatus body so as to change its state of use.

Another object of the present invention is to provide a small-sized portable information processing apparatus, in which the function of the keyboard is locked or all or a part of the operations are automatically invalidated, by rotating the liquid crystal display with respect to the apparatus body so as to change its state of use.

According to the present invention, there is provided a small-sized portable information processing apparatus comprising: an apparatus body; a display panel pivotably attached to the apparatus body, the display panel having a plurality of data display orientations therein; detecting means for detecting an angle between the apparatus body and the display; and changing means for selecting one of the orientations of the display panel in accordance with a result from the detecting means. Thus, the orientation of the display can be easily and automatically changed by only pivotably moving the liquid crystal display panel.

The display panel is pivotably movable by up to approximately 360° with respect to the apparatus body by means of a pivot shaft provided therebetween and a to switch performs an ON-OFF operation thereof in accordance with relative rotation between the display panel and the apparatus body about the pivot shaft. Thus, the orientation of the display can be easily and automatically changed by a switch ON-OFF operation.

The switching means is arranged to perform the ON-OFF operation thereof at a position near to the position achieved when the display has moved approximately 360° from a closed position thereof with respect to the apparatus body. Thus, the orientation of the display can be automatically changed when the apparatus is set so that only the display is to be operated.

The switching means comprises a cam provided on one of two members which move relatively about the pivot shaft and a cam follower which is provided on the other member so as to always be in contact with the cam and is axially moved in accordance with the rotation of the cam, so that the switching means performs ON-OFF operation thereof in accordance with the axial movement of the cam follower.

In an alternative embodiment, the switching means comprises a cam provided on one of two members which move relatively about the pivot shaft and a cam follower is provided on the other member so as to always be in contact with the cam and to be axially moved in accordance with the rotation of the cam, one of the cam and the cam follower having a concave shape and the other having a convex shape so that, after the cam follower moves in the axial direction and once comes into contact with a switching element, the concave and the convex shapes are mutually engaged with each other and therefore the cam follower moves away from the switching element.

The switching means comprises a projection provided on one of two members which move relatively about the pivot shaft and a sensor switch is provided on the other member so as to perform ON-OFF operation thereof in accordance with the rotational movement of the projection.

The sensor switch may be a type of switch which magnetically detects a position in the rotational movement of the display with respect to the apparatus body.

The sensor switch may be a type of switch which optically detects a position in the rotational movement of the display with respect to the apparatus body.

Since there is no mechanical switch means, a switch having few structural or movable parts can be obtained.

The display comprises a liquid crystal touch panel which has a function of displaying letters, images and the others, and a function of inputting information by touching thereon. Thus, an input operation can be effected from either the touch panel or the keyboard.

The apparatus body comprises a keyboard integrally incorporated therein and a means for locking or invalidating operation of the keyboard in accordance with a relative rotational movement of the display with respect to the apparatus body. Since the keyboard lock or the invalidation of keyboard operation is effected, when the state of use is changed, any accidental input errors through the keyboard can be prevented in advance.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a first embodiment of the apparatus of this invention with the liquid crystal display in an opened state, or condition;

FIG. **2** is a perspective view of the first embodiment, but wherein the liquid crystal display is pivotably moved by 360° from the state of FIG. **1**;

FIGS. **3**(*a*) and **3**(*b*) are schematic views showing a non-operable state in which the liquid crystal display is in a closed state with respect to the apparatus body and a pen operable state in which the liquid crystal display is pivotably moved by 360° relatively to the closed state of FIG. **3**(*a*), respectively;

FIGS. **4**(*a*) and **4**(*b*) are cross-sectional views of the display changing means according to the first embodiment of this invention with the switching means being turned off and on, respectively;

FIG. **5** is a cross-sectional view taken along line I—I in FIG. **4**;

FIGS. **6**(*a*) and **6**(*b*) show a modified embodiment of the cam and cam follower shown in FIGS. **4**(*a*) and **4**(*b*) and the operation thereof, respectively;

FIG. **7** is a flow-chart showing an operation of the first embodiment;

FIG. **8** is a perspective view of a second embodiment of the apparatus of this invention with the liquid crystal display being in an opened position by a 360° rotation with respect to a closed position thereof relatively the apparatus body;

FIGS. **9**(*a*) and **9**(*b*) are a perspective view of the second embodiment with the liquid crystal display relatively to the body and an enlarged perspective view of a portion indicated by circle C in FIG. **9**(*a*), respectively;

FIG. **10** is a side view of the second embodiment, with the liquid crystal display closed;

FIGS. **11**(*a*) and **11**(*b*) correspond to FIGS. **9**(*a*) and **9**(*b*), respectively, but the angle between the liquid crystal display and the apparatus body is changed;

FIG. **12** is a side view of FIG. **11**;

FIG. **13** is a side view of FIG. **11** in which the angle of the liquid crystal display is further changed from the state of FIG. **12**;

FIG. **14** is a side view in which the angle of the liquid crystal display is still further changed from the state of FIG. **13**;

FIG. **15** is a flow-chart showing an operation of the second embodiment;

FIGS. **16**(*a*) and **16**(*b*) are perspective views showing a portable apparatus known in the prior art with the liquid crystal display in opened and closed positions, respectively; and

FIGS. **17**(*a*) and **17**(*b*) show a states of the known apparatus in which the liquid crystal display in FIG. **17**(*b*) is turned by 90°, from that in FIG. **17**(*a*).

DETAILED DESCRIPTION OF THE EMBODIMENTS

In the drawings, FIGS. **1** through **7** show a first embodiment of a small-sized portable information processing apparatus according to the present invention. FIGS. **1** and **2** are perspective views generally illustrating the first embodiment, in which FIG. **1** shows the embodiment with the crystal display panel opened so that a keyboard can be operated and FIG. **2** shows the same embodiment with the crystal display panel closed by pivotably moving the crystal display panel by 360° from a closed position so that any information can be input to the crystal display by a pen. As shown in these drawings, this embodiment includes a body (i.e., a case, or housing) **10** of the apparatus, a keyboard **2** provided on the top of the apparatus body, a touch-panel type crystal display **3** which also serves as a cover of the apparatus, a pen **4**, and a hinge member **5** having two pivot shafts **5***a* and **5***b*.

The liquid crystal display **3** is connected to the apparatus body **1** by means of two pivot shafts **5***a* and **5***b*. Particularly, the hinge member **5** has a first pivot shaft **5***a* which is connected to the rear edge of the liquid crystal display **3** and a second pivot shaft **5***b* which is connected to the rear edge of the apparatus body **1**.

As shown in FIG. **1**, when the liquid crystal display **3** is in a position at a predetermined angle with respect to the key board **2**, an operator can perform an input operation through the key board **2** while watching the liquid crystal display panel **3**. Also, as shown in FIG. **2**, when the liquid crystal display panel **3** is in a position after being turned by approximately 360° from the closed position relatively to the apparatus body **1** so that the back of the liquid crystal display panel comes into contact with the back of the apparatus body **1**, the operator can perform an input operation directly through the liquid crystal display **3**, as a touch panel, using a pen **4**. (In FIG. **2**, the liquid crystal display touch panel is on the back side of the keyboard **2**.)

The liquid crystal display **3** is substantially rectangular in shape. Therefore, it is preferable to place the apparatus as shown in FIG. **1**, so that the operator can operate the key board **2** with his fingers while watching the liquid crystal display **3** and, on the other hand, it is preferable to place the apparatus as shown in FIG. **2**, so that the operator can operate the liquid crystal display **3** with the pen or the like.

FIGS. **3**(*a*) and **3**(*b*) are illustrations explaining the turning, or rotation, of the liquid crystal display panel **3** with respect to the apparatus body **1** by 360° by approximately means of the hinge member **5** having two pivot shafts **5***a* and **5***b*, as shown by an arrow from a first position where the liquid crystal display panel **3** is close (i.e., is contiguous) to the apparatus body **1**, to a second position, where the operator can operate the liquid crystal display **3** by a pen. As can be seen from these drawings, while the liquid crystal display **3** is turned with respect to the apparatus body **1** by 360°, the respective pivot shafts **5***a* and **5***b* of the hinge member **5** turn by 180°, respectively, with respect to the hinge member **5**.

FIGS. **4**(*a*) and **4**(*b*) are cross-sectional views of a first embodiment of a switching mechanism of this invention for changing the orientation of the liquid crystal display, in which FIG. **4**(*a*) shows a status of the switch turned off and FIG. **4**(*b*) shows a status of the switch turned on. The switching mechanism can be provided, for example, on the hinge shaft **5***a* between the liquid crystal display **3** and the hinge member **5**.

The switching mechanism **10** comprises a body **20** rigidly attached to the side of the liquid crystal display **3**, a rotary portion fixed to the side of the hinge member **5** and a sliding member movable in the axial direction in response to the rotation of the rotary portion. The rotary portion comprises a shaft **11** fixed to the hinge member **5**, a cam **12** fixed to the tip of the shaft **11** and a flange **13** which allow the cam **12** to move in the rotational direction, but prevent the movement thereof in the axial direction. The slide portion comprises a cam follower or receiver **14** which contacts the cam **12**, a guide plate **15** fixed to the cam receiver **14** to allow the cam follower to move in the axial direction but to prevent the rotation thereof, and a shaft **16** fixed to the cam follower **14**. The guide plate **15** is offset from the shaft **16** to prevent interference therewith.

The body **20** comprises a bearing **21** rotatably supporting the shaft **11**, an annular guide grooves **22** rotatably guiding the, flange **13** but preventing axial movement thereof, axial guide grooves **23**, which axially guide the guide plate **15** but prevent the rotational movement thereof, a bearing **24** supporting the shaft **16** to allow axial movement thereof, and a switch element **25** which functions as a switch when it comes into contact with the shaft **16**. Also, there is a spring **26** provided along the shaft **16** between the wall of the bearing **24** and the cam follower **14** to keep the cam follower **14** always in contact with the cam **12**.

As mentioned above, while the liquid crystal display **3** is turned by substantially 360° with respect to the apparatus body from the closed position, the respective pivot shafts **5***a* and **5***b* are turned by 180°, respectively. The cam **12** and the cam follower **14** have inclined surfaces or spiral surfaces mutually contacting each other. Therefore, during this operation, the cam **12** is turned by 180° with respect to the cam follower **14**. Since the rotation of the cam follower **14** is prevented, the cam follower **14** is pushed in the axial direction by the cam **12** and axially moved in the direction of arrow B. When the cam **12** is rotated by a predetermined angle near to 180°, the end of the shaft **16** comes into contact with the switch element **25** and the switch is turned on, as shown in FIG. **4**(*b*). When the liquid crystal display **3** is returned to its original position with respect to the apparatus body **1**, for example the position as shown in FIG. **1**, the switch is turned off.

It is possible that the switching mechanism **10** is attached to the pivot shaft **5***b* of the apparatus body **1** side, in place of the pivot shaft **5***a* of the liquid crystal display **3** side. It is also possible that the apparatus body **1** of the switching mechanism **10** and the rotatable portion (cam **12**) are arranged in reverse. For instance, the apparatus body **20** may be provided in the hinge member **5** and the rotatable portion (cam **12**) may be provided in the hinge member **5**.

It is possible to regulate the rotational torques of the respective pivot shafts **5***a* and **5***b* in such a manner that, when the liquid crystal display panel **3** is turned by 360° with respect to the hinge member **5**, one of the two pivot shafts **5***a* and **5***b* is first turned by 180° and the other thereof (in which this switching means is incorporated) is then turned by 180°, and when it is turned oppositely, the other is first turned and the one is then turned.

FIG. **6**(*a*) shows a modified embodiment of the cam **12** and the cam follower **14**. In the same manner as the previous embodiment, an inclined or spiral surface is provided on the contact surface between the cam **12** and the cam follower **14**. In this modified embodiment, one of the cam **12** and the cam follower **14** is provided with a concave surface **12***a* and the other is provided with a corresponding convex surface **14***a* in such a manner that, after the end of the shaft **16** once comes into contact with a switching element **25**, the concave surface **12***a* and the convex surface **14***a* are engaged with each other so that the end of the shaft **16** comes away from the switching element **25**.

FIG. **6**(*b*) shows the relationship between the angle of rotation of the cam **12** with respect to the switch body **10** and the stroke of the shaft **16**. However, even if the end of the shaft **16** moves away from the switching element **25** after the end of the shaft **16** once comes into contact with the switching element **25**, the switching element **25** is kept in the on state. If an opposite operation is effected, the concave surface **12***a* of the cam **12** and convex surface **14***a* of the cam follower **14** move with each other, the end of the shaft **16** upon coming into contact with the switching element **25** turns off the switching element **25** and thereafter moves away from the switching element **25**. In this case, even if the shaft **16** moves away from the shaft **16** after it comes into contact therewith, the switching element **25** is kept in the off state.

When the switching element **25** is in the state OFF, the display of the liquid crystal **3** is positioned as shown in FIG. **1**. Therefore, it is preferable for the operator to operate the keyboard with his fingers while watching the liquid crystal display **3**. On the other hand, the switching element **10** is in the state ON, the display of the liquid crystal **3** is positioned

as shown in FIG. **2**. Therefore, it is preferable to operate the liquid crystal display panel **3** as a touch panel with a pen or the like. In FIG. **2**, the liquid crystal display **3** is positioned on the back side of the keyboard **2**.

FIG. **7** is a flow-chart showing an operation of the above-mentioned embodiment. First, the main power of this apparatus is turned ON (step **101**) and the state of the display changing switch **10** is checked (step **102**). When the switch is in a contact state (step **103**), a display changing signal is supplied (step **104**), the display of the liquid crystal **3** is turned by 90° (step **105**), the other processes are carried out (step **106**) and then the process is returned to step **102**. When the switch is not in the contact state, the display of the liquid crystal **3** is kept as the initial state (step **107**), the other processes are carried out (step **106**) and then the process is returned to step **102**.

A second embodiment of a small-sized portable information processing apparatus of this invention will now be described with reference to FIGS. **8** through **15**. FIG. **8** shows a state of the second embodiment with the liquid crystal display panel being opened by approximately 360° with respect to the apparatus body and FIGS. **9**(*a*), **9**(*b*) and FIG. **10** show the embodiment with the liquid crystal display panel being closed. FIG. **9**(*b*) is an enlarged perspective view of a portion indicated by C in FIG. **9**(*a*).

As shown in FIGS. **9**(*a*) and **9**(*b*), the liquid crystal display panel **3** is provided with a sensor switch **30** at a position near to the hinge member **5** on the back side thereof. On the other hand, the hinge member **5**, i.e., a rotatable side, is provided with a projection **32** which interfere with a movement path of a contact **31** of the sensor switch **30**.

As shown in FIGS. **9**(*a*), **9**(*b*) and FIG. **10**, when the liquid crystal display panel **3** is in a closed position with respect to the apparatus body **1**, the relationship between the contact **31** of the sensor switch **30** and the projection **32** of the hinge member **5** are apart from each other, by nearly 180°, the projection **32** of the hinge member **5** does not interfere with the contact **31** of the sensor switch **30** and therefore the switch is in OFF state.

FIGS. **11**(*a*) and **11**(*b*) correspond to FIGS. **9**(*a*) and **9**(*b*), respectively, and FIG. **12** corresponds to FIG. **10**. In this state, the liquid crystal display panel **3** is turned with respect to the apparatus body **1** from the position shown in FIGS. **9**(*a*), **9**(*b*) and 10 by 346° (the angle between the apparatus body **1** and the liquid crystal display panel **3** is 14°). In this state, the relationship between the contact **31** of the sensor switch **30** and the projection **32** of the hinge member **5** is a turned state by nearly 180° from the position of FIGS. **9**(*a*), **9**(*b*) and **10**, the projection **32** comes into touch with the contact **31** of the sensor switch **30** and therefore the switch is in ON state.

The angle of the liquid crystal display panel **3**, with respect to the apparatus body **1**, at which the sensor switch **30** performs the ON-OFF changing action, can be suitably selected by changing the position of the projection **32**. For example, FIG. **13** shows a case in which the ON-OFF changing action is performed at a position of the liquid crystal display **3** which is turned by 355° with respect to the apparatus body **1** from the state shown in FIGS. **11**(*a*), **11**(*b*) and **12**. Also, FIG. **14** shows another case in which the projection **32** comes into touch with the contact **31** of the sensor switch **30** to perform the switch ON-OFF changing action at a position of the liquid crystal display panel **3** which is turned by 35° with respect to the apparatus body **1** from the state shown in FIGS. **11**(*a*), **11**(*b*) and **12**.

In the same manner as the first embodiment, the sensor switch **30** and the projection **32** can be provided on the apparatus body **1** and the hinge member **5**, respectively. It is also possible that the sensor switch **30** is provided on the hinge member **5** and the projection **32** is provided on liquid crystal display panel **3** or the apparatus body **1**. For example, when the sensor switch **30** is in the state ON, a keyboard lock is effected (i.e., is active), and on the contrary when the sensor switch **30** is in the state OFF, the keyboard is unlocked. If the keyboard lock is to be effected, all of the keys may be made unoperable or only a part of the keys may be made unoperable.

Also, instead of the keyboard lock being effected, any actions to the apparatus can be ignored. For example, all or part of the inputs by the pen or keyboard can be ignored, the presentation on the display can be fully or partially invalidated, or any other actions can be made ineffectual.

FIG. **15** is a flow-chart showing an operation of the second embodiment. First, the main power (not shown) of this apparatus is turned ON (step **201**) and the state of the keyboard input lock switch **10** is checked (step **202**). When the switch is in a contact state (step **203**), a keyboard input lock signal is supplied (step **204**), the keyboard input lock is effected (step **205**) so that an input operation can only be performed on the display (step **206**), the other processes are carried out (step **207**) and then the process is returned to step **202**. When the switch is not in the contact state, the keyboard input lock is not effected (step **205**) so that an input operation can be performed both by the keyboard and the display (step **208**), the other processes are carried out (step **207**) and then the process is returned to step **202**.

It should be understood by those skilled in the art that the foregoing description relates to only some preferred embodiments of the disclosed invention, and that various changes and modifications may be made to the invention without departing from the spirit and scope thereof.

What is claimed is:

1. An information processing apparatus, comprising:

a body;

a display panel attached to said body and rotatably movable through an angle of up to substantially 360° relatively to said apparatus body, said display panel having plural individually selectable data display orientations;

a detector detecting at least a predetermined size of the angle between said apparatus body and said display panel; and

a display orientation selector selecting a corresponding one of said data display orientations in accordance with the size of the angle detected by the detector, in such a manner that the data display orientation is changed automatically by approximately 90° when the display panel is rotated by approximately 360° with respect to the base.

2. An information processing apparatus according to claim **1**, wherein said body further comprises an input unit.

3. An information processing apparatus according to claim **2**, further comprising:

a disabling unit selectively disabling operation of said input unit in accordance with said detector detecting an angle of a prescribed size between said display panel and said body.

4. An information processing apparatus according to claim **2**, wherein said input unit is a keyboard.

5. An information processing apparatus according to claim **1**, wherein said display panel further comprises a touch sensitive input unit.

6. The information processing apparatus according to claim **5**, further comprising:

a disabling unit disabling operation of said touch sensitive input unit in accordance with said detector detecting the angle.

7. An information processing apparatus according to claim **6**, further comprising:

a disabling unit selectively disabling operation of said touch sensitive input unit of said body in accordance with said detector detecting the angle between said display panel and said body.

8. An information processing apparatus according to claim **7**, wherein said touch sensitive input unit is enabled for inputting information at least when the operation of said input unit of said body is disabled.

9. An information processing apparatus according to claim **1**, further comprising a hinge comprising a first shaft connected to said body and a second shaft connected to said display panel, said hinge allowing the display panel to rotate relatively to the body through an angle of up to substantially 360°.

10. An information processing apparatus according to claim **1**, wherein said display panel displays at least letters and images and is touch responsive for inputting information.

11. An information processing apparatus according to claim **1**, wherein:

said display panel is rotatable through an angle of up to substantially 360° relatively to said body by means of a pivot shaft provided therebetween; and

said detector comprises a switching mechanism performing an ON-OFF operation in accordance with respective, different angles between said display panel and said apparatus body, produced by relative rotation thereof about said pivot shaft.

12. An information processing apparatus accordingly to claim **11**, wherein said switching mechanism performs the ON-OFF operation thereof in response to rotation of said display panel through an angle of substantially 360° from a closed position thereof with respect to said body.

13. An information processing apparatus according to claim **11**, wherein said switching mechanism comprises a cam on one of two members respectively connected to the body and the display panel and which rotate therewith, and relatively to each other, about said pivot shaft and a cam follower positioned on the other member so as to always be in contact with said cam and so as to be axially moved in accordance with rotation of said cam relatively to the cam follower, said switching mechanism performing the ON-OFF operation thereof in accordance with the axial movement of said cam follower.

14. An information processing apparatus according to claim **11**, wherein said switching mechanism comprises a switching element, a cam provided on one of two members respectively connected to the body and the display panel and which rotate therewith, and relatively to each other, about said pivot shaft and a cam follower positioned on the other member so as to always be in contact with said cam and so as to be axially moved in accordance with rotation of said cam relatively to the cam follower, one of said cam and said cam follower having a concave surface and the other having a convex surface, so that relative rotation between said cam and said cam follower in a first direction causes, said cam follower to move in a first sense in the axial direction and come into contact with said switching element and an opposite direction of relative rotation between said cam and said cam follower causes said cam follower to move in the opposite sense in the axial direction, causing said cam follower to move away from said switching element.

15. An information processing apparatus according to claim **11**, wherein said switching mechanism comprises a projection on one of two members, respectively connected to the body and the display panel and which rotate relatively to each other about said pivot shaft, and a sensor switch on the other member, so as to perform an ON-OFF operation of said sensor switch in accordance with the rotational movement of said projection.

16. An information processing apparatus according to claim **15**, wherein said sensor switch magnetically detects a position in the rotational movement of said display panel with respect to said apparatus body.

17. An information processing apparatus according to claim **15**, wherein said sensor switch optically detects a position in the rotational movement of said display panel with respect to said apparatus body.

18. An information processing apparatus according to claim **1**, wherein said display panel has a substantially rectangular shape, longer sides thereof being parallel to an axis around which said display panel is rotatable with respect to said apparatus body.

19. An information processing apparatus according to claim **18**, wherein the display panel has a further axis disposed centrally of and perpendicular to a plane of the substantially rectangular shape and the change of the data display orientation on the display panel comprises a rotation about the further axis by approximately 90° from a first position in which top and bottom edges of the display are parallel to, to a second position in which the top and bottom edges of the display are perpendicular to, the long edges of the rectangular shape.

20. An information processing apparatus according to claim **18**, wherein the data display has selectable orientations parallel to and perpendicular to the longer sides of the substantially rectangular shape of the display panel and the data display orientation is changed therebetween when the display panel is rotated by approximately 360° with respect to the base.

21. An information processing apparatus comprising:

a body having a keyboard;

a display panel attached to said body and rotatably movable through an angle of up to 360°, encompassing plural selectable data display orientations of said display panel, relatively to said body;

a touch sensitive input unit;

a detector detecting at least a predetermined size of the angle between said apparatus body and said display panel; and

a disabling unit disabling operation of said touch sensitive input unit in accordance with said detector detecting the angle, in such a manner that the operation of said keyboard is disabled and the data display orientation is changed by approximately 90° when the display panel is rotated by substantially approximately 360° with respect to the body.

22. An information processing apparatus according to said claim **21**, wherein input to said touch sensitive input unit is performed by a pen.

23. An information processing apparatus according to claim **21**, wherein said touch sensitive input unit is disposed at said display panel.

24. An information processing apparatus according to claim **21**, further comprising a hinge comprising a first shaft connected to said body and a second shaft connected to said display panel, said hinge allowing the display panel to rotate relatively to the body through an angle of up to substantially 360°.

25. An information processing apparatus according to claim 21, wherein said display panel displays at least letters and images and is touch sensitive for inputting information.

26. An information processing apparatus according to claim 21, wherein said display panel has a substantially rectangular shape, longer sides thereof being parallel to an axis around which said display panel is rotatable with respect to said apparatus body.

27. An information processing apparatus according to claim 26, wherein the display panel has a further axis disposed centrally of and perpendicular to a plane of the substantially rectangular shape and the change of the data display orientation on the display panel comprises a rotation about the further axis by approximately 90° from a first position in which top and bottom edges of the display are parallel to, to a second position in which the top and bottom edges of the display are perpendicular to, the long edges of the rectangular shape.

28. An information processing apparatus according to claim 26, wherein the data display has selectable orientations parallel to and perpendicular to the longer sides of the substantially rectangular shape of the display panel and the data display orientation is changed therebetween when the display panel is rotated by approximately 360° with respect to the base.

* * * * *

Exhibit 1015

US007061472B1

(12) **United States Patent**
Schweizer et al.

(10) **Patent No.: US 7,061,472 B1**
(45) **Date of Patent: Jun. 13, 2006**

(54) **PRESENTATION DEVICE**

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(73) Assignee: **Jopet GmbH & Co. KG**, Norderstedt (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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PCT Pub. Date: **Jan. 11, 2001**

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Oct. 29, 1999 (DE) 199 52 486

(51) **Int. Cl.**
G09G 5/00 (2006.01)

(52) **U.S. Cl.** **345/168**; 345/156; 345/169; 361/681

(58) **Field of Classification Search** 345/168, 345/169, 173, 1.1–23
See application file for complete search history.

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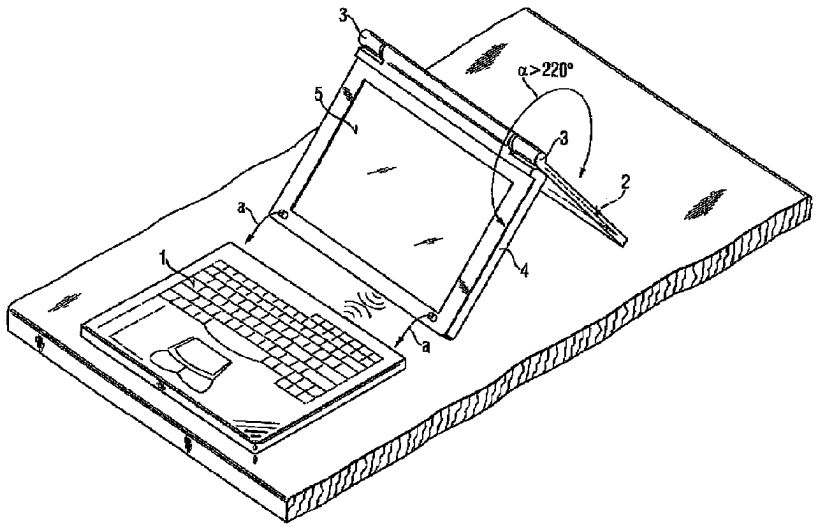
* cited by examiner

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Assistant Examiner Alecia D. Nelson
(74) *Attorney, Agent, or Firm*—Henry M. Feiereisen

(57) **ABSTRACT**

The invention relates to a presentation device which is primarily designed for advising customers while conducting visits outside of the office. A laptop computer with a detachable keyboard (**1**) has a second display screen (**5**) located under the same. A primary display screen (**2**) can be pivoted around an angle of at least 220° so that, during a presentation, two people located opposite one another can each view a display screen. The presentation device can also be used as a conventional laptop.

7 Claims, 4 Drawing Sheets



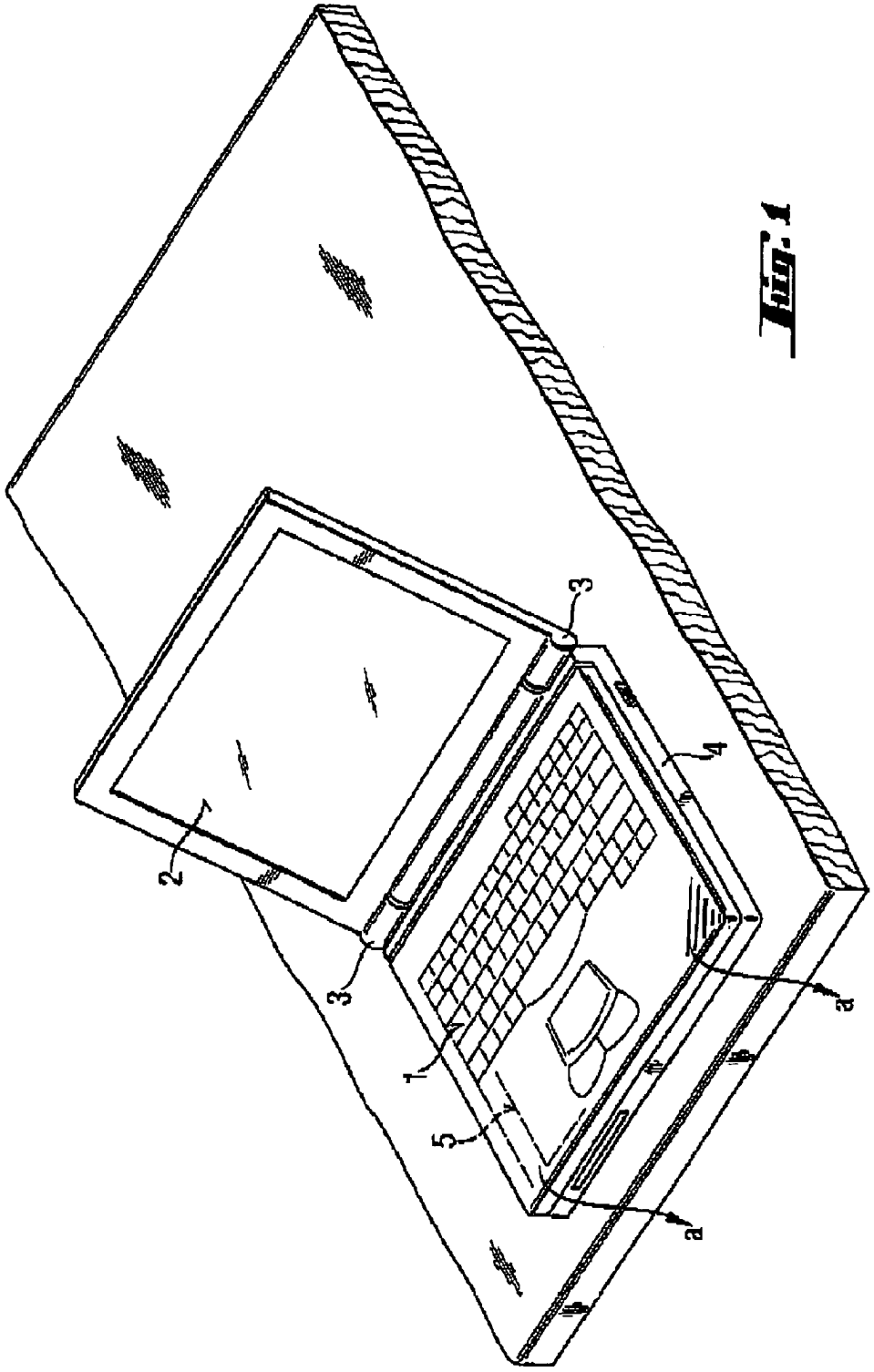


Fig. 1

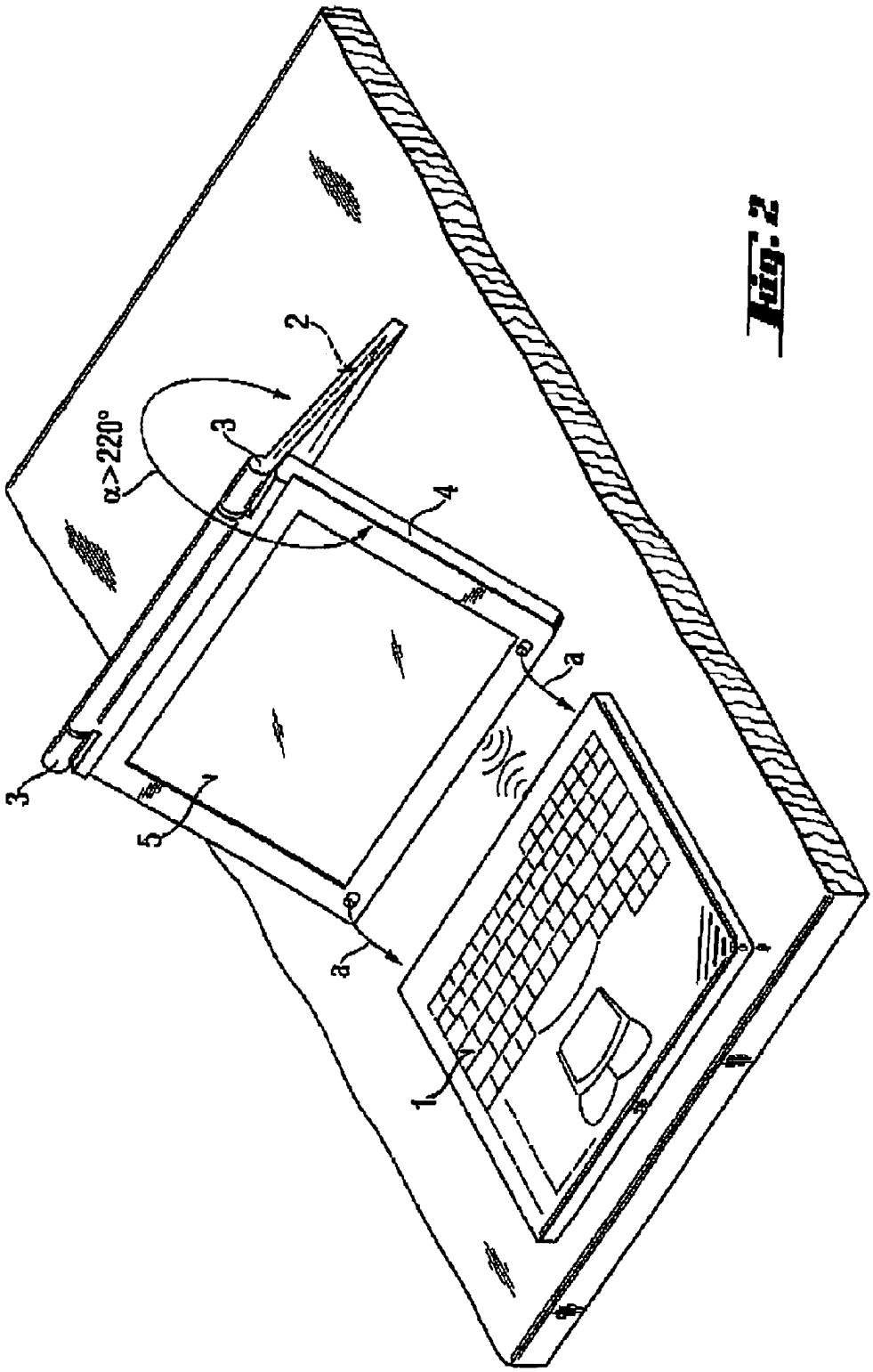


Fig. 2

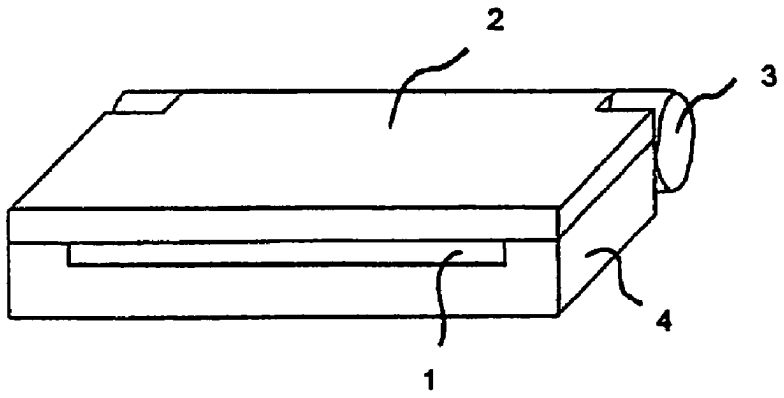


Fig. 3

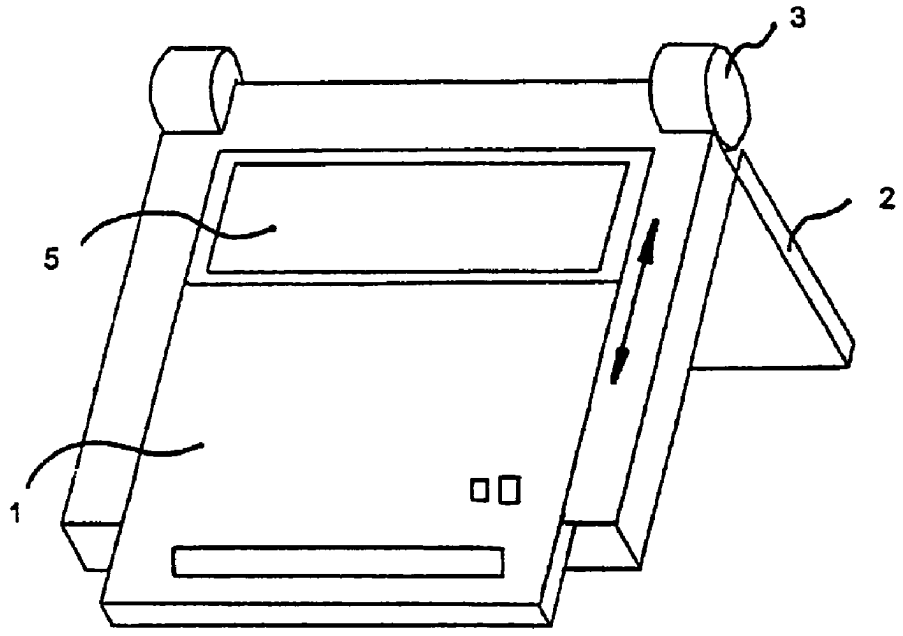


Fig. 4

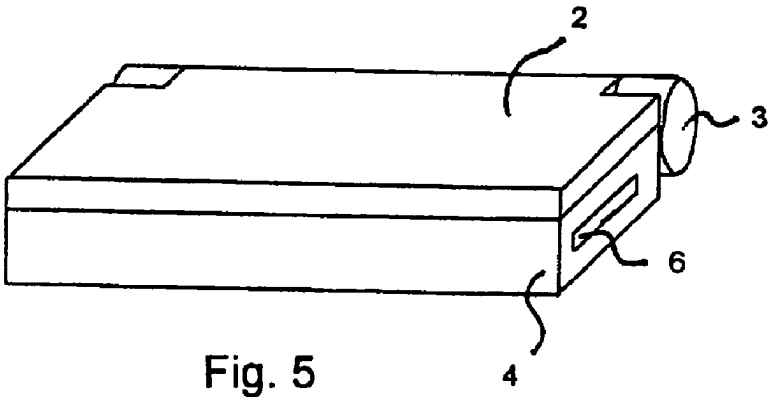


Fig. 5

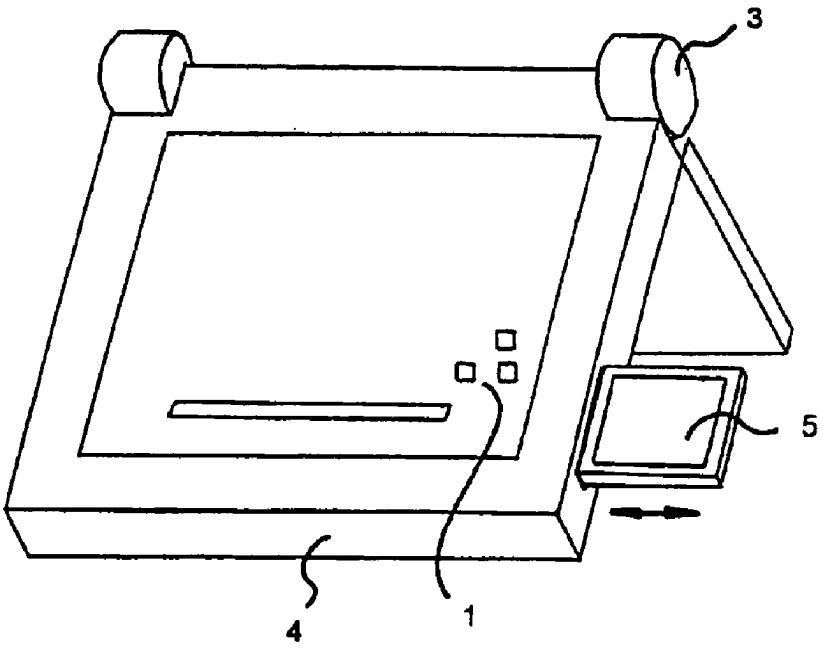


Fig. 6

PRESENTATION DEVICE

The invention concerns a presentation device, which is primarily designed for advising customers by agents in the field.

If a consultation or sales discussion is conducted at the customer's site, the available space is often not suitable for an optimal presentation, i.e., a modern presentation means, such as, e.g., an overhead projector with an LC display or a video projector, cannot be utilized. If, for example, insurance agents or financial service providers visit customers in their homes, it is not possible to set up a wall for projection. And such rearrangements of the room will be discouraged by most customers. It is thus usual to make calculations and diagrams on a piece of paper and then to rotate the paper halfway to the customer so that he can follow the additional written explanation. It is also possible to utilize a laptop computer, but this introduces problems, since [both] the salesman and the customer must both observe a relatively small display screen.

It has been shown that a presentation with a computer offers a number of advantages. The most varied types of life insurance can be calculated e.g., by means of special software and can be presented immediately graphically, i.e., easy to understand and thus convincing. Since this presentation technique is being continuously further developed and is accepted as very convenient by the customer, there is an urgent need to utilize this technique also for small presentation use on site, i.e., in the customer's residence or in a small office space.

Small modern computers, such as, e.g., small notebooks, due to their high computing power, in principle, offer the possibility of also applying programming and memory-intensive, i.e., demanding, presentation software. Thus, a convincing presentation would also be possible on site at the customer's location, if the above-named problem of space limitations could be solved.

It was proposed for this purpose, e.g., in the German GBM [Utility Model] 94 06985 to connect another flat display screen by means of a hinge to a conventional laptop with flat display screen on its upper edge, so that two-persons sitting across from each other can each view one display screen. This device is suitable in principle for the provided case of application, but is very cumbersome in operation. Therefore, there is the need for a further improvement of the presentation quality, for another decrease in cost, for a reduction in weight, or for an improved ease of operation.

The object of the invention consists of creating a computer-supported presentation device, which makes possible a convincing presentation even under very limited spatial constraints and is easy to operate.

The object is solved with a device according to claim **1**. The presentation device is a conventional laptop computer with a removable keyboard and a main display screen that can be rotated out, which is applied onto the base unit of the laptop computer when folded in and covers the keyboard.

According to the invention, another display screen is arranged under the keyboard in the base unit of the laptop computer, which is also connected to the laptop computer. In addition, the hinge of the main display screen that can be rotated out is designed so that the main display screen can be rotated by at least approximately 220 degrees.

The presentation device can be utilized as a conventional laptop computer, whereby the keyboard can be removed as desired.

If a second person is to be shown a presentation, the main display screen can be rotated out by at least 220 degrees or more, so that the second person can now view the main display screen. The image of the main display screen is rotated by 180 degrees by a control device.

The operator controls the presentation by means of the keyboard, a mouse or other input devices and follows the course of the presentation on the second display screen, which is arranged under the keyboard in the base unit of the laptop computer, whereby the keyboard does not lie on the base unit during the presentation, but is connected in a wireless manner to the computer.

The principal advantage of this form of embodiment of the invention in comparison to GBM [Utility Model] 94 06985 consists of the fact that no additional mechanical holding device is necessary for the second display screen, since the display screen is integrated directly in the base unit of the laptop and is held there in a mechanically stable manner. By these measures, the costs and the total weight of the presentation device are considerably decreased in comparison to the solution according to GBM [Utility Model] 94 06985. In addition, handling is improved.

The second display screen can be turned on and the image of the main display screen can be swung out selectively by a switch or by keyboard input manually. However, an automatic turning on and rotation of the image according to claim **2**, e.g., by arranging a device that recognizes the turning angle coupled to the hinge, which causes the image of the main display screen to rotate by 180 degrees and also to turn on the second image screen when a predetermined rotating angle of the main display screen is present.

According to claim **3**, the second display screen is smaller than the main display screen. This enhancement is advantageous, if, e.g., a time-consuming graphic is to be shown to the customer, that is, e.g., an attractive and convincing presentation. The operator, i.e., the salesman, does not require this high-value presentation. He needs only to be able to follow the presentation and to be able to examine the correctness of the input of data, e.g., the personal data of the customer, if such inputs are made.

Since the second display screen also requires a smaller resolution, it is more cost-favorable than the main display screen, whereby the total costs can be further decreased.

The object of the invention is also solved with a device according to claim **4**.

The presentation device is a laptop computer with a keyboard that can be pulled out and a main display screen that can be rotated out, which lies on the base unit of the laptop computer and covers the keyboard when it is pushed in.

According to the invention, another display screen, which is also controlled by the laptop computer, is arranged under the keyboard in the base unit. In addition, the hinge of the main display screen that can be rotated out is configured in such a way that the main display screen can be rotated by at least 220 degrees.

The presentation device can be utilized as a conventional laptop computer, wherein the keyboard can be pulled out as desired, so that the display screen that lies under it is visible. This is, e.g., appropriate, if a menu is indicated on the second display screen, in order to be able to utilize the entire display surface of the main display screen [for the presentation].

If a second person is to be shown a presentation, the main display screen is rotated out by at least 220 degrees or more, so that the second person can now view the main display screen. The image of the main display screen is rotated by 180 degrees by a control device.

The operator controls the presentation by means of the keyboard, a mouse or other input devices and follows the course of the presentation on the second display screen with the function of a control display screen.

The second display screen can be turned on and the image of the main display screen can be rotated out selectively and manually by means of a switch or by keyboard input. However, according to claim **5**, an automatic turning on and rotation of the image is appropriate, e.g., by coupling the hinge with a device that recognizes a rotating angle, which causes the image of the main display screen to rotate by 180 degrees and also the second display screen is turned on when a predetermined rotating angle of the main display screen is present.

According to claim **6**, the second display screen is a black-and-white display screen. This enhancement is advantageous, e.g., if a time-consuming color graphic is to be shown on the main display screen to the customer, which is, e.g., an attractive and convincing presentation. The operator, i.e., the salesman, does not need this high-value presentation. He only needs to be able the follow the presentation and to be able to check that the input is correct, if inputs are made, e.g., personal data of the customer.

Since the second display screen also requires a smaller resolution, it is more cost-favorable than the main display screen, whereby total costs can be reduced.

According to claim **7**, the keyboard can be removed as desired, whereby the communication with the computer is made by means of a wireless data interface. This option is then of advantage, if the presentation device, e.g., is to stand next to the customer.

The object is further solved with a device according to claims **8** and **12**.

According to claim **8**, the notebook has a main display screen, an integrated computer and a current supply, as is usual for conventional laptops, notebooks, etc. In addition, a second display screen is provided, which is arranged in the slot for the CD-ROM drive or a slot provided particularly for this purpose. Since two display screens are to be controlled, it is clear to the person of average skill in the art that the electronics necessary for this purpose must also be provided.

In addition, a control unit is provided, which rotates the image of the main display screen by 180 degrees for the presentation, so that it is correct for observation. It is clear to the person of average skill in the art that the hinges for this must be appropriately configured.

If the notebook is to be used for the presentation, the main display screen will rotate out at an angle of approximately 270 degrees, so that a roof-like structure of approximately 90 degrees can be set up in a stationary manner on a table. The observer, e.g., a customer, who sits opposite the operator, can view quite well the main display screen, and e.g., follow the displayed development of his life insurance.

The operator, e.g., the insurance salesman, can thus follow the input on the second display screen, and the screen can be driven laterally by an electric motor so that it travels out from a slot after a specific keyboard input or after actuating a switch, so that the observer can view it. Although this monitoring display screen is essentially smaller than the main display screen, this size is fully sufficient for monitoring the input.

When the presentation has terminated, the monitoring display screen is again driven by an electric motor or manually to travel back into the slot.

According to claim **9**, the flat display screen unit can be easily removed from the base unit. This measure provides user-friendly service.

According to claim **10**, the flat display unit is arranged in the slot for the disk drive. This form of embodiment is particular advantageous, since a conventional notebook need only be changed in its construction at the hinges and can be used as a conventional notebook without limitations. This form of embodiment is particularly cost-favorable. It is clear to the person of average skill in the art that the electrical plug connection must be designed and wired for this purpose.

According to claim **11**, the main display screen is designed for contact-sensitive input, whereby the operator can immediately recognize on the second image screen, i.e., on the monitoring display screen, which position of the main display screen, on which, e.g., a diagram is shown, the customer touches with his finger or with a pen.

Claim **12** concerns an independent invention. A flat display screen unit is designed such that it can be utilized in the slot provided in the notebook for a CD-ROM drive, instead of this drive, whereby the slot, however, is arranged at the side edge of the notebook. The flat display screen unit contains a drive with an electric motor, which drives the flat display screen in and out, as is usual for a CD-ROM drive.

The forms of embodiment of the invention are explained on the basis of the appended schematic drawings.

FIG. **1** shows a perspective lateral view of a first form of embodiment of the invention for conventional use as a laptop.

FIG. **2** shows a perspective lateral view of the invention according to FIG. **1** for use as a presentation device.

FIG. **3** shows a perspective lateral view of a second form of embodiment of the invention for conventional use as a laptop.

FIG. **4** shows a perspective lateral view of the invention according to FIG. **3** for use as a presentation device.

FIG. **5** shows a perspective lateral view of a third form of embodiment of the invention for conventional use as a laptop.

FIG. **6** shows a perspective lateral view of the invention according to FIG. **5** for use as a presentation device.

FIG. **1** shows a perspective lateral view of the invention for conventional use as a laptop with a keyboard **1**, a main display screen **2**, which is attached with hinges **3** to a base unit **4** of the laptop, so that it can be rotated out. It is also possible, if desired, to remove keyboard **1**. The keyboard with separate power supply means can be coupled in a wireless manner in this example by means of a conventional infrared interface, whereby it is up to the person with average skill in the art also to utilize other wireless couplings.

FIG. **2** shows the invention for use as a presentation device. The IR-coupled keyboard **1** is removed, so that the operator can view a second display screen **5**. The main display screen **2** is rotated out as a first display screen, as shown by the double arrow. The customer thus can view correctly the image of the main display screen, if this image is rotated electronically by 180 degrees.

FIG. **3** shows a perspective lateral view of the invention for conventional use as a laptop with a keyboard **1**, a main display screen **2**, which is attached with hinges **3** to a base unit **4** of the laptop in such a way that it can be rotated out. It is also possible, if desired, to pull out the keyboard.

FIG. **4** shows the invention for use as a presentation device. Keyboard **1** is pulled out, so that the operator can view the second display screen **5**. The main display screen **2** is rotated out, as shown by the double arrow. The customer can observe the image correctly on the main display screen, if it is electronically rotated by 180 degrees.

FIG. **5** shows a notebook in the closed state. It does not differ from a conventional notebook and has a slot **6** for the uptake of additional devices.

FIG. **6** shows the notebook as a presentation device. The main display screen **2** is rotated out at an angle of approximately 270 degrees, so that a roof-like structure is formed, which is arranged in a stationary manner between the customer and the salesman. A slot **6**, e.g., for a CD-ROM drive is arranged on the cross side of base unit **4** of the notebook. A control monitoring unit with a flat display screen **5** that can travel out is found in this slot **6**. If the presentation device is to be used, the image on main display screen **2** is rotated electronically by 180 degrees, so that the customer can observe an image that is an upright-positioned and laterally correct image. The flat image screen **5** of a control monitoring unit is made to travel out by means of a drive with an electric motor, by means of a switch or by a keyboard input, and then can be viewed by the salesman for monitoring the input.

The configuration of the electric-motor drive of the control monitoring unit for moving out the flat image screen **5** can be omitted for the person of average skill in the art, since no inventive activity is involved. The same is true for the creation of the control electronics for rotating the image of the main display screen by 180 degrees and for the control of the flat display screen **5** of the control monitoring unit.

In summary, it is established that the subjects of claims **1**, **4** and **8** are based on a uniform basic principle. According to this construction principle, the secondary image screen **5** is arranged underneath keyboard **1**, the primary image screen **2** can be rotated out at an angle of at least 220 degrees, and the image of the primary display screen **2** can be rotated by 180 degrees.

The configuration of the secondary image screen **5** depends on the requirements. It is possible to select the secondary image screen as a small unit and/or for black-and-white display. In this case, it serves only as an input monitoring means for input of letters or numbers. It is also possible to select a secondary display screen of the same quality as the primary display screen if, e.g., the presentation device will also be used as a game console, whereby two players sit opposite one another and look only at their own display screens in order to play e.g., a card game.

The invention claimed is:

1. A presentation device, comprising:

a base unit including operating components and having integrated therein a auxiliary display screen;

a keyboard detachably received by the base unit above the auxiliary display screen and constructed for wireless connection to the base unit;

a main display screen swingably mounted to the base unit for rotation about a rotating angle of at least 220 degrees so as to allow disposition of the main display screen in a first operating position in which the presentation device is useable as a laptop computer and a second operating position in which the presentation device is useable for dual display mode in combination with the auxiliary display screen; and

a control device for rotating an image on the main display screen by 180 degrees, when the main display screen is in the second operating position.

2. The presentation device of claim **1**, wherein the base unit assumes an inclined disposition in the second operating position.

3. The presentation device of claim **1**, wherein the control device is constructed to respond to a rotation of the main display screen about a predetermined rotating angle by rotating the image of the main display screen by 180 degrees and by turning on the auxiliary display screen.

4. The presentation device of claim **1**, wherein the auxiliary display screen is smaller than the main display screen.

5. The presentation device of claim **1**, wherein the main display screen is designated for contact-sensitive input.

6. The presentation device of claim **1**, wherein the keyboard is detachably received in a pocket of the base unit, said pocket being sized for flush disposition of the keyboard with respect to an upper surface of the base unit.

7. The presentation device of claim **1**, wherein the keyboard is constructed for detachable placement upon the base unit.

* * * * *

Exhibit 1024

US005644516A

United States Patent [19]

Podwalny et al.

[11] Patent Number: 5,644,516

[45] Date of Patent: Jul. 1, 1997

[54] **PORTABLE COMPUTER**

[75] Inventors: **Sergey Gary Podwalny**; **Michael D. Derocher**; **Scott N. Hickman**, all of Corvallis; **Jan Hippen**, Portland, all of Oreg.

[73] Assignee: **Hewlett-Packard Company**, Palo Alto, Calif.

[21] Appl. No.: **485,939**

[22] Filed: **Jun. 7, 1995**

Related U.S. Application Data

[62] Division of Ser. No. 994,035, Dec. 21, 1992.

[51] **Int. Cl.**^{6} **G06F 1/16**

[52] **U.S. Cl.** **364/708.1**; 345/901

[58] **Field of Search** 364/708.1; 345/901, 345/156, 173

[56] **References Cited**

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D. 321,865	11/1991	Derocher	D14/100
4,918,632	4/1990	York	364/708
5,109,354	4/1992	Yamashita et al.	364/708

Primary Examiner—Tan V. Mai

Attorney, Agent, or Firm—Curtis G. Rose

[57] **ABSTRACT**

A display cover is coupled to a portable computer by one of a variety of double-pivot hinges. Such arrangements permit the cover to be folded flush against the back of the computer, providing the screen protection benefits of a cover without the usually-attendant increase in computer "footprint." The preferred cover includes a window that permits a portion of the display to be viewed even when the cover is closed. By such an arrangement, alert or status messages can be conveyed to the user without requiring that the cover be opened. In some embodiments, the user can respond to visual or other alert messages, again without opening the cover.

4 Claims, 6 Drawing Sheets

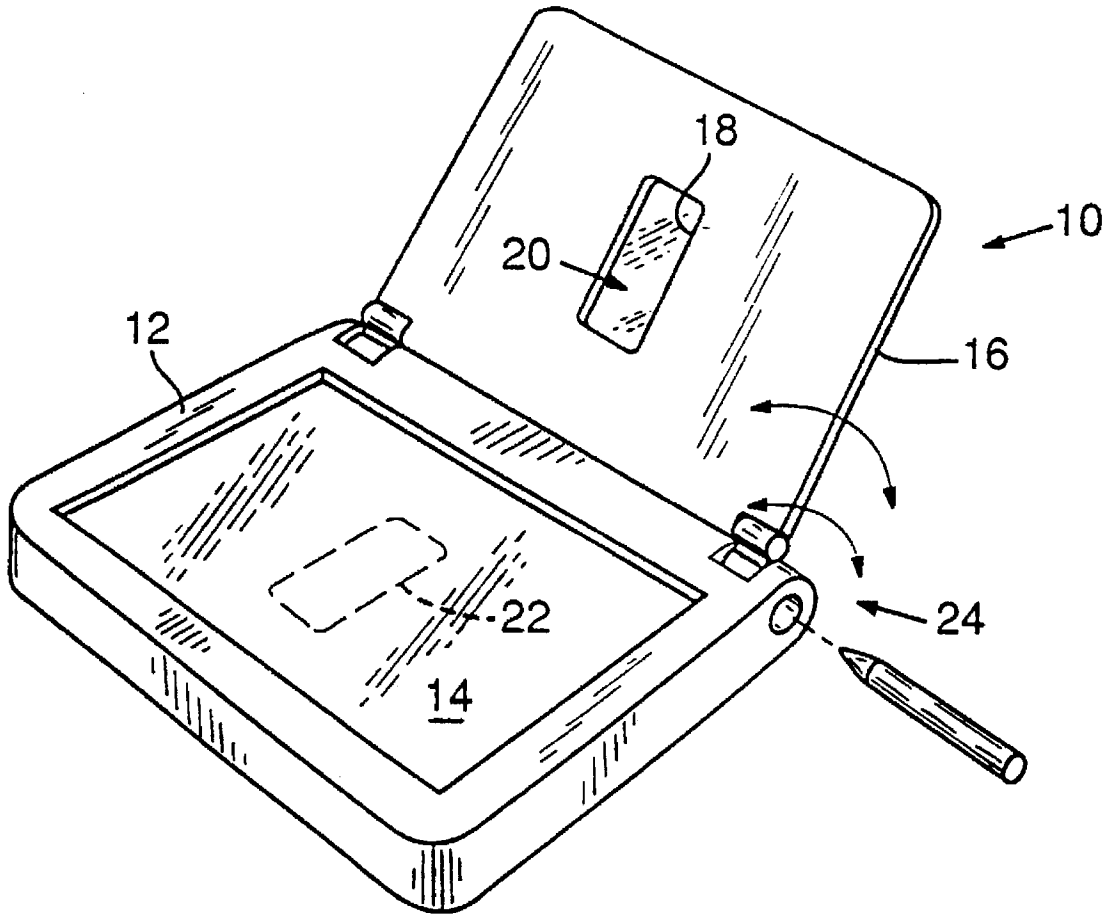


FIG. 1

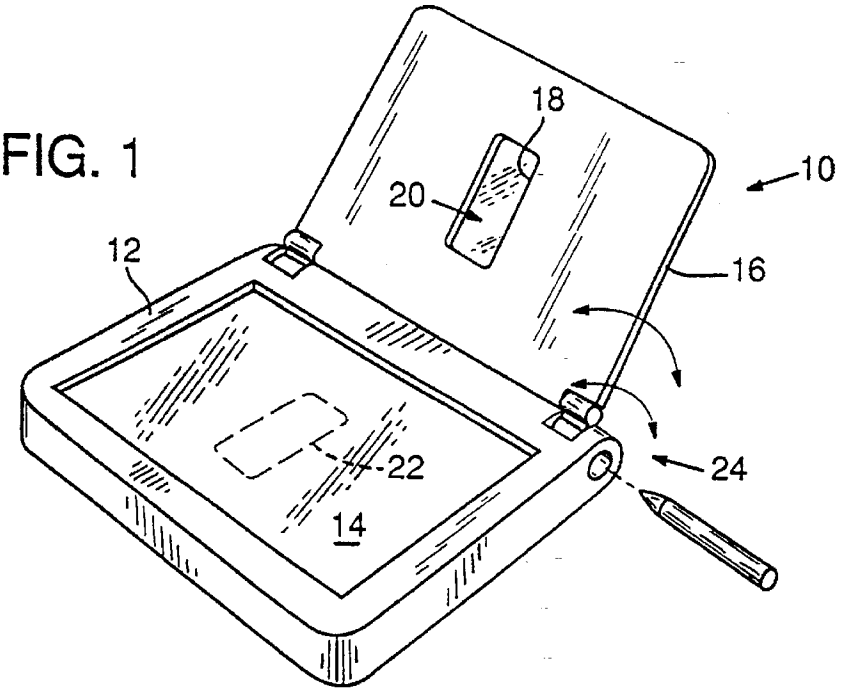


FIG. 1A

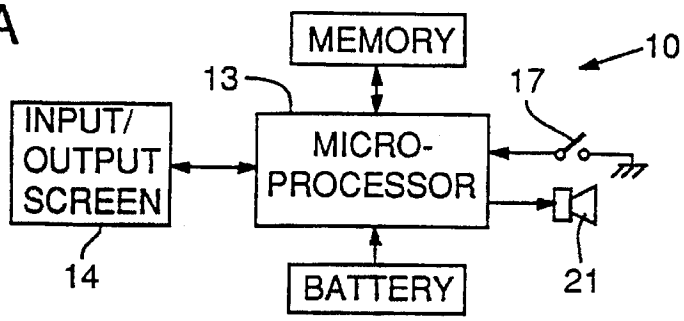


FIG. 2

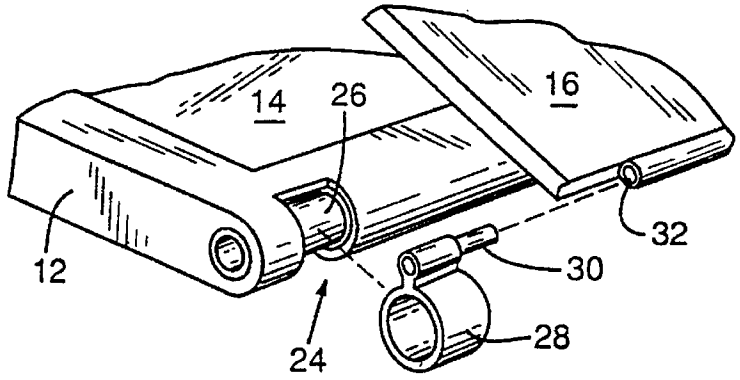


FIG. 3

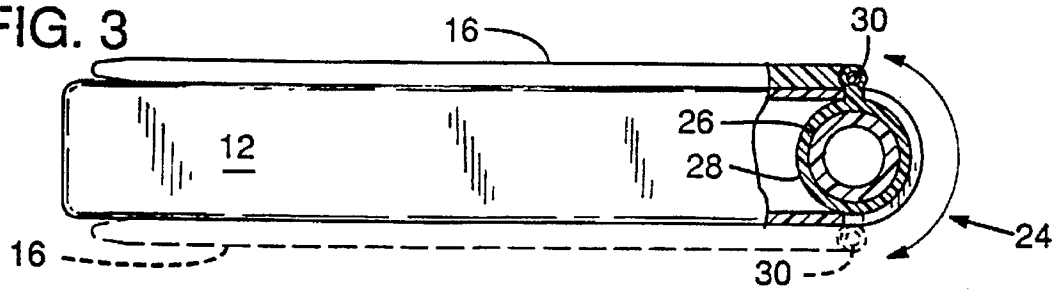


FIG. 4

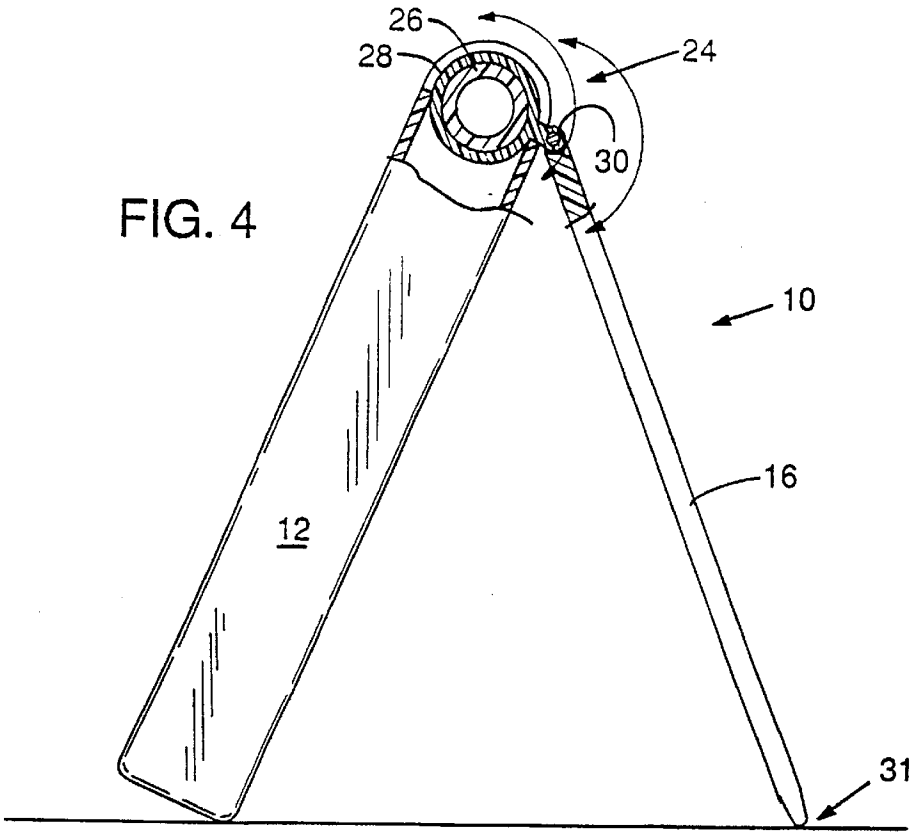


FIG. 5

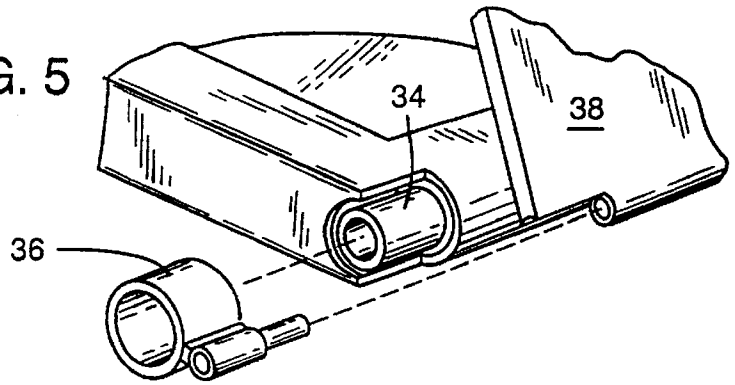


FIG. 6

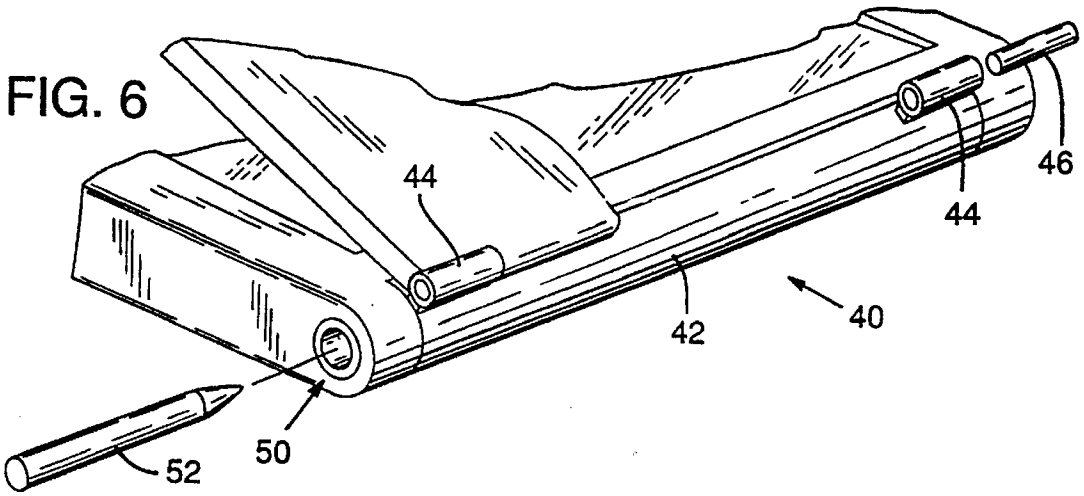


FIG. 7

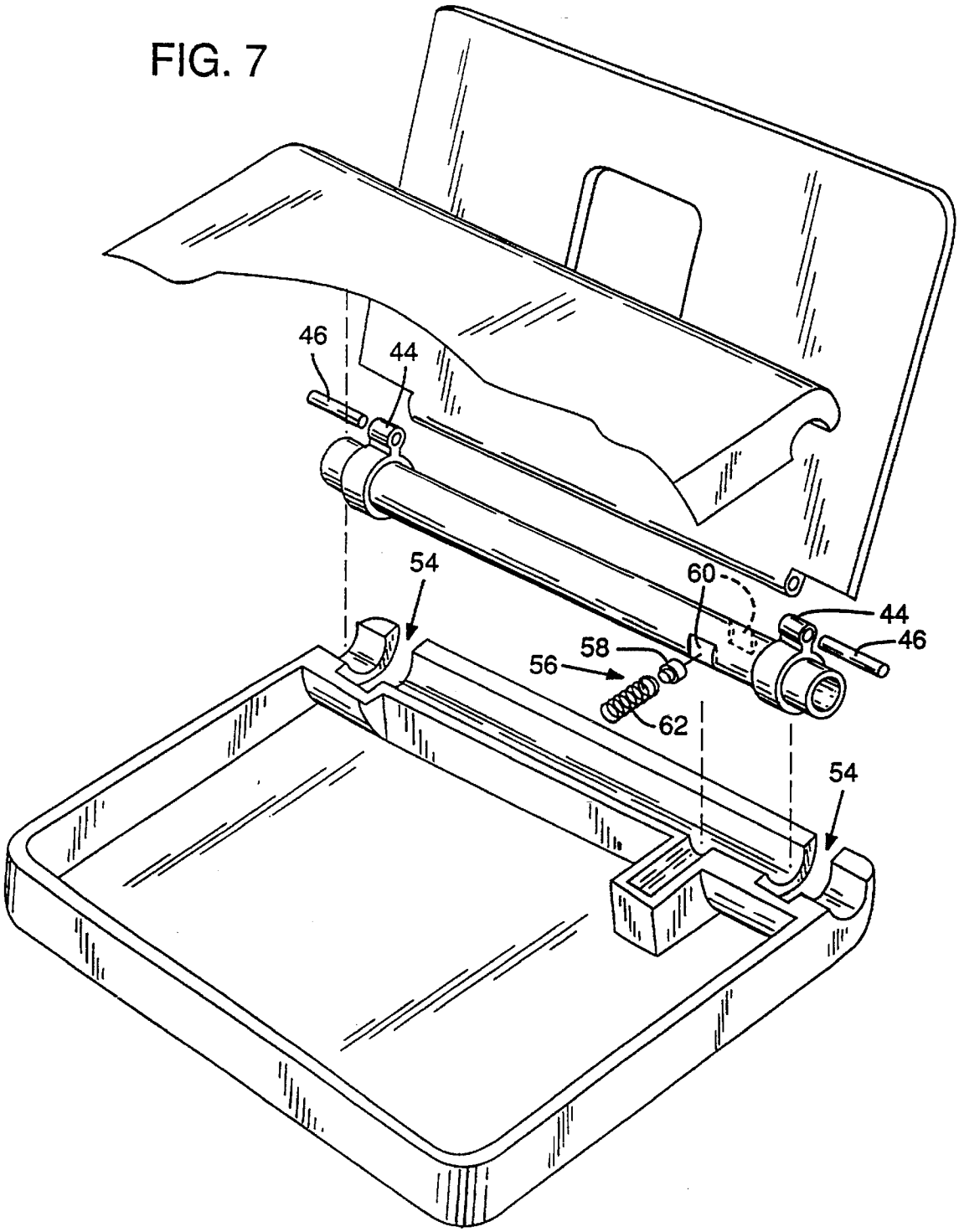


FIG. 8A

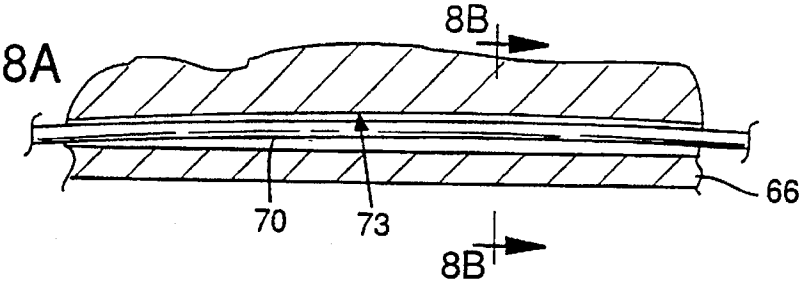


FIG. 8B

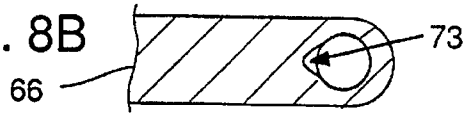


FIG. 8

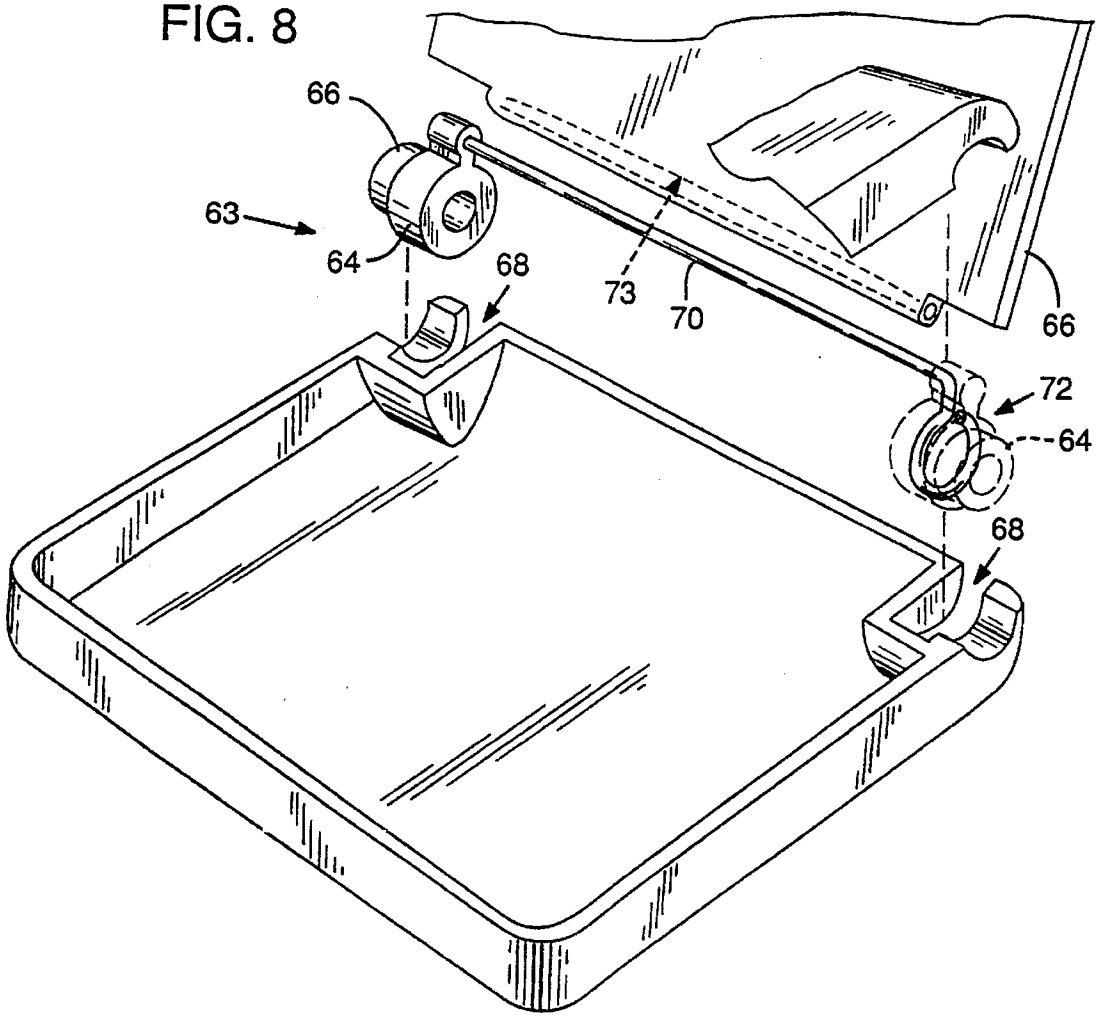


FIG. 10

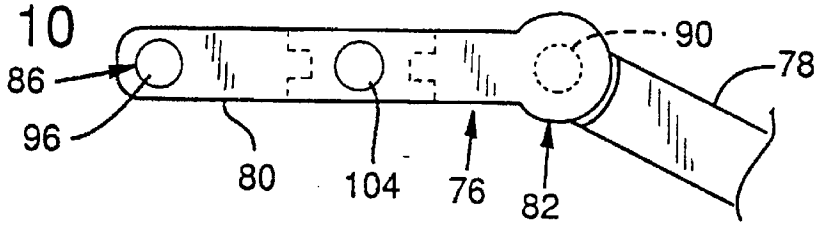


FIG. 9

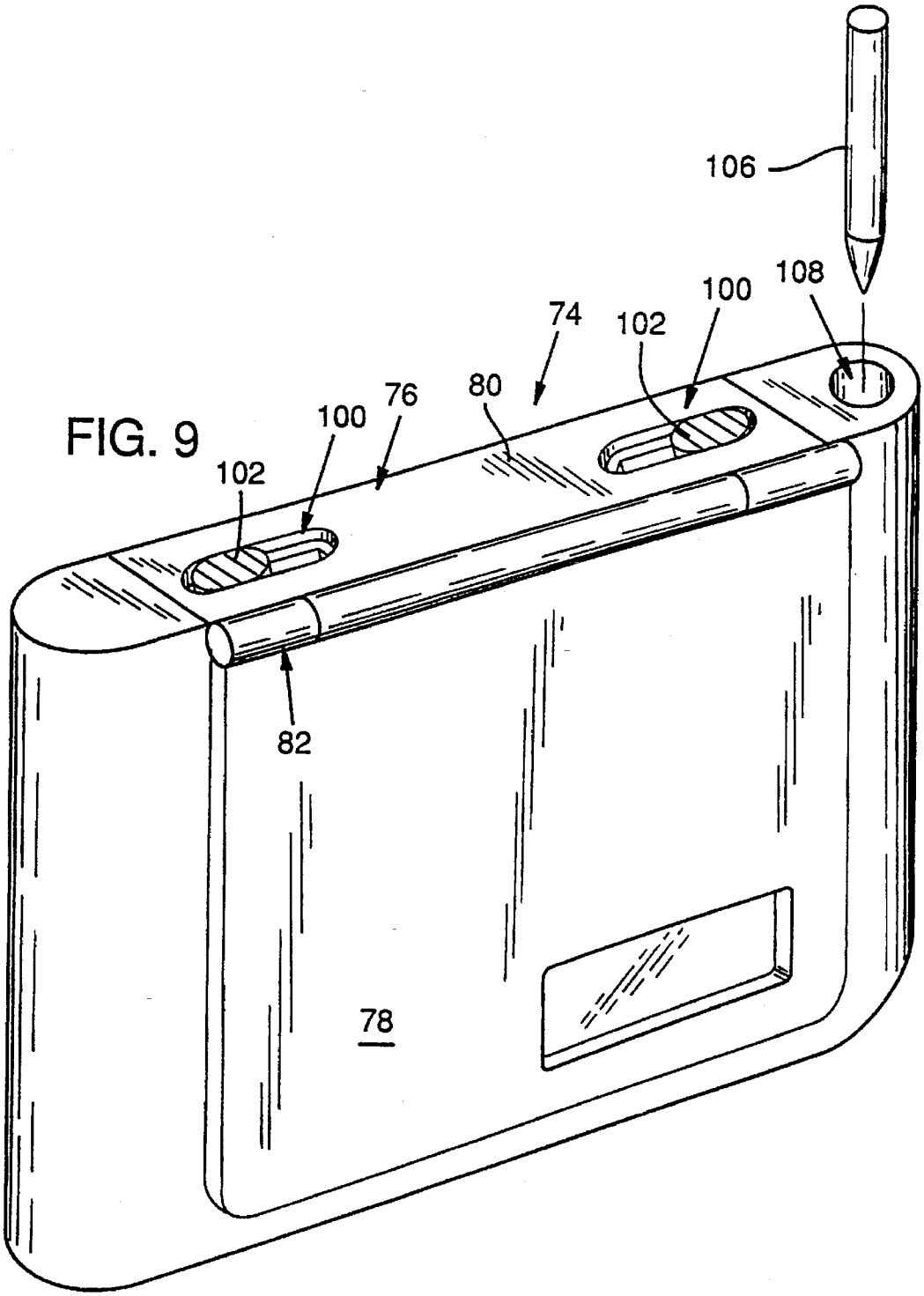


FIG. 11

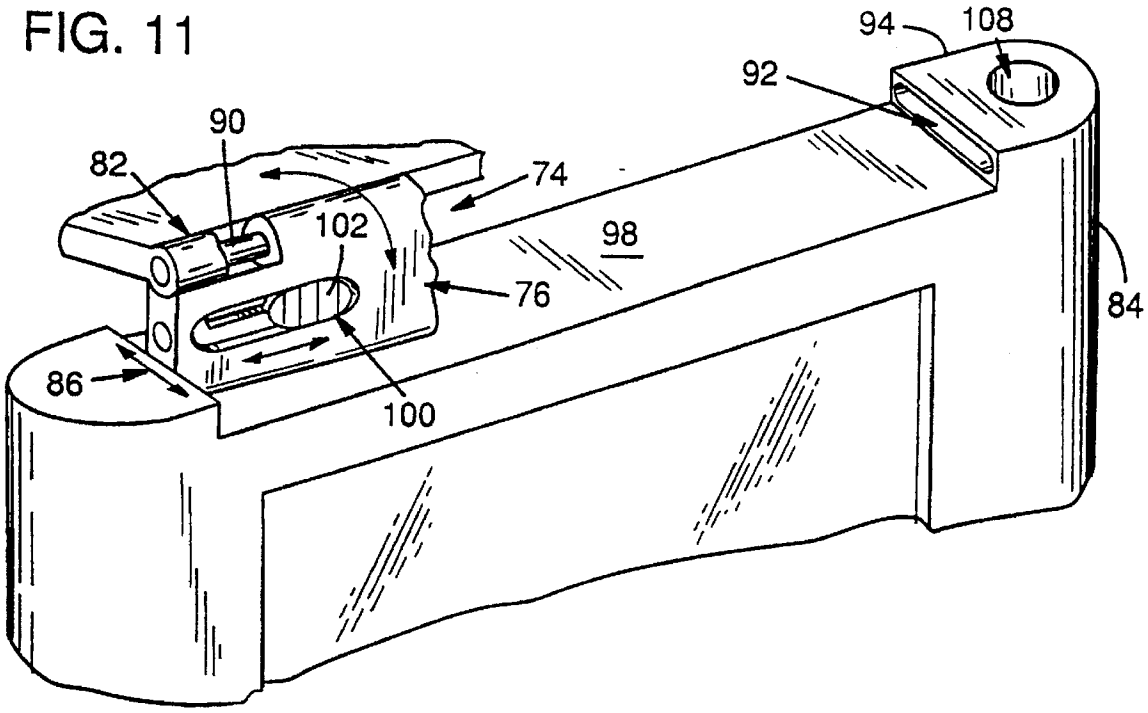


FIG. 12

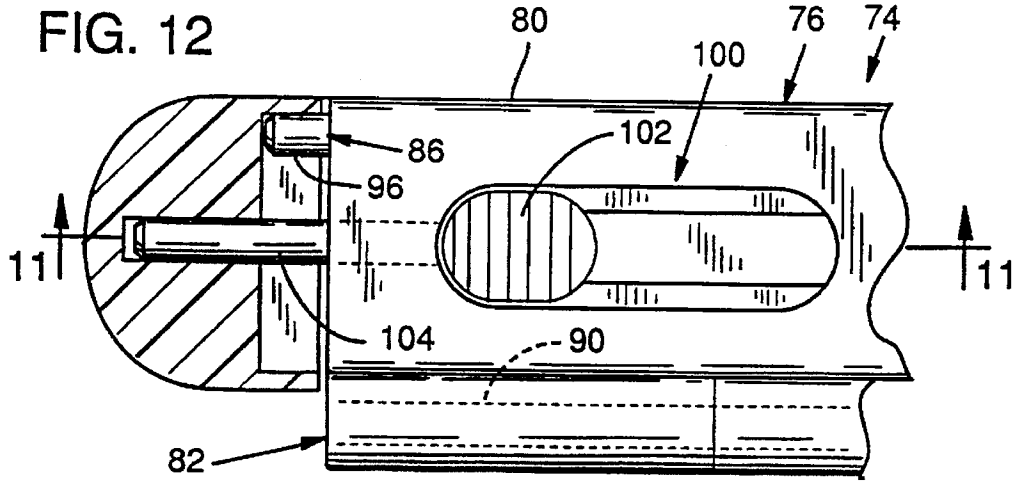
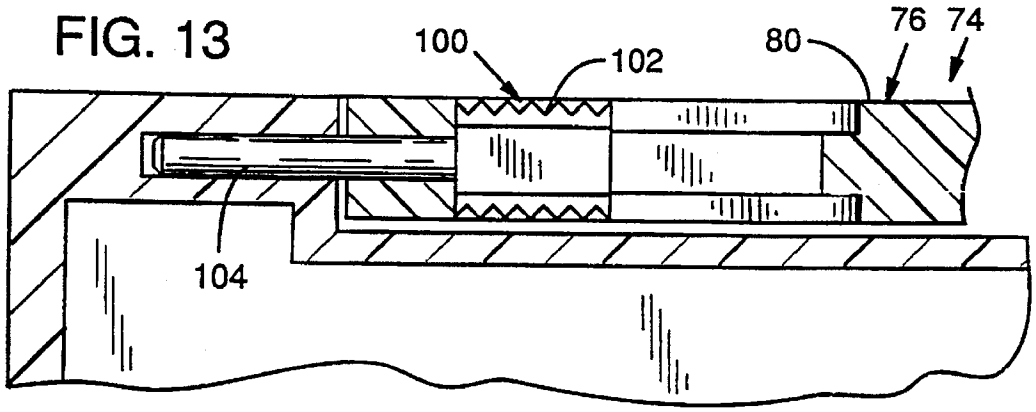


FIG. 13



PORTABLE COMPUTER

CROSS REFERENCE TO RELATED APPLICATION(S)

This is a divisional of copending application Ser. No. 07/994,035 filed on Dec. 21, 1992.

FIELD OF THE INVENTION

The present invention relates to portable computers, and more particularly relates to methods and apparatuses facilitating user interaction with a portable computer without first opening a computer display cover.

BACKGROUND AND SUMMARY OF THE INVENTION

Portable computers are available in a wide variety of styles, including laptops, notebooks, palmtops, and write-on computers (the latter also being variously known as slate computers or pen computers, and being characterized by the absence of an alphanumeric keyboard). Some portable computers have an LCD or other flat-panel display that is protected from abuse by a hinged display cover.

Exemplary of these prior art display covers is the arrangement shown in Design Pat. No. 321,865, wherein a hinged plastic plate overlies and protects the display of a write-on computer. Another common arrangement is that shown in allowed design patent application 07/652,743, wherein the display of a palmtop computer is protected by another component of the computer (such as the keyboard) folded adjacent thereto.

All of these arrangements suffer from a common failing: there is virtually no provision for user interaction with the computer when the cover is closed. (Some computers can "beep" at the user when the cover is closed.) As disclosed below, this is an unnecessary impairment of the computer's capabilities.

In accordance with one aspect of the present invention, a computer is provided with a display cover that permits visual—and in some cases tactile or stylus-based—interaction with the computer, even when the cover is closed. Such a computer may also be equipped with a touch-responsive input device that permits a user to acknowledge alerts from the computer, again without opening the display cover. In many embodiments, the computer is provided with an improved display cover hinge that facilitates operation.

The foregoing and additional features and advantages of the invention will be more readily apparent from the following detailed description thereof, which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a view of a write-on computer according to a first embodiment of the present invention.

FIG. **1A** is a simplified schematic block diagram of the computer of FIG. **1**.

FIG. **2** is a detail showing a double-pivot hinge used to connect the cover to the housing in the write-on computer of FIG. **1**.

FIG. **3** is a sectional view of the write-on computer of FIG. **1**, illustrating (in solid lines) the cover in a first position overlying the input/output screen and (in dashed lines) the cover position flush against the back of the housing.

FIG. **4** is a side view, partially in section, showing the write-on computer of FIG. **1** arranged in an easel configuration.

FIG. **5** is a detail of a write-on computer incorporating a double-pivot hinge according to a second embodiment of the present invention.

FIG. **6** shows a write-on computer incorporating a double-pivot hinge according to a third embodiment of the invention.

FIG. **7** is an exploded view of a write-on computer incorporating a double-pivot hinge according to a fourth embodiment of the invention.

FIG. **8** is an exploded view of a write-on computer incorporating a double-pivot hinge according to a fifth embodiment of the invention.

FIG. **8A** is a detail showing a detent arrangement suitable for use with the FIG. **8** embodiment.

FIG. **8B** is a further detail showing a detent arrangement suitable for use with the FIG. **8** embodiment.

FIG. **9** is a view of a write-on computer according to a sixth embodiment of the present invention.

FIG. **10** is a detail illustrating a flip-around double-pivot hinge used to couple the cover of the FIG. **9** computer to the housing.

FIG. **11** further details operation of the flip-around double-pivot hinge used with the computer of FIG. **9**.

FIG. **12** is a top plan view, partially in section, illustrating the double-pivot hinge of FIG. **11**.

FIG. **13** is a sectional view illustrating the double-pivot hinge of FIG. **11**.

DETAILED DESCRIPTION

Referring to FIGS. **1** and **1A** a write-on computer **10** according to a first embodiment of the present invention includes a housing **12**, a microprocessor **13**, an input/output screen **14** mounted in the housing and coupled to the microprocessor, and a cover **16** movable between first and second positions. In the first position, the cover overlies and protects the input/output screen from damage. In the second position, the cover exposes the input/output screen for use.

In the preferred embodiment, the cover defines a window **18** which permits a portion of the input/output screen **14** to be viewed by the user even when the cover **16** overlies the screen. This window can include a transparent, rigid medium **20** serving to protect the screen from damage while permitting viewing therethrough. Alternatively, such a transparent medium can be omitted.

Window **18** finds particular application in conjunction with software applications that stay resident even when the computer is not in active use. Exemplary are software appointment calendars into which a user loads data relating to upcoming appointments. Many such programs include alarm features to alert the user to imminent appointments, even when the computer is otherwise idle. Another example of resident software applications are e-mail communications programs that alert users to incoming messages.

Previously, such programs have activated an audible tone alert device. In response, the user would open the computer to view the screen and determine the reason for the audible alert.

In accordance with this embodiment of the present invention, the software not only activates an audible alert device **21**, but also displays an explanatory message on a portion **22** of the screen **14** visible through the window. By glancing at the computer, the user can determine the reason for the alert without going to the effort of opening the computer.

In addition to alert messages, the window can also be used to convey information relating to equipment status. In one such application, information pertaining to battery charge is displayed. In another, wherein the computer is used in conjunction with a desktop "docking" station and is connected to a network, the window can be used to display information relating to message traffic on the network. By such an arrangement, the user can avoid "undocking" the computer inadvertently in the middle of, for example, the downloading of e-mail or other network data to the computer.

If the message calls for a user response (i.e. acknowledgement), the user may be able to provide such a response without opening the cover. In embodiments in which the window does not include a transparent medium, the user can effect a response by using a stylus on the exposed region of the screen. For example, if the visible message reports an upcoming appointment or an incoming message, and the user wishes to acknowledge receipt in order to prevent the computer from issuing further alerts relating to the same matter, the user can simply draw a check-mark on the screen to effect acknowledgment.

This same capability can also be achieved in computers having transparent media-protected windows, provided the stylus operates on proximity rather than contact. Proximity-based styli are well known in the art and can, for example, include battery powered circuitry that selectively passes current through an inductor in the tip of the stylus. An array of sensing elements positioned below the LCD screen senses the resulting magnetic field and provides data indicating the stylus' position. (Related systems employing capacitive, rather than inductive, coupling are also known.) Kurta Corporation of Phoenix, Ariz. is a supplier of such equipment and is the owner of a number of patents on stylus-sensing technology suitable for use in the present invention, including U.S. Pat. Nos. 4,672,154, 4,661,656, 4,616,106, and 4,492,819.

User alert acknowledgements can also be effected by via touch-responsive input devices, such as pushbuttons or capacitive switches. Desirably, such an input device is mounted where it can be accessed without opening the cover **16**. In an illustrative embodiment, a pushbutton switch **17** having a button diameter of about 0.25 inches is mounted on the left side of the housing, approximately one inch down from the top. This switch is connected to a microprocessor input that is polled to solicit acknowledgement of alerts (whether audible or visual).

In related embodiments, other sensors can be used to accept alert acknowledgments. Some may find it gratifying to employ a vibration sensor, so that the computer can be struck to effect acknowledgement.

(It will be recognized that these alert acknowledgment features can be implemented even in write-on computers that do not employ covers to protect the input/output screen.)

The sizing and placement of an alert message on portion **22** of screen **16** is well within the capabilities of those of ordinary skill in the applications programming art. Application development tools associated with popular graphical user interface operating systems provide simple commands for the sizing and placement of message windows.

Many portable computers include battery-saving circuitry that blanks the screen when the computer is idle for a predetermined period, or when the cover is closed. In accordance with this aspect of the present invention, the screen is re-activated, at least temporarily, when an window message is to be provided to the user.

Turning to mechanical details of construction, the cover **16** in FIG. **1** is coupled to the top of the housing **12** by a double-pivot hinge **24**. As shown in FIGS. **2** and **3**, this hinge includes a cylindrical ring bearing **26** formed in the case, on which an annular ring **28** rides. Ring **28** includes a finger **30** that engages a socket **32** in the cover **16**. A pair of such ring/bearing assemblies are used—one at each side of the housing. (The rings can obviously be narrower than those shown in the Figures.) The bottom of the cover can be releasably attached to the housing by a magnetic closure. It will be recognized that the double-pivot hinge arrangement permits the cover to be folded flush against the back of the computer, providing the protection benefits of a display cover without the usually attendant increase in computer "footprint."

Desirably, one of the pivots that makes up double-pivot hinge **24** includes a detent mechanism that secures the pivot against free rotation when in one or more predetermined angular positions. In the preferred embodiments, the detented position is provided at an end-of-travel position of the rings on the bearings. Such a detent permits the computer to be stably arranged in the easel-like fashion depicted in FIG. **4**, with the cover propping up the housing. In this arrangement, the bottom edge **31** of the cover can be provided with a non-slick elastomer to increase stability. This easel position facilitates certain uses of the computer.

FIG. **5** shows a write-on computer incorporating a double-pivot hinge according to a third embodiment of the invention, wherein the ring bearing **34** extends to the edge of the housing. The ring **36** and display cover **38** correspond to elements **28** and **16** of FIG. **2**.

FIG. **6** shows a write-on computer **40** incorporating a double-pivot hinge according to a third embodiment of the invention. Whereas in FIGS. **1–5**, the cover is held at its edges by pivots than can move independently, in FIG. **6** the pivots are mechanically connected, causing them to rotate in tandem. This is accomplished by use of an axle **42** rather than a pair of ring/bearing assemblies **28/26**.

Axle **42** extends across the top of the computer **40** and is journalled or otherwise mounted to permit rotary motion. From the axle protrude features **44** that include pivot fingers **46**. As in the FIG. **1** embodiment, the cover **48** is pivotally mounted on these fingers. As the axle rotates, the fingers **46** move in tandem. This tandem motion avoids "racking," a phenomenon caused by independent motion of two spaced hinges, which can result in binding of the hinge.

Axle **42** desirably includes an axial bore **50** in which a stylus **52** can be stored.

In the FIG. **6** embodiment, the axle is external and forms part of the external surface of the computer. In a related embodiment, shown in FIG. **7**, the axle is disposed within the computer housing. In this embodiment, the housing is provided with slots **54** through which features **44** extend to couple to the cover. FIG. **7** also shows a representative detent mechanism **56** that can be used to secure the axle against free rotation. The illustrated detent mechanism includes a nib **58** that is urged against a flat face **60** on the axle by a spring **62**.

FIG. **8** shows the presently preferred double-pivot hinge **63**. In this arrangement a pair of plastic rings **64** (having shoulders **66** journalled in cradles **68**) are physically interconnected with a rigid steel wire **70** to avoid racking. The cover **66** is pivotally mounted on the wire.

The rigid wire **70** can be connected to the rings **64** by various attachment means. The preferred attachments, however, are effected by forming the ends of the wire in the

configuration **72** shown, and insert molding the plastic rings **64** around the formed wire. This arrangement provides superior strength over other attachment techniques.

Attachment of the cover **66** to the wire **70** can also be accomplished by various means. The preferred technique is to fabricate the cover in two pieces: a base piece, and a top piece which cooperate to define the bore through which the wire passes. These pieces are then ultrasonically welded around the wire.

In this embodiment, the cover **66** has a thickness of 3.8 mm, and the wire has a thickness of 1.5 mm. At the top edge of the cover, where the top and bottom pieces are welded to contain the wire, there is a ridge having a thickness of 4.5 mm. The housing of the computer has a thickness of 26 mm. The distance between the two pivot axes (i.e. the center-to-center radial distance between the rings **64** and the wire **70**) is great enough to provide a 0.5 mm spacing between the top of the cover and the housing when the cover is in its closed position. This gap assures the cover won't bind regardless of manufacturing tolerances.

The illustrated housing and cover are made of polycarbonate/ABS plastic, with the rings **64** and the associated cradles **68** being made of a self-lubricating material, such as teflon- or silicone-impregnated plastic.

It is possible to effect a detent in the pivotal mounting of the cover **66** on the wire **70** by slightly bending or kinking the wire, and providing a small slot or indentation **73** in the side of the bore within the cover in which this bend or kink can fit, as shown in FIGS. **8A** and **8B**. When the cover is rotated about the wire to a predetermined position, the bent/kinked wire—which is normally confined to the linear bore—can expand into the slot or indentation, resisting further rotation absent increased torque.

It is possible to effect a detent in the pivotal mounting of the wire to the housing by the same arrangement depicted in FIG. **7**, viz. to use a spring detent radially directed against the rings **64**. Alternatively, an axially directed detent, such as against the sides of the shoulders **66**, can also be used. If desired, both of the pivots that comprise the double-pivot hinge can have their own detent mechanism.

FIGS. **9–13** show a write-on computer **74** using a flip-around double-pivot hinge **76**. In this arrangement, a cover **78** is connected to an intermediate member **80** by a first pivot **82**. The intermediate member, in turn, is pivotally to the computer housing **84** by a second pivot **86**.

The first pivot **82** includes a socket in the cover which cooperates with a finger **90** extending from the intermediate member to provide pivotal motion of the cover around the edge of the intermediate member.

The second pivot **86** includes a slot **92** in a boss **94** portion of the housing **84**, which cooperates with a finger **96** extending from the intermediate member **80**. As best shown in FIG. **11**, slot **92** permits the axis of the second pivot **86** to be slid back and forth along the top face **98** of the computer. This arrangement permits linear motion, as well as pivotal motion, of the intermediate member relative to the top face of the computer.

Intermediate member **80** further includes a sliding latch **100** comprised of a slidably mounted thumb grip **102** having a locking pin **104** extending therefrom. The thumb grip **102** is two-sided, permitting operation of the latch **100** regardless of which face of the intermediate member faces the computer housing, and which is exposed for use.

In operation, the intermediate member **80** can be flipped (about the second pivot **86**) so that either of its two faces abuts the top face **98** of the computer. The intermediate member can then be secured in this position by urging the thumb grips toward the outer edges of the computer, engaging the locking pins **104** in the slots **92**. Depending on which face of the intermediate member is adjacent the computer, the cover pivot **82** will be positioned adjacent either the front or back of the computer. In the former position, the cover can be folded down to overlie the display. In the latter position, the cover can be folded flush against the back of the computer, out of the user's way.

Like the computer shown in FIG. **1**, the computer of FIG. **9** includes provision for storing a stylus **106** in a bore **108** defined in the housing. However, the bore in FIG. **9** is disposed perpendicularly to the axis of the cover hinge, rather than parallel thereto.

From the foregoing, it will be recognized that computers according to the present invention provide a number of important advantages. Computers including display cover windows according to the present invention permit communication to, and in some cases from, the user without requiring the user to first open the display cover. Computers including alert acknowledgement provisions further facilitate user interaction, again without requiring that the display cover first be opened. Write-on computers incorporating double-pivot hinge covers according to the present invention provide the protection benefits of a display cover without the usually-attendant increase in computer "footprint." Hinges incorporating plastic that is injection molded onto steel wire can be kept within much tighter manufacturing tolerances than those employing exclusively plastic or exclusively steel parts.

Having described and illustrated the principles of our invention with reference to preferred embodiments, it should be apparent that the invention can be modified in arrangement and detail without departing from such principles. For example, while the invention has been illustrated with reference to a cover that is secured to the top of a computer housing, it will be recognized that the cover can alternatively be secured to a side of the housing instead. Such an arrangement advantageously serves a shading function in situations where light incident from the side of the display might otherwise create glare. Other adaptations of the cover of the present invention to shade the display will be apparent to those of ordinary skill in the art.

Similarly, while the invention has been illustrated with reference to a cover that can lie flat against the front or back of a computer by virtue of a double-pivot hinge, it will be recognized that similar benefits can be achieved by alternative arrangements. In one such arrangement, the side edges of the cover are adapted to slidingly engage a pair of corresponding tracks formed in the front and back of the computer. By this arrangement, the cover can be slid from the front, exposing the display, and thereafter inserted into the tracks on the back, securing the cover out of the way.

In still further embodiments of the invention, it will be recognized that the window and/or alert acknowledgement features can be employed in a computer without a double-pivot hinge.

In view of the many possible embodiments to which the principles of our invention may be put, it should be recognized that the detailed embodiments are illustrative only and should not be taken as limiting the scope of our invention. Rather, we claim as our invention all such embodiments as may come within the scope and spirit of the following claims and equivalents thereto.

We claim:

1. A method of operating a computer, the computer including a microprocessor, a display screen, and a cover for the display screen, the method comprising:

(a) when the computer is not being used, closing the cover to overlie and protect the display screen; and

(b) when, thereafter, a program performed by the microprocessor solicits user attention:

providing an audible alert signal; and

displaying indicia to the user indicating the reason the program solicits attention, said indicia being displayed in a portion of the display screen viewable even when the cover is positioned to overlie and protect the display screen.

2. The method of claim 1 which further includes accepting an alert acknowledgment from the user while the cover is positioned to overlie and protect the display screen.

3. The method of claim 2, wherein said display screen is an input/output display screen, said accepting step comprising accepting the alert acknowledgment from the display screen while the cover is positioned to overlie and protect said display screen.

4. The method of claim 2 in which the accepting step comprises accepting feedback from a touch-responsive input element distinct from the display screen.

* * * * *

Exhibit 1016

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(54) ELECTRONIC APPARATUS HAVING UNIVERSAL HUMAN INTERFACE

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(21) Appl. No.: **11/196,462**

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(30) **Foreign Application Priority Data**

Aug. 10, 2004 (JP) 2004-233643

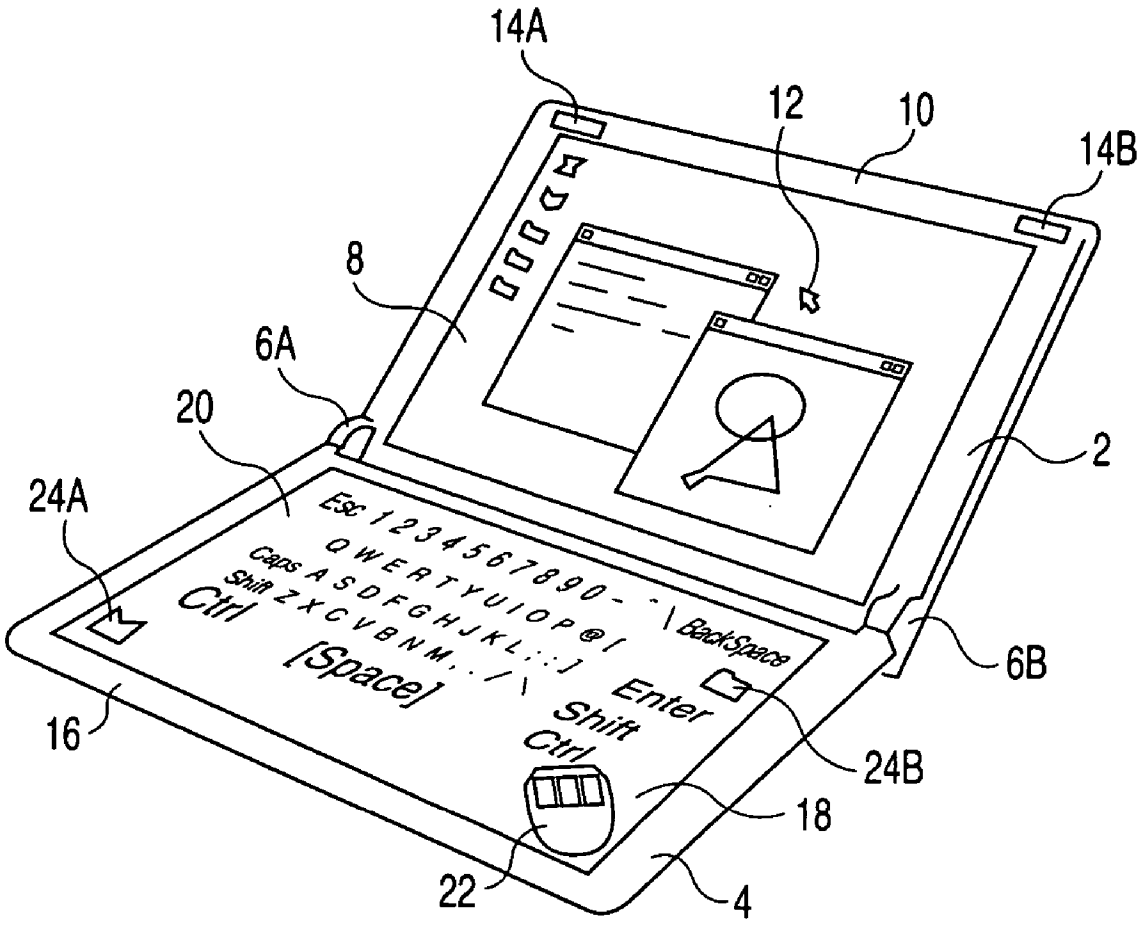
Publication Classification

(51) **Int. Cl.**
G06F 1/16 (2006.01)

(52) **U.S. Cl.** **361/681**; 345/905; 248/917

(57) **ABSTRACT**

An electronic apparatus includes first and second display devices having first and second display screens held in first and second housings, respectively. The second display screen is provided with a sensor which generates an output signal determining an input area in response to an external predetermined input to the second display screen. The first and second housings are connected together by a connecting mechanism so that an opening angle between the first and second housings can be adjusted. A first interface image is displayed on the second display screen. An instruction input to the interface image is determined on the basis of a sensor output signal. In response to the instruction input, a second display image is displayed in place of the first display image. In response to the instruction input, a second interface image is displayed in place of the first interface image.



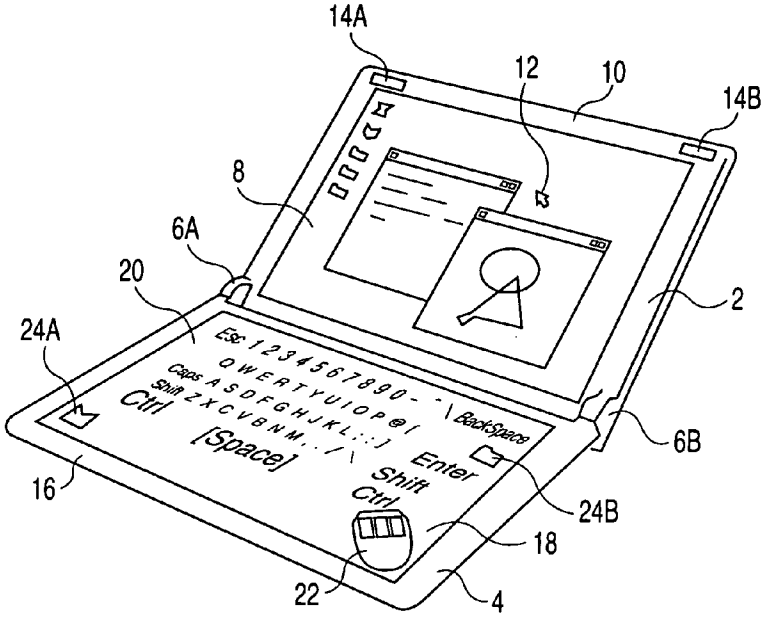

14A
12
10
14B
8
6A
20
2
24A
6B
16
24B
18
22
4
Ctrl
[Space]
Shift
Enter
BackSpace

FIG. 1

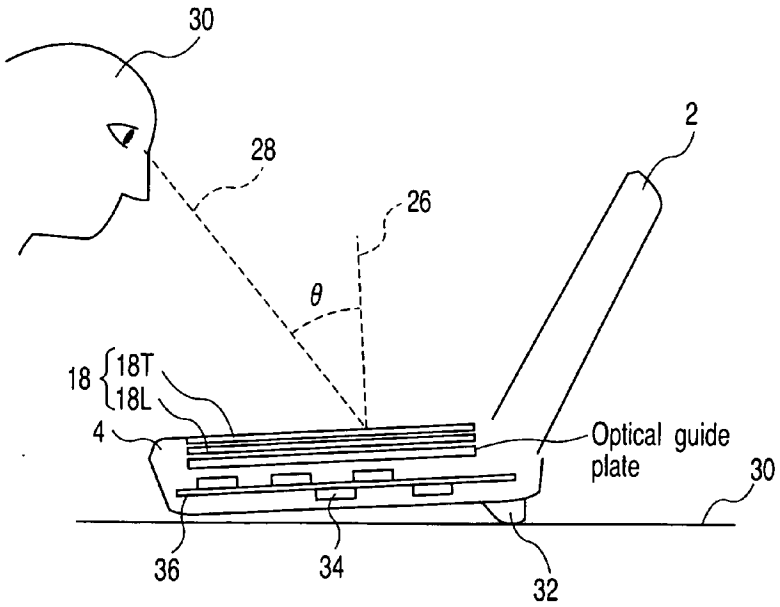

30
28
2
26
θ
18
18T
18L
4
Optical guide plate
30
36
34
32

FIG. 2

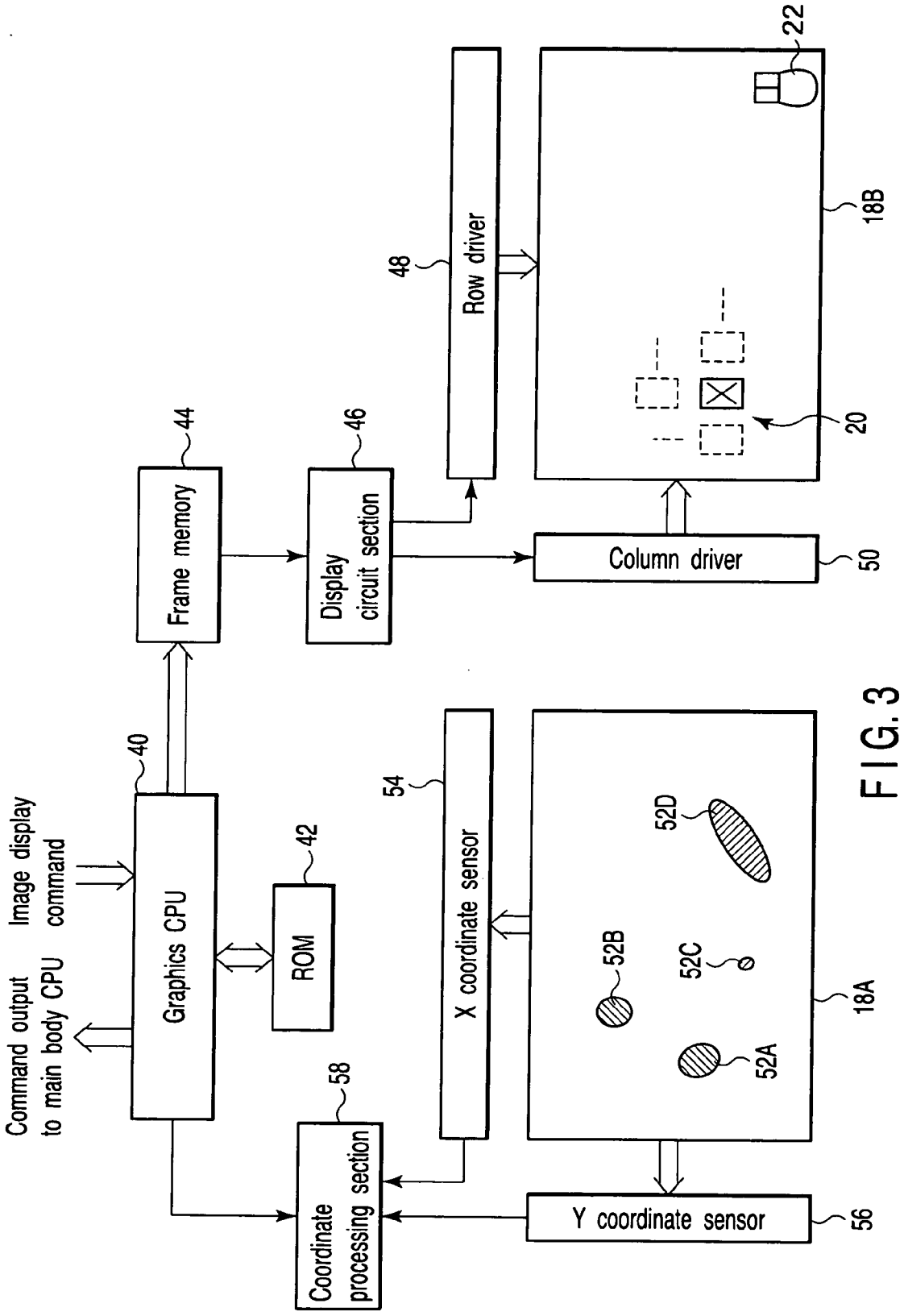

22
18B
48
Row driver
20
44
Frame memory
46
Display circuit section
Column driver
50
40
Image display command
Command output to main body CPU
Graphics CPU
42
ROM
54
X coordinate sensor
52D
52B
52C
52A
18A
58
Coordinate processing section
Y coordinate sensor
56

FIG. 3

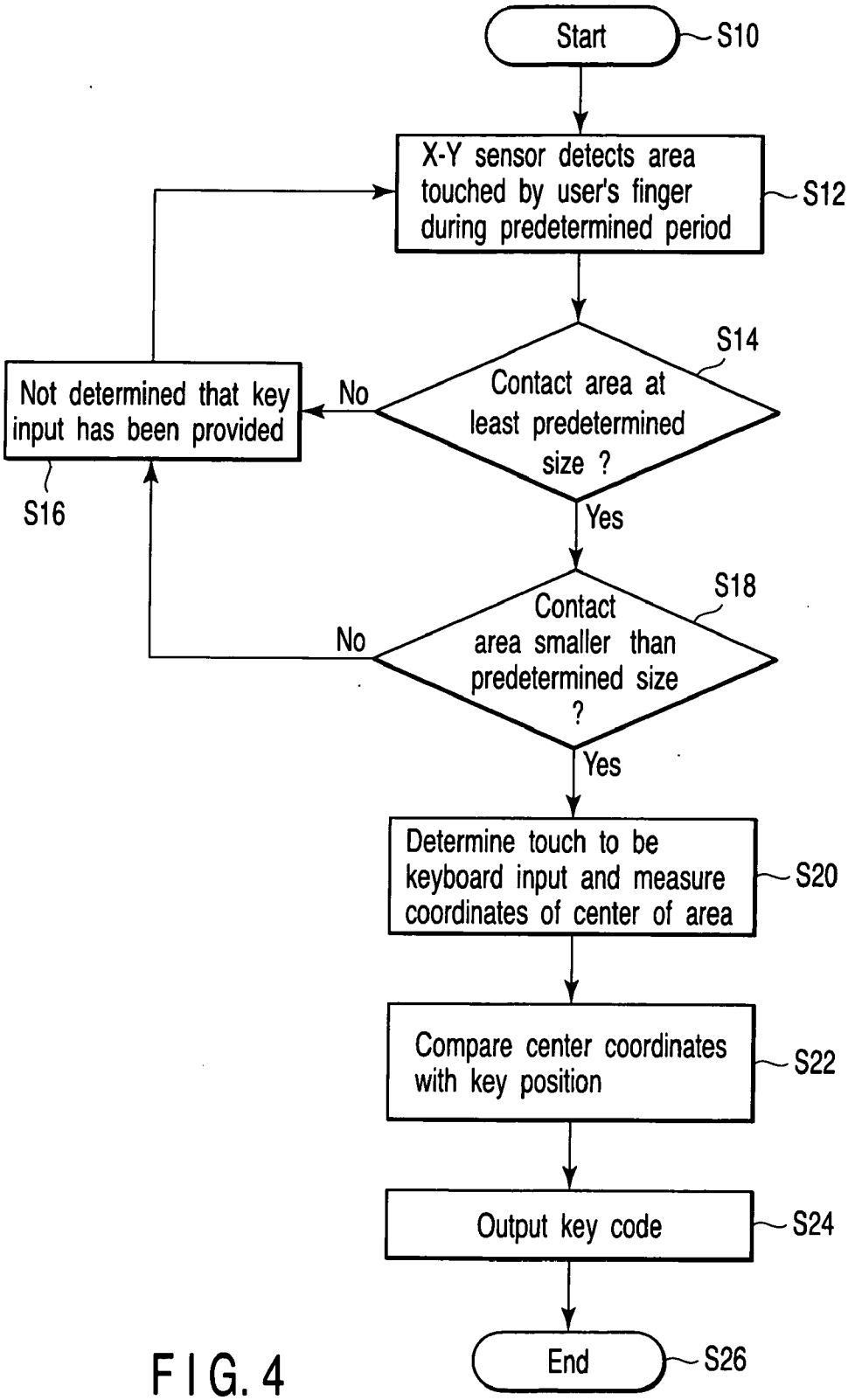

Start
S10
X-Y sensor detects area touched by user's finger during predetermined period
S12
S14
Contact area at least predetermined size ?
No
Not determined that key input has been provided
S16
Yes
S18
Contact area smaller than predetermined size ?
No
Yes
Determine touch to be keyboard input and measure coordinates of center of area
S20
Compare center coordinates with key position
S22
Output key code
S24
End
S26

FIG. 4

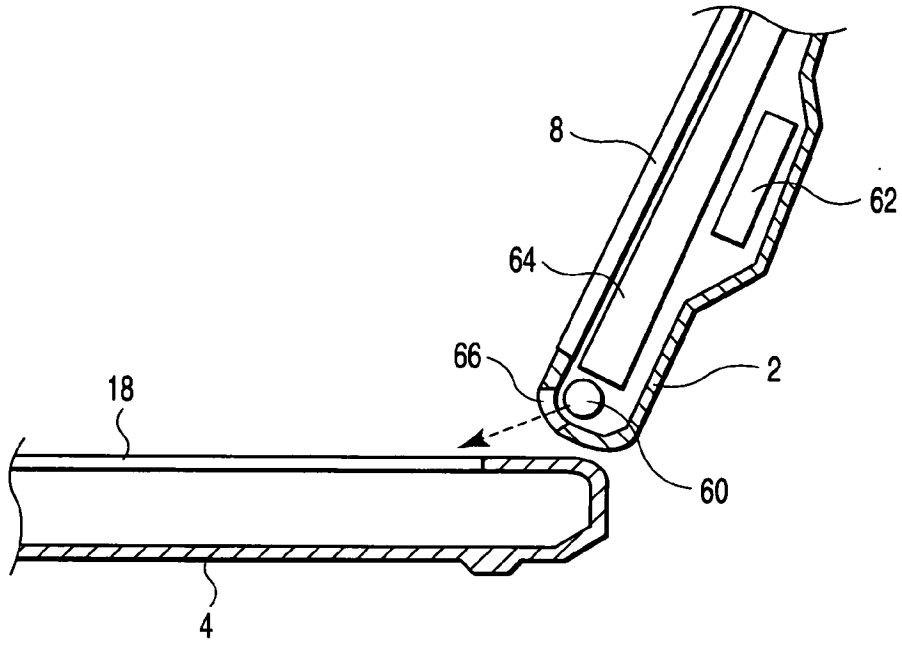


FIG. 5

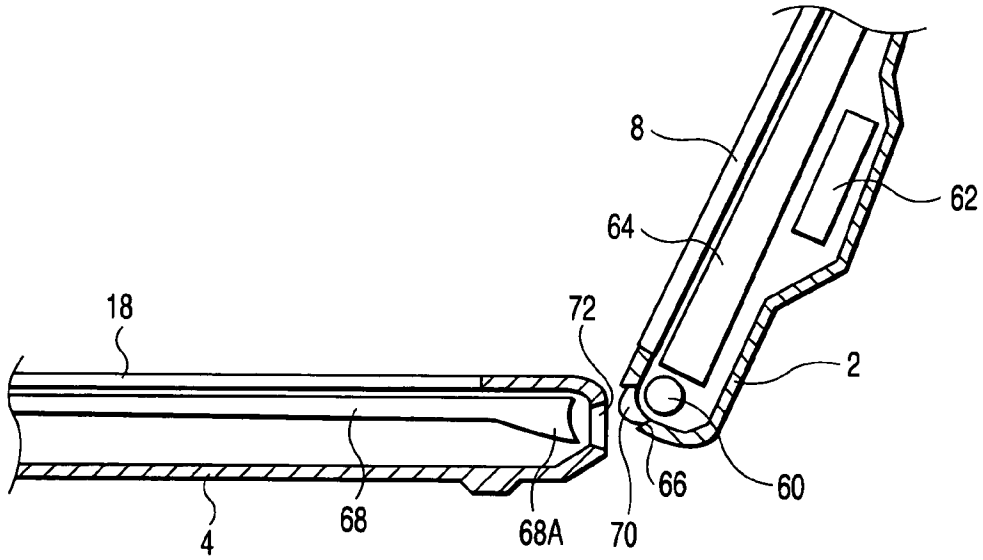


FIG. 6

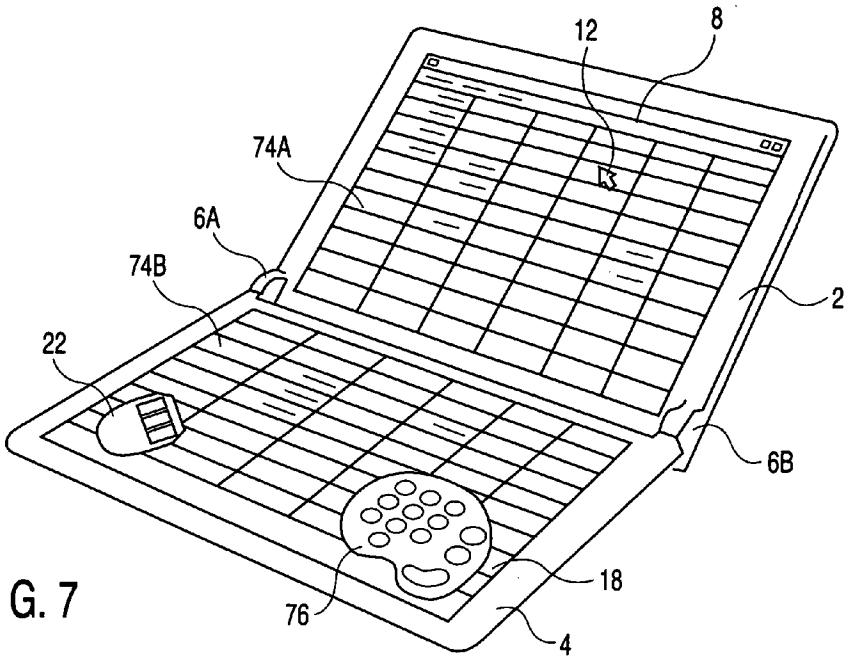


FIG. 7

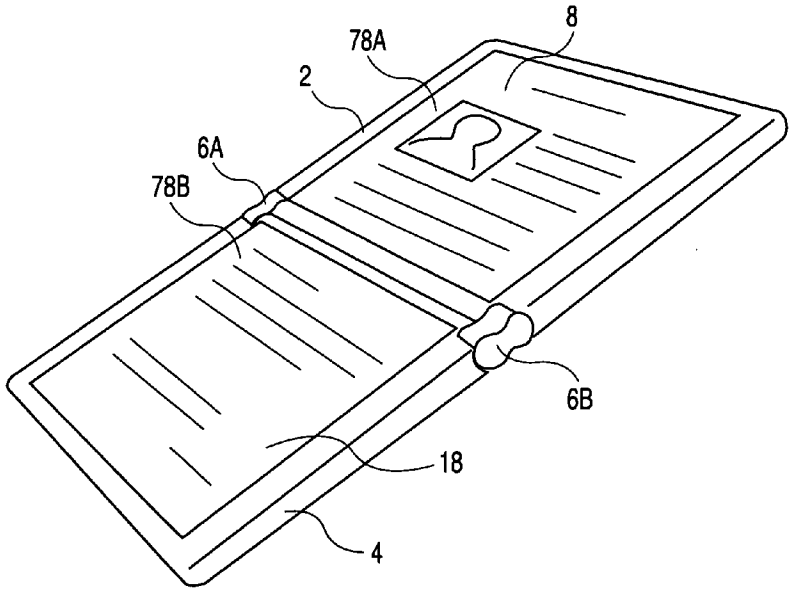


FIG. 8

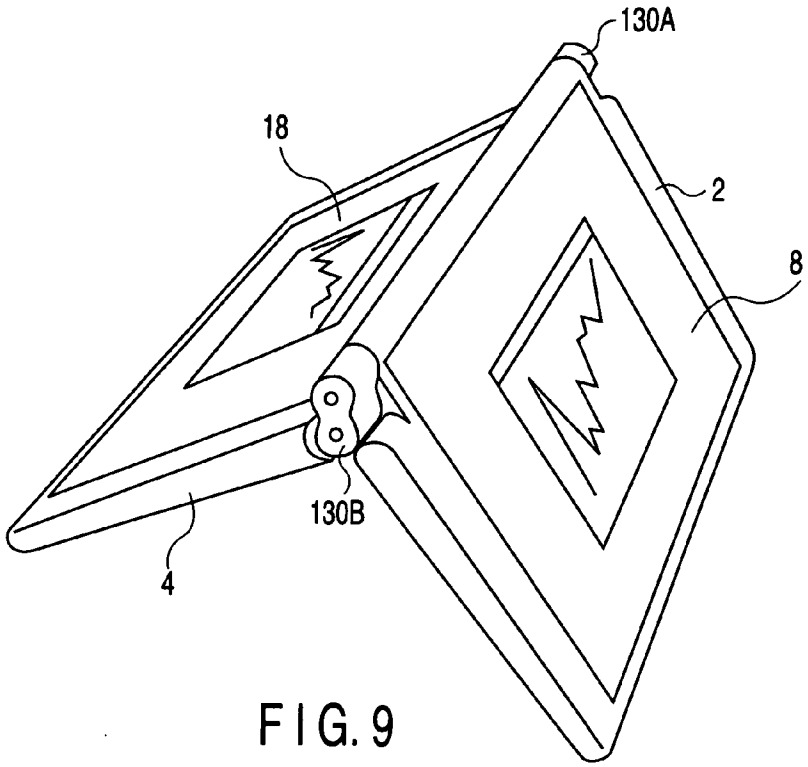


FIG. 9

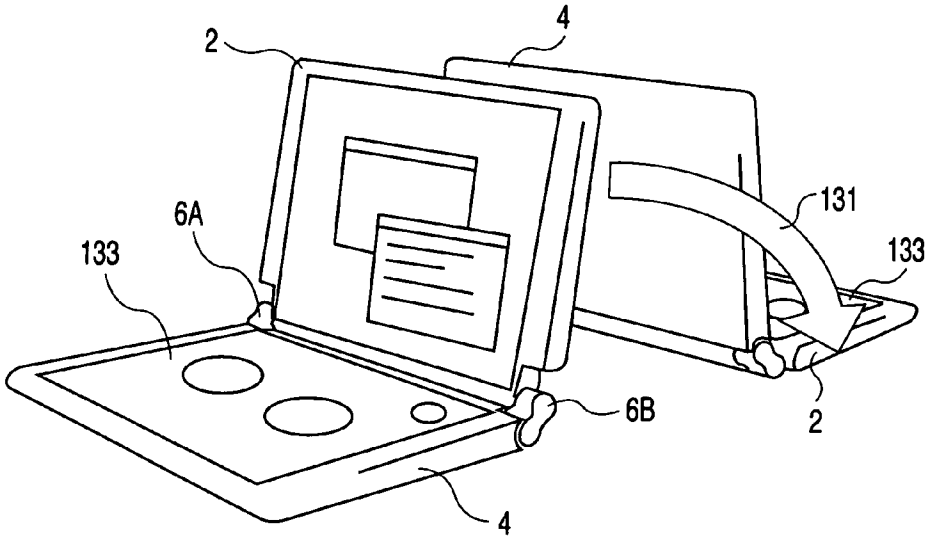


FIG. 10

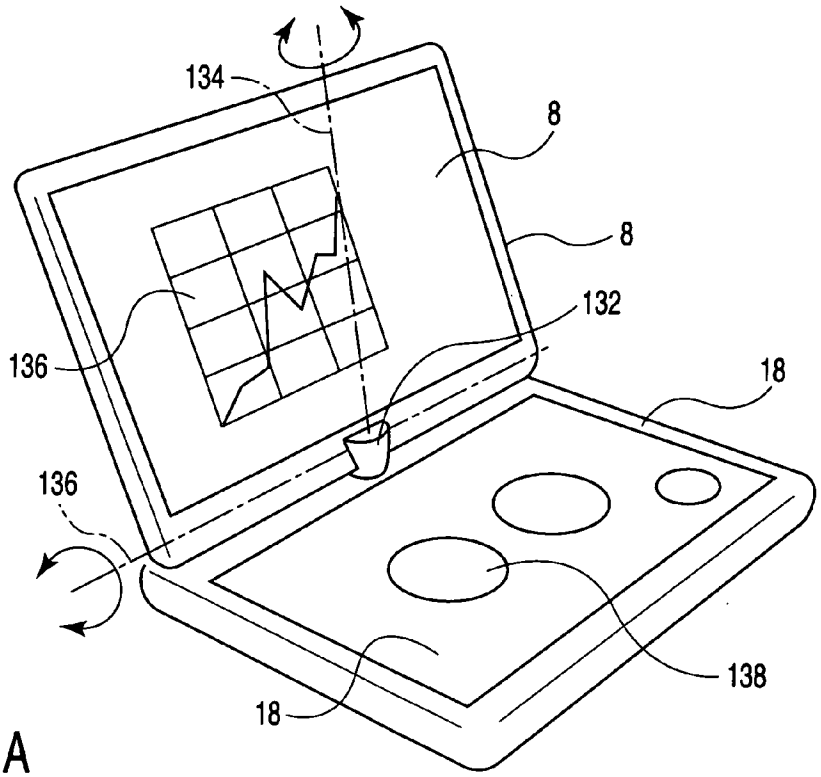


FIG. 11A

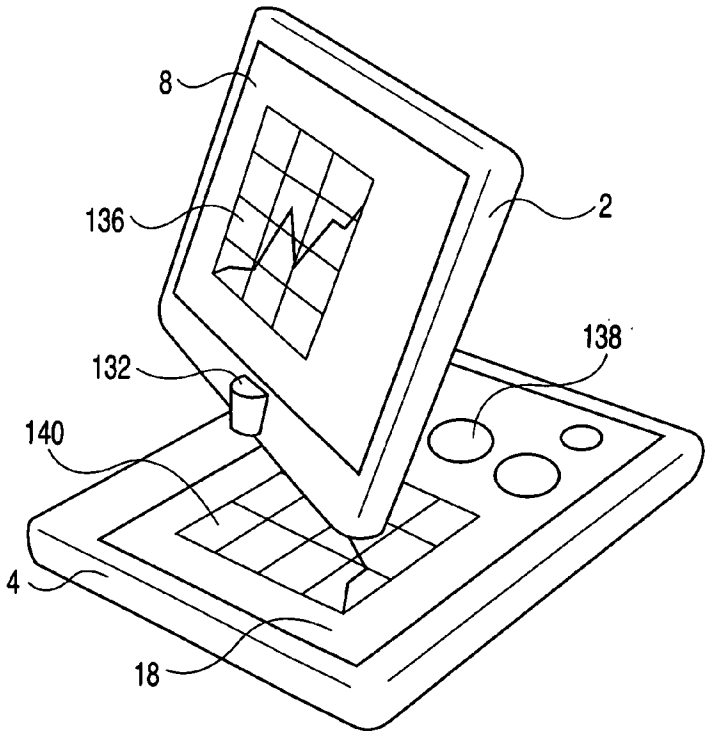


FIG. 11B

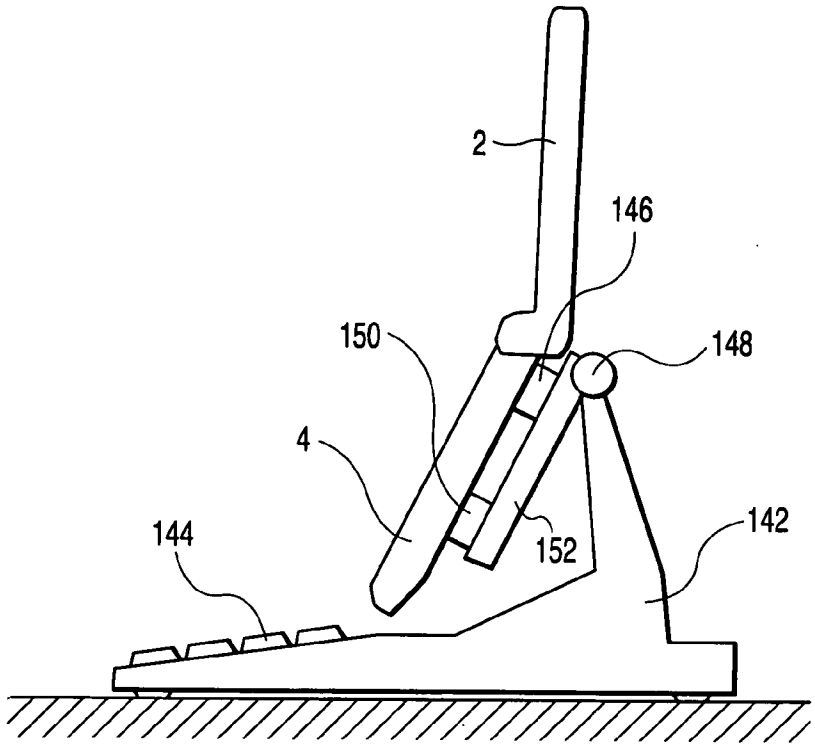

2
146
150
148
4
144
152
142

FIG. 12

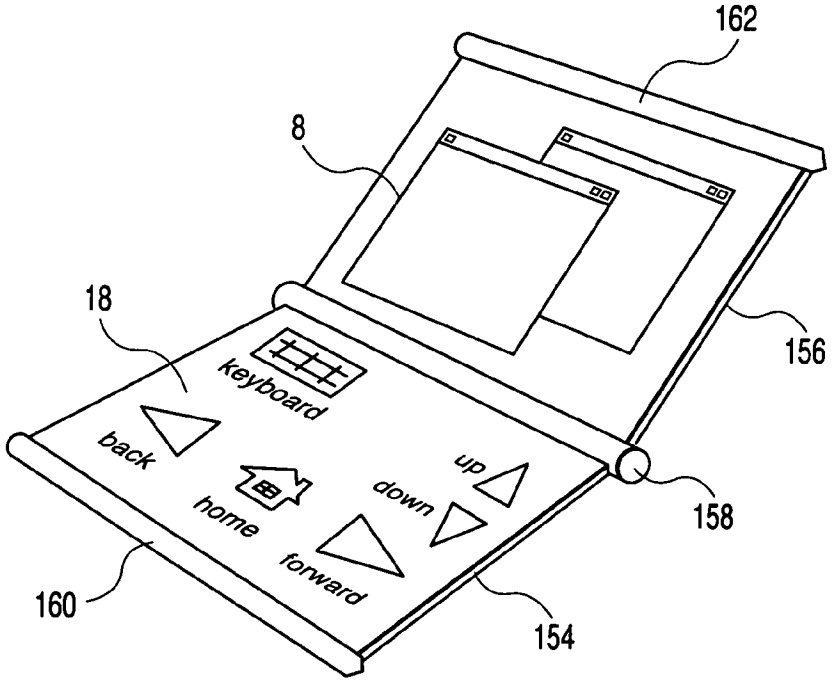

162
8
18
156
keyboard
back
up
down
home
forward
158
160
154

FIG. 13

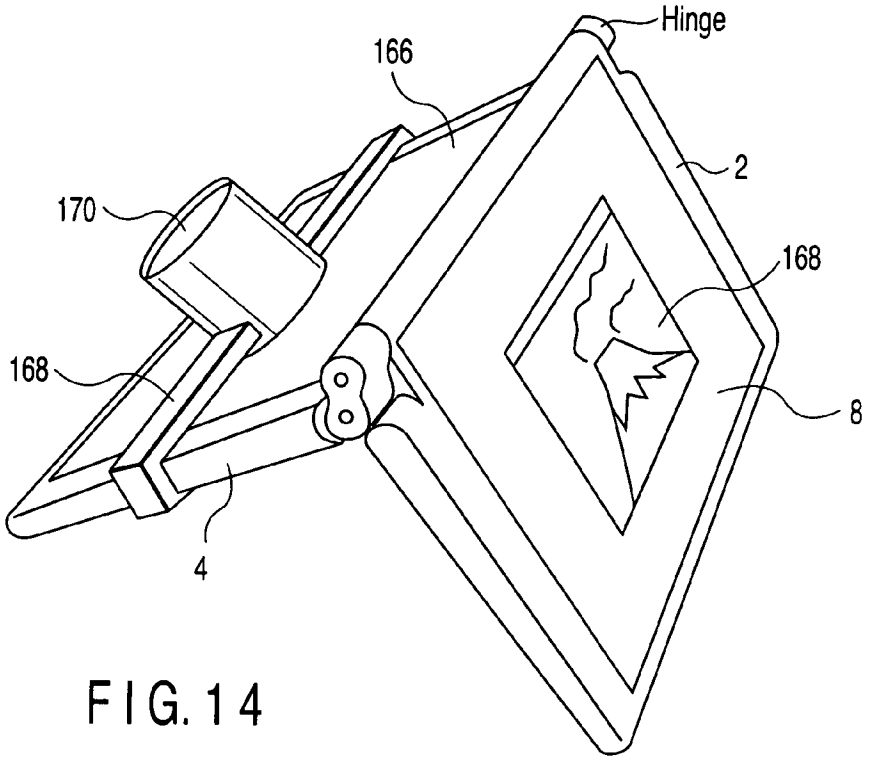

Hinge
166
2
170
168
168
8
4

FIG. 14

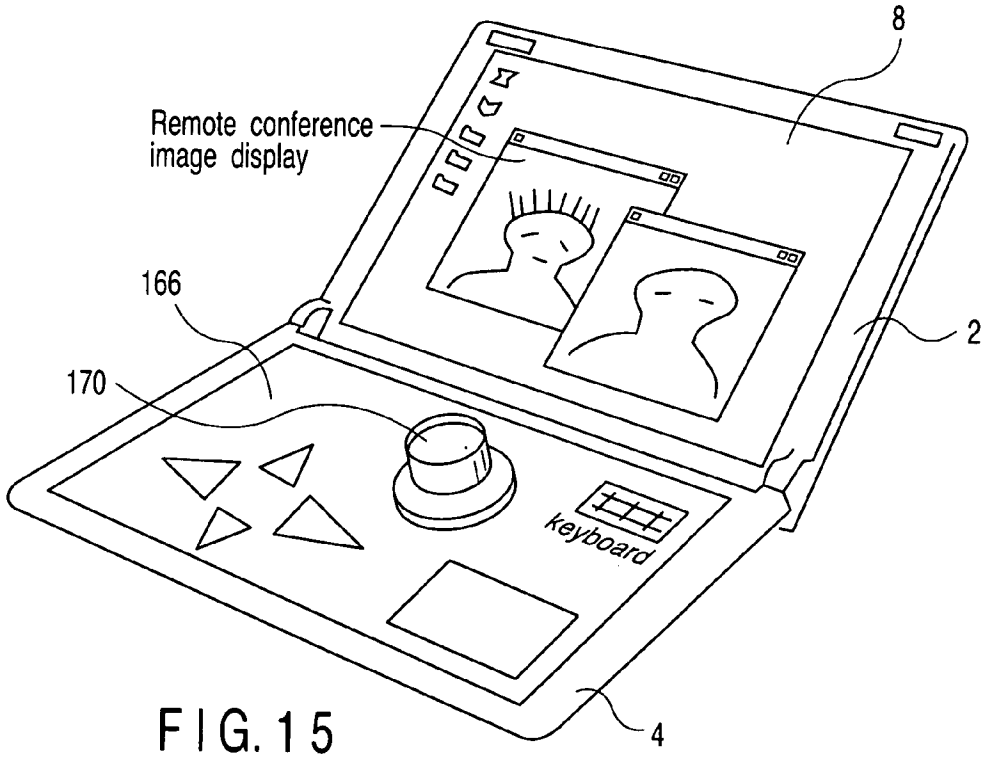

8
Remote conference
image display
166
2
170
keyboard
4

FIG. 15

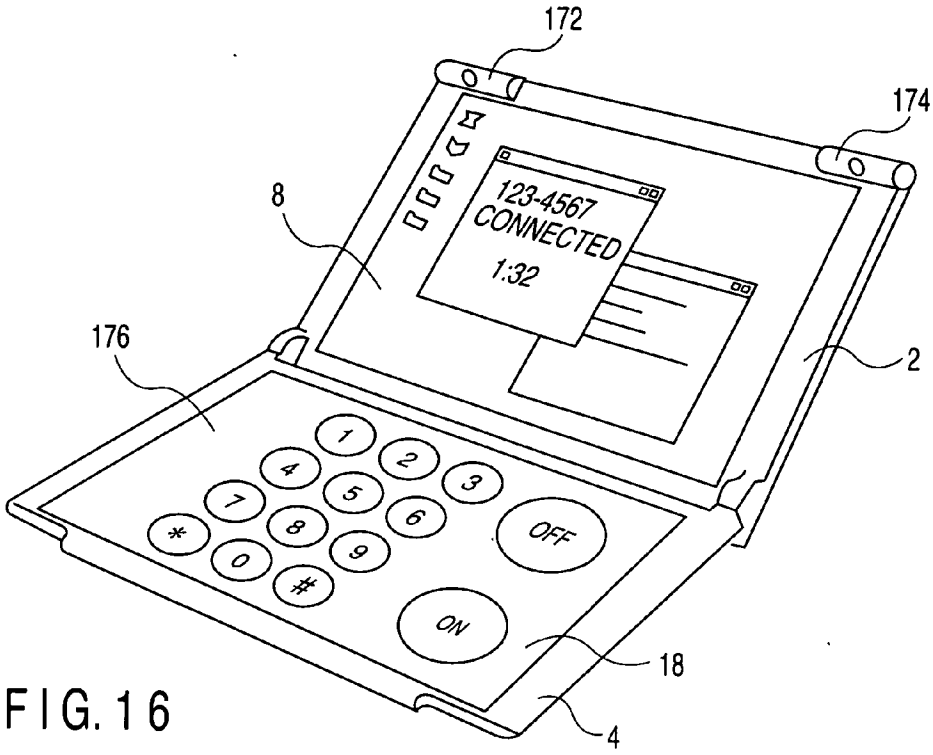

172
174
8
123-4567
CONNECTED
1:32
176
2
1
2
3
4
5
6
7
8
9
*
0
#
OFF
ON
18
4

FIG. 16

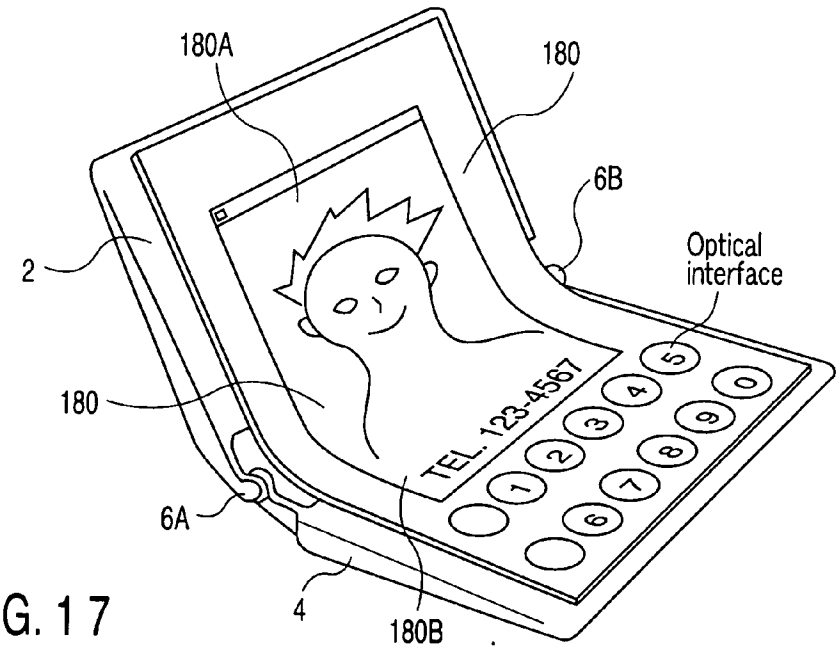

180A
180
6B
2
Optical
interface
180
TEL. 123-4567
6A
4
180B

FIG. 17

ELECTRONIC APPARATUS HAVING UNIVERSAL HUMAN INTERFACE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority from prior Japanese Patent Application No. 2004-233643, filed Aug. 10, 2004, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an electronic apparatus having a universal human interface, and in particular, to improvements in a user interface for a portable information apparatus having a planar display device and a device that allows a user to provide inputs using the user's finger or a stylus.

[0004] 2. Description of the Related Art

[0005] Notebook personal computers, PDAs, cellular phones, and the like are known as typical electronic apparatuses having user interfaces. For example, a conventional notebook personal computer comprises, as a user interface, a display such as a liquid crystal display which displays characters, graphics s, and the like on a plane surface, and a keyboard that allows a user to input characters by depressing keys arranged in a predetermined manner, as described in Jpn. Pat. Appln No. 1997-130935. In such a notebook personal computer, the display and the keyboard are held in respective independent housings, which are foldably connected together using hinges. When the notebook personal computer is used, the keyboard is placed on a plane almost parallel to a desk surface by appropriately adjusting the hinge angle of one of the housings to that of the other, both housings being placed on the desk surface. The display is placed so as to face the user. The user can input characters from the keyboard and move a cursor by operating keys on which arrows are printed. A pointing device called a touch pad is provided on the surface of the housing in which the keyboard is installed; the touch pad is located farther from the hinge than the keyboard. The user can move the mouse cursor by touching this pointing device with his or her fingertip. Available pointing devices include a stick system that allows the user to move the mouse cursor by using his or her finger to exert a force on a stick provided near the center of the keyboard.

[0006] In general, for portable electronic apparatuses, portability is inconsistent with operability and visibility associated with ease of use. It has thus been desirable to make portability consistent with ease of use. That is, the notebook personal computer is an information apparatus that the user carries with him or her for use. Accordingly, the sizes of the housings are important specification items. Obviously, the display area of the display decreases consistently with housing size. Further, when the notebook personal computer is equipped with a keyboard having a key arrangement and a key number significantly different from the standards, the general-purpose properties of the notebook personal computer are degraded. Consequently, the key pitch of the keyboard decreases consistently with housing size. The consistence between portability and the human interface is very important for the notebook personal computer. Thus, notebook personal computers are classified into a category including what is called full-size notebook personal computers which are inferior in portability and which have large housings, a large screen, and almost the same key pitch as that of desktop computers and a category including notebook personal computers having mobile housings which are small and easy to carry out but which have a small-sized screen, a small key pit, and a small touch pad area, that is, an inferior human interface. The user selects the category to which the personal computer the user is to purchase belongs, assuming a situation in which the personal computer is most frequently used. Also in this regard, for portable electronic apparatuses, portability must be compatible with ease of use.

[0007] For portable electronic apparatuses, it is desirable to improve the operability of the pointing device. To move the mouse cursor on the screen using the touch pad, the user must move the mouse cursor within a plane much smaller than the screen by moving his or her finger. This pointing device is considered to offer operability inferior to that of a mouse connected to the notebook personal computer and which can be moved to a larger extent than the touch pad in controlling the mouse cursor. Similarly, to move the mouse cursor using the stick, the user must use the force of his or her finger to adjust the movement of the position of the mouse cursor. This pointing device is considered to offer operability inferior to that of a mouse connected to the notebook personal computer and which can be moved to a larger extent than the stick in controlling the mouse cursor.

[0008] The mouse, which is externally installed, is easier to operate than the touch pad, which is incorporated into the notebook personal computer because it allows the user to use a larger area than the touch pad. However, disadvantageously, the user must move his or her arm quite a long distance in a horizontal direction from the keyboard, from which the user commonly provides inputs using both hands, to the mouse, which is operated with the user's right or left hand. Further, when it is difficult to operate the computer using the mouse, hardware such as a joy stick or a game pad must be mounted on the computer as an external input device, the hardware being specialized for software. Such hardware may not offer sufficient general-purpose properties and is likely to be infrequently used. Disadvantageously, the cost effectiveness of the device introduced by the user is virtually low. Further, manufacturing many devices infrequently used may lead to contamination of environment and consumption of resources. Also in this regard, the use of such hardware is not preferable.

[0009] Notebook personal computers are also commercially available which have an electromagnetic or pressure-sensitive touch panel lying on top of an LCD panel so that direct touch with the screen enables the position on the screen to be input. However, with such a notebook personal computer, when inputting characters, while editing the input characters using the pointing device, the user must frequently move his or her arm a relatively long distance against gravity from the keyboard to the screen. This is disadvantageously inappropriate if both keyboard and pointing device are frequently operated.

[0010] Further, such a notebook personal computer enables the user to input characters by displaying a software-based keyboard on the screen and depressing virtual keys.

However, the keyboard is almost two-dimensionally placed on a desk surface, and the display surface is placed at an angle with the desk surface so as to face the user. As is easily understood from this arrangement, the angle of a plane suitable for input is different from that of a plane suitable for viewing. There is a limit to the improvement of the input environment based on the addition of the touch panel function to one display.

[0011] Moreover, it is desirable to adapt the portable electronic apparatus to a particular situation so that the apparatus can be used easily in that situation. In general, the keyboard arrangement is specified. Accordingly, when the keyboard is utilized for a particular task, the fixed arrangement may disadvantageously be unsuitable for improving work efficiency. For example, the user may carry the notebook personal computer with him or her in order to process personal information. In this example, information stored in the notebook personal computer may be shown to a person different from the user. In some cases, a person different from the user may be allowed to perform a simple operation to execute a specified process on the basis of a procedure stored in a server on the network to which the notebook personal computer is connected, thus providing outputs constituting services. In other cases, subsequent business activities for articles or insurances may be based on these outputs. In such an example, not all the keys of the keyboard are required in the site where the user carries the notebook personal computer with him or her. Further, the client may provide incorrect input. If it is inconvenient to be able to use all the key inputs, the notebook personal computers manufactured by the current techniques offer no solutions. The possibility of incorrect operations can be reduced by allowing the client to operate only the previously described touch panel-installed display. However, the presence of the keyboard may hinder fundamental solutions. To solve this, a portable personal computer has been provided which has no keyboard and which is composed of an externally rectangular housing comprising a display and the minimum required input device such as a power supply switch. However, adapting the hardware only to a particular situation may degrade general-purpose properties. Specifically, when the user carries the apparatus to the client with him or her and if the client suddenly changes the contents of the operation, it is difficult to deal with this change with the above computer. Further, the user normally places paper flat on the desk when writing characters on the paper with a pencil. When reading a book, the user holds the book in his or her hand so that his or her line of sight is perpendicular to the print surface of the book. As is apparent from this behavior, the angle of a plane at which the user can easily input characters with his or her finger or a pen is different from that of a plane at which the user can easily read information displayed on the plane. This may disadvantageously tire the user. Moreover, for the electronic apparatuses, the user interface desirably meets users' individual requirements. That is, the input device needs to flexibly conform to the physical properties or preferences of users. It is well known that the size of each part of the human body varies. The input device such as a common keyboard or mouse has fixed dimensions. Consequently, a comfortable work environment cannot be realized unless the user prepares an input device of a size suitable for himself or herself. However, in the notebook personal computer, the keyboard is integrated with the main body. Thus, disadvantageously, the user cannot adjust the key pitch or arrangement.

[0012] The interface for the electronic apparatus can desirably provide a quieter environment. That is, when the user inputs characters from the keyboard, typing sounds occur. Accordingly, the keyboard is inconvenient for taking notes in a situation where making noise is not preferable, for example, in a library or during a class in school. It is thus desirable to enable input while maintaining a quiet environment.

BRIEF SUMMARY OF THE INVENTION

[0013] It is an object of the present invention to provide an electronic apparatus which is excellent in portability, operability, visibility, and reliability.

[0014] According to an aspect of the present invention, there is provided an electronic apparatus comprising:

[0015] a first display device comprising a first housing and a first display screen which is held in the first housing;

[0016] a second display device comprising a second housing and a second display screen which is received and held in the second housing, the second display screen comprising a sensor which generates a sensor output signal depending on an input on the second display screen;

[0017] a connecting mechanism configured to connect the first and second housings together and capable of adjusting an opening angle of the first housing with respect to the second housing;

[0018] a display processing section configured to display a first display image on the first display screen and a first interface image on the second display screen;

[0019] a determining section configured to determine an instruction to the interface image on the basis of the sensor output signal; and

[0020] a control section configured to control the display processing section in response to the instruction to cause a second display image to be displayed in place of the first display image and control the display processing section in response to the instruction to cause a second interface image to be displayed in place of the first interface image.

[0021] According to another aspect of the present invention, there is provided a foldable display device comprising:

[0022] a first device having a first display screen to display application images;

[0023] a second device having a second display screen to display interface images and an input sensor provided around the second display screen to sense an input position of touching or a movement on the second display screen;

[0024] a connecting mechanism configured to arbitrarily set an angle of the first display screen of the first device and the second display screen of the second device and to be capable to be folded;

[0025] an input processor to converting an input position sensed by the sensor into an input data to the display processor, and

[0026] a display processor to generate application images to be displayed on the first display screen and interface images to be displayed on the second display screen,

[0027] wherein the display processor generates a first interface image indicating distinctly displaying the input position after receiving the input data on the second display screen, and generates a first application image reflecting the input data on the first display screen.

[0028] According to yet another aspect of the present invention, there is provided a portable computer, comprising:

[0029] a flat panel having a first display panel and a second display panel, that is foldable along a centerline and that a surface of the second display panel approaches to a surface of the first display panel when they are folded;

[0030] a touch panel sensor provided at least on a second display panel to detect a user's input operation;

[0031] a display processor to supply display data to the first display panel and the second display panel; and

[0032] a display controller to control the display processor in at least two modes comprising,

[0033] a first mode where the display processor supplies an application image to the first display panel while supplying an interface image to the second display panel so as to use the second display panel as an input device, and

[0034] a second mode where an application image is divided into two part and one part of the application image is supplied to the second display panel and the other part of the application image is supplied to the first display panel so as to use the first and second display panels as a one extended screen.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0035] **FIG. 1** is a perspective view schematically showing a notebook personal computer as an example of a portable electronic apparatus according to an embodiment of the present invention;

[0036] **FIG. 2** is a sectional view schematically showing the internal structure of the notebook personal computer shown in **FIG. 1**;

[0037] **FIG. 3** is a block diagram showing a driving circuit that drives a touch panel-equipped LCD panel of the notebook personal computer shown in **FIG. 1**;

[0038] **FIG. 4** is a flowchart showing control with which a key code is output in response to an input to a virtual keyboard displayed on the touch panel-installed LCD panel of the notebook personal computer shown in **FIG. 1**;

[0039] **FIG. 5** is a sectional view schematically showing the structure of an illuminating mechanism incorporated into the notebook personal computer shown in **FIG. 1**;

[0040] **FIG. 6** is a sectional view schematically showing another structure of the illuminating mechanism incorporated into the notebook personal computer shown in **FIG. 1**;

[0041] **FIG. 7** is a perspective view schematically showing how a document is displayed on two screens according to another usage of the notebook personal computer shown in **FIG. 1**;

[0042] **FIG. 8** is a perspective view schematically showing an interface display according to yet another usage of the notebook personal computer shown in **FIG. 1**;

[0043] **FIG. 9** is a perspective view schematically showing usage of a notebook personal computer as an example of a portable electronic apparatus according to another embodiment of the present invention;

[0044] **FIG. 10** is a perspective view schematically showing usage of a notebook personal computer comprising a gravity sensor as a portable electronic apparatus according to yet another embodiment of the present invention;

[0045] **FIGS. 11A and 11B** are perspective views schematically showing usage of a notebook personal computer as an example of a portable electronic apparatus according to still another embodiment of the present invention;

[0046] **FIG. 12** is a perspective view schematically showing another usage of the notebook personal computer shown in **FIG. 1**;

[0047] **FIG. 13** is a perspective view schematically showing a notebook personal computer comprising a silicon on glass structure as an example of a portable electronic apparatus according to further another embodiment of the present invention;

[0048] **FIG. 14** is a perspective view schematically showing usage of a notebook personal computer comprising an input display function a as an example of a portable electronic apparatus according to further another embodiment of the present invention;

[0049] **FIG. 15** is a perspective view schematically showing usage of a notebook personal computer comprising an input display function a as an example of a portable electronic apparatus according to yet another embodiment of the present invention;

[0050] **FIG. 16** is a perspective view schematically showing usage of a camera-installed notebook personal computer as an example of a portable electronic apparatus according to still another embodiment of the present invention; and

[0051] **FIG. 17** is a perspective view schematically showing usage of a camera-installed notebook personal computer as an example of a portable electronic apparatus according to further another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0052] With reference to the drawings, description will be given of an electronic apparatus having a universal human interface according to an embodiment of the present invention.

[0053] **FIG. 1** is a perspective view schematically showing a notebook personal computer as an example of a portable electronic apparatus according to an embodiment of the present invention.

[0054] As shown in **FIG. 1**, the notebook personal computer is made portable by foldably connecting a first housing **2** and a second housing **4** together using hinges **6**A and **6**B and folding the first housing **2** over the second housing **4** to lay the first housing **2** on top of the second housing **4**. Further, as shown in **FIG. 1**, the first housing **2** is opened with respect to the second housing **4** so that a user can operate the notebook personal computer while viewing the first housing **2** and the second housing **4**. That is, the user can place the second housing **4** on a desk surface and use the hinges **6**A and **6**B to appropriately adjust the angle of the first housing **2** so that the user can easily view an LCD panel in the first housing **2**.

[0055] The first housing **2** has the LCD (liquid crystal display) panel **8** installed in its frame **10** to display images, characters, and the like. A driving circuit (not shown) is stored in the housing **2** to drive the LCD panel **8**. Further, in addition to the LCD panel **8**, an antenna for wireless LAN or radio communication such as Bluetooth is stored in the first housing **2**. The LCD panel **8** displays a pointer **12** used to select any of icons shown as images or characters. The pointer **12** can be used to make any of the icons active to operate the related application.

[0056] In the second housing **4**, rubber pads **14**A and **14**B are applied to the surface of the frame **10** as a cushioning material so as to prevent the first housing **2** and the second housing **4** from being shocked when they are folded. Accordingly, the rubber pads **14**A and **14**B absorb an external shock applied when the notebook personal computer is folded or carried. This prevents the first housing **2** and the second housing **4** from being damaged by the shock.

[0057] The second housing **4** has a touch panel-installed LCD panel **18** installed in its frame **16**. The touch panel-installed LCD panel **18** includes a pressure-sensitive touch panel laminated to an LCD panel (liquid crystal display device) used to display images, characters, and the like. The second housing **4** stores a driving circuit (not shown) that drives the LCD panel of the touch panel-installed LCD panel **18** and a detecting circuit (not shown) that detects an input to the touch panel. Further, the second housing **4** has a built-in motherboard on which a CPU and a memory are mounted, and a drive device such as an HDD. The housings **2** and **4** supply power to each other and exchange information with each other via a bundle of electric wires passing through the neighborhood of the center of a shaft of each of the hinges **6**A and **6**B.

[0058] The touch panel-installed LCD panel **18** displays a virtual keyboard **20** corresponding to a keyboard image that can be used to input characters or the like by providing key input as with common keyboards. That is, an input to the touch panel is replaced with a code or the like which is generated when the corresponding key of the common keyboard is depressed, on the basis of the relationship between the input and the corresponding display image. The code is then input to a CPU in the notebook personal computer main body, where the code is then subjected to software processing. Then, the resulting image is displayed on the LCD panel **8**. In this manner, emulation of the mechanical keyboard may be implemented by a special electronic circuit that controls the touch panel-installed LCD panel. Alternatively, it may be implemented by processing executed by software such as firmware. The user may create the keyboard image in bitmap form. Further, the touch panel-installed LCD panel can be used as an interface in a form different from the keyboard as described later.

[0059] The touch panel-installed LCD panel **18** displays not only the virtual keyboard **20** but also a virtual mouse **22** operated similarly to a common mouse to move a pointer position or make any icon active. That is, an image corresponding to the mouse **22** is displayed in a screen on which the keyboard **20** is displayed. The user uses his or her hand to touch and depress a part of the touch panel corresponding to the displayed position of the virtual mouse **22**, to move the virtual mouse **22**. This results in a setting such that the entire touch panel is used as an area in which the virtual mouse can move. In this case, even if the virtual keyboard is depressed during the operation of the virtual mouse **22**, this is not recognized as a key input. When the user's hand remains off the virtual mouse **22** for a specified time, the virtual mouse moves to the lower right of the touch panel-installed display **18**, shown in **FIG. 1**, to wait for an operation. Then, an input can be provided to the virtual keyboard **20**. Of course, the standby position of the virtual mouse **22** is not limited to the lower right of the touch panel-installed display **20** but can be arbitrarily set by the user. Further, by making the displayed virtual mouse **22** smaller while it is standing by than while it is being used, as in the case of the icons, it is possible to reduce the possibility that the virtual mouse **22** will interfere with an input area for the virtual keyboard **20**. If the standing-by virtual mouse **22** is displayed as an icon, then tapping the icon enables the virtual mouse **22** to be displayed near the icon in the use-time size.

[0060] The following action may be taken instead of causing the virtual mouse **22** to stand by while it is not used: upon sensing the thenar eminence, hypothenar eminence, index finger, and middle finger of one hand touching the touch panel and moving over the touch panel **20** while maintaining the same positions, the computer may determine that the virtual mouse **22** is being operated. In this case, the virtual mouse is displayed on the touch panel-installed LCD panel **20** so that a pointer on the screen can be moved. Further, the computer can be allowed to determine, on the basis of the pressure of the finger, whether a button is being pressed or the finger is off the button, to perform a click operation. Further, when one of the fingers moves in a way that the distances from this finger to the thenar eminence and to hypothenar eminence change, the computer may determine that this input indicates that a wheel has been moved. In this manner, as in the case of the common mouse, an output from the virtual mouse is provided to the CPU in the personal computer main body, where it is subjected to software processing. The results of the software processing are displayed as an image on the LCD panel **8**.

[0061] In this case, when the virtual mouse **22** moves onto the virtual keyboard **20**, it may be displayed on top of the virtual keyboard **20** so as to appear translucent or opaque. Further, when the virtual mouse **22** or the virtual keyboard **20** is touched, the brightness, color, or image contrast of the touched input area may be changed depending on the intensity of the input to the touch panel. Furthermore, if any line or character is already displayed in an input area when the virtual mouse **22** or the virtual keyboard **20** is touched, the thickness of the line, the size of the character, or the font may be changed. A sound may be generated which corresponds to the virtual key displayed in the input area.

[0062] Further, the touch panel-installed LCD panel **18** can display other icons **24**A and **24**B and the like as required and also display images, characters, and the like without showing the virtual keyboard **20** similarly to the LCD panel **8**. A combination of the LCD panel **8** and the LCD panel **18** provides a larger work area than with common personal computers. On the touch panel-installed LCD panel **18**, the icons **24**A and **24**B may be displayed on top of another image. When displayed on top of another image, the icons **24**A and **24**B may be translucent or opaque.

[0063] In the above embodiment, the touch panel-installed LCD panel **18** senses a contact pressure on the basis of the contact area. However, obviously, the touch panel-installed LCD panel **18** may be able to sense the pressure exerted directly on a touch panel **18**T. Similarly, the touch panel-installed LCD panel **18** may be able to electromagnetically sense a touch with the touch panel **18**T. The electromagnetic type adopts a sensor that can detect the intensity of electromagnetic waves on the touch panel **18**T to sense a touch on the basis of a change in intensity.

[0064] The second housing **4** is assembled in the following manner: the panel surface of the touch panel-installed LCD panel **18**, installed in the second housing **4**, is flush with the top surface of the frame **16** of the second housing **4** so that no step is formed between the panel surface of the LCD panel **18** and the frame **16** of the housing **14**. Since there is almost no step between the surface of the LCD panel in the housing and the surface of the second housing, the movement of the user's hand is not hindered by steps at the ends of the panel when the virtual mouse is operated.

[0065] With the conventional notebook personal computer, the pointer moving all over the screen is operated by moving the user's finger in a small area such as the touch pad, which is at most several centimeters by several centimeters square. This is considered to be disadvantageous in the accuracy of operations. However, with such a notebook personal computer as shown in **FIG. 1**, an area almost equal to the size of the housing can be used as a pointing device. Consequently, operability is expected to be drastically improved.

[0066] In the embodiment shown in **FIG. 1**, the LCD panel **8** in the first housing **2** is not provided with any touch panel. However, it may be provided with a touch panel similarly to the LCD panel in the second housing **4**.

[0067] If icons used to activate applications or indicating files, folders, or the like are arranged on the touch panel **18**, it is possible to equally perform a series of operations for operating the keyboard and an operation for clicking any of the icons. This eliminates the need for a change in input path which is effected by, for example, taking the user's hand off the keyboard and operating the pointing device as with the common notebook personal computers.

[0068] When the notebook personal computer shown in **FIG. 1** is used, the second housing **4**, which houses a circuit board **36** provided with a semiconductor element **34**, is placed on a desk surface **30** as shown in **FIG. 2**. Then, the angle of the LCD panel **8** is appropriately adjusted utilizing the hinges **6**A and **6**B so that the user can view the LCD panel **8** easily. If there is a large angle between the direction of the line of sight **28** of the user **30** and the normal **26** of the LCD panel **18**, provided in the second housing **14**, and external light incident on the panel **18** is reflected to make the display on the LCD panel **18** difficult to view, a tilt stand **32** can be used to adjust the angle. Adjustments with the tilt stand **32** are insufficient to set the angle of the second housing **4** set as freely as the holding angle of the first housing **2**.

[0069] The touch panel-installed panel **18** is normally composed of a touch panel **18**A stacked on a liquid crystal display section **18**B. If the line of sight **28** of the user **30** coincides with the direction of the normal **26**, the depressed position of the touch panel **18**A matches a display position on the liquid crystal display section **18**B. However, if there is a certain angle θ between the line of sight **28** of the user **30** and the direction of the normal **26**, the depressed position of the touch panel **18**A does not match the display position on the liquid crystal display section **18**B. The depressed position is misaligned with the display position. To deal with this problem, the relationship is preferably established such that the input position on the touch panel deviates from the position corresponding to the display section **18**B. That is, with the certain angle θ between the line of sight **28** of the user **30** and the direction of the normal **26** taken into account, if a position on the touch panel **18**A lying on an extension of the line of sight is depressed, an instruction is preferably given on a display position in the liquid crystal display section **18**B also lying on the extension of the line of sight **28**.

[0070] In this case, the touch panel **18**A and the liquid crystal display section **18**B are driven using, by way of example, such a driving arrangement as shown in **FIG. 3**. With the circuit shown in **FIG. 3**, when the notebook personal computer is powered on, an image display command is provided to a graphics s CPU **40**. In response to the command, the CPU **40** transfers image data on the virtual keyboard **20** from a graphics s ROM **42** to a frame memory **44**. The frame memory **44** then expands the transferred image data on the virtual keyboard **20** into a bitmap, which is provided to a display circuit section **46** on a line-by-line basis. The display circuit **46** processes and converts the image line signal into a row driving signal and a column driving signal. The display circuit **46** then supplies the row and column driving signals to a row driver **48** and a column driver **50**, respectively. The drivers **48** and **50** convert the respective driving signals into signals driving the display signal in accordance with the driving signals. The LCD display section **18**B displays an image of the virtual keyboard **20**. The image display command provided to the graphics s CPU **40** contains information on the keyboard size and arrangement of the virtual keyboard **20**. In accordance with the image display command, the CPU **40** processes and converts data from the ROM **42** into appropriate image data and then supplies the image data to the frame memory **44**. Therefore, after the default virtual keyboard **20** is displayed on the LCD display section **18**B, it can be utilized to provide the CPU **40** with an instruction on a change in the size and arrangement of the virtual keyboard **20**.

[0071] With reference to **FIGS. 3 and 4**, description will be given of a control flow in which a key code is output in response to a certain input to the virtual keyboard **20**.

[0072] The virtual keyboard **20** is displayed and its control is started (step **S10**). In this case, when the user's finger

touches the touch panel **18**A on the LCD display section **18**, on which the virtual keyboard **20** is displayed, an X coordinate sensor **54** and a Y coordinate sensor **56** detects the coordinates of the touched area, for example, the area shown at reference numerals **52**A and **52**B in **FIG. 3**, as shown in step S**12**. The coordinates detected by the X coordinate sensor **54** and Y coordinate sensor **56** contain all the pixel coordinates in the area touched by the user's finger, the pixel coordinates corresponding to pixels in the LCD display section **18**B. A coordinate processing section **58** is supplied with an X and Y coordinate detection signals specifying the pixel coordinates. If the area touched by the user's finger during an adjustable predetermined period is equal to or larger than a predetermined size as shown by reference numerals **52**A or **52**B or is smaller than the predetermined size as shown in steps S**14** and S**15**, the coordinate processing section **58** determines that the touch is a keyboard input to determine the central coordinates of the touched area as shown in step S**20**. Then, the graphics s CPU **40** compares the central image with the virtual keyboard **20** as shown in step S**22**. The graphics s CPU **40** then outputs the key code of the key corresponding to the central image and also outputs a signal for a change in the color or brightness of the key corresponding to the central coordinates, to the frame memory **44**. The color or brightness of the key on the virtual keyboard **20** corresponding to the key input is changed and the screen indicates that the input has been provided. Likewise, if the user's finger touches the virtual keyboard **20** to provide the next input, steps S**10** to S**26** are similarly repeated.

[**0073**] In step S**14**, when the area of the touch panel **18**A touched by the user's finger during the predetermined period is smaller than the predetermined size as shown by reference numeral **52**C, for example, when the user's finger inadvertently touches the touch panel **18**A, the area is smaller than the predetermined size. Accordingly, the coordinate processing section **58** does not determine that a keyboard input has been provided as shown in step S**18**. Thus, the coordinate processing section **58** does not output the signal for key central coordinates to the graphics s CPU **40**. The area touched by the user's finger is smaller than the predetermined size when, for example, the finger remains placed on the keyboard, for example, at a home position for a period longer than in the case of a keyboard input.

[**0074**] Further, in step S**18**, if the area of the touch panel **18**A touched by the user's finger during the predetermined period is larger than the predetermined size and exceeds the limit beyond which the input is determined to be abnormal, as shown by reference numeral **52**D, for example, if the user's finger touches the touch panel **18**A in such a way that it strokes the panel, then the coordinate processing section **58** does not determine that a keyboard input has been provided as shown in **FIG. 18**. Thus, the coordinate processing section **58** does not output the signal for key central coordinates to the graphics s CPU **40**.

[**0075**] If the virtual mouse **22** is displayed, when the notebook personal computer is powered on, the image display command is similarly provided to the graphics s CPU **40**. In response to the command, the CPU **40** transfers image data on the virtual mouse **22** from the graphics s ROM **42** to the frame memory **44** together with the image data on the virtual keyboard **20**. The frame memory **44** then expands the transferred image data on the virtual mouse **22** into a bitmap, which is provided to the display circuit section **46** on a line-by-line basis. The display circuit **46** processes and converts the image line signal into a row driving signal and a column driving signal. The display circuit **46** then supplies the row and column driving signals to the row driver **48** and the column driver **50**, respectively. The drivers **48** and **50** convert the respective driving signals into signals driving the display signal in accordance with the driving signals. The LCD display section **18**B displays an image of the virtual mouse **22**. The image display command provided to the graphics CPU **40** contains the information on the keyboard size and arrangement of the virtual mouse **22**. In accordance with the image display command, the CPU **40** processes and converts the data from the ROM **42** into appropriate image data and then supplies the image data to the frame memory **44**. Therefore, after the default virtual keyboard **20** is displayed on the LCD display section **18**B, it can be utilized to provide the CPU **40** with an instruction on a change in the size and arrangement of the virtual mouse **22**.

[**0076**] Button operations with the virtual mouse **22** are treated similarly to key inputs. Depressing the area of a button is determined to be a click. That is, if the user's finger is simply placed on the button with no instruction on a click given, the operation is not determined to be a click because the area in which the user's finger is placed is smaller than the predetermined size as in the case of key inputs. To move the virtual mouse **22** to change the pointer position, a plurality of fingers are placed and moved in order to move the virtual mouse **22**. Accordingly, the area touched by the plurality of fingers is detected. Movement of the virtual mouse **22** is determined when the following state is sensed: the area in which the user's fingers are placed is equal to or larger than the predetermined size and this area is moved with time. In this case, the pointer moves with this movement, and the movement of the pointer corresponds to the movement of a predetermined position in the area specified by the plurality of fingers. That is, when the predetermined position in the area is moved, the pointer is moved the same distance as that the predetermined position moves, in the same direction as that of the movement of the predetermined position. Further, when the user takes his or her finger off the virtual mouse **22**, the virtual mouse **22** is returned to the home position. Specifically, when the finger remains off the touch panel-installed display **18** for a predetermined period in order to change the manner of touching the virtual mouse **22**, the coordinate processing section **58** determines that the coordinates of the area touched by the finger have disappeared for the predetermined period. The coordinate processing section **58** thus instructs the graphics CPU **40** to suspend the operation of the virtual mouse **22**. Therefore, the graphics CPU **40** executes a process of returning the virtual mouse **22** to the home position, in the example shown in **FIG. 3**, the area in the lower right of the touch panel-installed panel **18**.

[**0077**] In response to a keyboard input, the graphics CPU **40** outputs the signal for the key central coordinates to the CPU (not shown) in the notebook personal computer as a command corresponding to the input key or the like. The CPU then executes an ordinary process corresponding to the key input. Likewise, for a mouse output, the graphics CPU **40** outputs a command corresponding to a mouse operation to the CPU in the notebook personal computer. The CPU then executes an ordinary process corresponding to the mouse input. For a process realized using another icon, the

CPU in the notebook personal computer executes a process corresponding to the input command.

[0078] In the notebook personal computer shown in **FIGS. 1 and 2**, the LCD panels **8** and **18** are illuminated using one light source as shown in **FIG. 5**. Specifically, as shown in **FIG. 5**, which is a sectional view of a part of the notebook personal computer, the first housing **2** has an FL tube **60** and a built-in circuit **62** such as an inverter which supplies a high voltage to the FL tube **60** to cause it to emit light. The LCD panel **8** is of a transmission type illuminated by the FL tube **60** from behind. The LCD panel **18** in the second housing **4** is designed to be of a reflection type illuminated by the FL tube **60** from the front. Accordingly, the FL tube **60** is placed in the first housing **2** and in proximity to the second housing **4**. A light guide plate **64** is placed behind the LCD panel **8** to guide an illumination beam. A window **66** is formed in the first housing **2**; the window **66** is closed with a transparent member that guides an illumination beam from the FL tube **60** to a surface of the LCD panel **18**. An illumination beam from the FL tube **60**, placed between the window **66** and the light guide plate **64**, is introduced into the light guide plate **64**, which then guides the illumination beam to the rear surface of the LCD panel **8**. Consequently, the LCD panel **8** is illuminated from its rear surface to display an image on itself. Further, an illumination beam from the FL tube **60** is guided to the front surface of the LCD panel **18** via the window **66** as shown by the arrow in the figure. The illumination beam is guided to the interior of the LCD panel **18** and then reflected. The reflected beam allows the user to recognize an image formed on the LCD panel **18**. This structure is provided with the one FL tube **60** and the one inverter circuit **62**, which drives the one FL tube **60**. This structure can thus make it possible to reduce power consumption compared to a structure in which an FL tube and its driving circuit are provided in each of the housings **2** and **4**. The space for parts arrangement can also be saved. It should be noted that the hinges connecting the first and second housings **2** and **4** together are omitted in **FIG. 5**.

[0079] In the illumination system shown in **FIG. 5**, the LCD panel **18** is of the reflection type illuminated from the front. However, the LCD panel **18** may be of the transmission type illuminated from behind as shown in **FIG. 6**. Specifically, as shown in **FIG. 6**, a light guide plate **68** is provided behind the LCD panel **18**. A window **72** is formed in the first housing **4** opposite a light incident portion **68**A of the light guide plate **68**; the window **66** is closed with a transparent member. The window **72** lies opposite the window in the housing **2** in which a lens **70** is fitted. The lens **70** in the housing **4** suppresses the leakage of light from the gap between the hinges **6**A and **6**B to the exterior. In the housings **2** and **4** adopting such an illumination system, rotating shafts of the hinges **6**A and **6**B are placed below the hinge position in the structure shown in **FIG. 5**. When the first housing **5** is opened, the lower end of the first housing **2** is placed below that in the structure shown in **FIG. 5**.

[0080] In the illumination system shown in **FIG. 6**, an illumination beam from the FL tube **60**, housed in the first housing **2**, is guided by the light guide plate **64** inside the first housing **2** and condensed by the lens **70**. The illumination beam is thus guided to the window **72**. The condensed beam introduced via the window **72** is lead to the light guide plate **68** inside the second housing **4** via the light incident section **68**A. The beam is then transmitted through the light guide plate **68** and then from the light guide plate **68** to the LCD panel **18**. Therefore, the user views an image displayed on the LCD panel **18**.

[0081] The illumination system shown in **FIG. 6** is provided with the one FL tube **60** and the one inverter circuit **62**, which drives the one FL tube **60**. This illumination system can thus make it possible to reduce power consumption compared to a structure in which an FL tube **60** and its driving circuit are provided in each of the housings **2** and **4**. The space for parts arrangement can also be saved.

[0082] With reference to **FIGS. 5 and 6**, description has been given of a method of illuminating the two LCD panels **8** and **18** using the one FL tube **60**. However, the use of a light source such as a LED which does not require any inverter solves the problem for the space for the light source power source and makes it possible to reduce power consumption. This enables an illumination light source to be provided in each of the two LCD panels **8** and **18**. It is thus possible to use a self-luminescent display device such as an EL display panel which does not require any illumination light source.

[0083] The software in the personal computer may be set as follows. If a stylus or the user's finger has not touched the input device such as the touch panel **18**T for a preset time period, the display by at least one of the first display device **8** and second display device **18** is stopped to turn down or put out the illumination by a backlight, a front light, or the like.

[0084] In the description of the touch panel-installed panel **18**, shown in **FIGS. 1 and 2**, the size of the area depressed by the user's finger is in proportion to the pressure of the touch. The touch panel **18**T may be of an arbitrary type provided that it can sense pressure. A key input is determined on the basis of the pressure of the finger touch.

[0085] To ensure the user's input, it is possible to change the display color of the virtual key, increase the brightness of the key, or make a key input sound when a key input is provided. Further, even if the input is insufficient to be recognized as a key input, the display color or brightness of the key may be slightly changed to provide feedback to the user to inform him or her that the touch panel **18**T is sensing pressure. In some places such as a library and some situations such as note taking at a meeting or lecture, it is inappropriate to generate sound. Accordingly, the user can set whether or not to generate a key input sound. The sound may correspond to the key position, for example, depressing the key "A" may result in the corresponding sound, and depressing the key "B" may result in a beep. Alternatively, a pip may be generated which has a frequency varying depending on the key position. Alternatively, typing sounds may be generated using recorded typing sounds of a conventional mechanical keyboard or a typewriter.

[0086] In the notebook personal computer shown in **FIGS. 1 and 2**, both of the two LED panels **8** and **18** may be used as output screens to continuously display data across the two screens as shown in **FIGS. 7 and 8**. That is, when the personal computer is used to perform an operation for which viewing displayed information is more important than key inputs, the display on the keyboard may be reduced or deleted so that the data succeeding the contents of the display in the LCD panel in the first housing **2** can be

displayed on the LCD panel **18** in the second housing **4**. Alternatively, data associated with the contents of the display in the LCD panel in the first housing **2** can be displayed on the LCD panel **18** in the second housing **4**. **FIG. 7** shows an example in which continuous spread sheets **74**A and **74**B are displayed across the two screens. In the example shown in **FIG. 7**, when numbers must be input, a pad-like virtual key area **76** can be displayed which shows the minimum required keys such as numeric keys, an addition, subtraction, multiplication, and division symbol keys, an enter key, and a delete key. The position and rotating angle of the pad-like virtual key area **76** can be adjusted so as to facilitate inputs by dragging any of the corners of the pad with the user's finger. To move the pad with one point on the pad kept depressed, the pad can be moved. To move the pad with a plurality of points on the pad depressed, the pad can be rotated by associating the movement of the center of gravity of the point group with the movement of the pad and moving the pad with respect to the center of gravity of the point group.

[**0087**] **FIG. 8** shows an example in which a document is displayed using the two screens. For example, each page of a vertically long document can be displayed all over the screen of the display device by opening the hinges **6**A and **6**B through an angle of about 180° so that display screens **78**A and **78**B of the housings **1** and **2** face in almost the same direction; for example, the vertically long document is created on the assumption that it is to be printed on A4-sized sheets. This enables the document to be easily read and reduces the amount of printing on paper intended to allow the document to be read rather than to, for example, store the document. This reduces the wasteful consumption of global resources. **FIG. 8** shows the example in which the display surfaces are at almost the same height, that is, the two display surfaces are on almost the same plane. However, depending on the structure of the hinges **6**A and **6**B, the display surfaces need not be at the same height and may instead have almost the same normal direction.

[**0088**] In addition to the methods using the two screens for display as described above, various other methods are possible; a document or an image file is corrected by checking an uncorrected and corrected documents or files displayed on the respective screens; a plurality of thumbnail images are displayed on the LCD panel in the second housing so that the user can use his or her finger or the like depress any of the positions at which the thumbnail images are displayed to display an enlarged image on the first screen; or a part of a screen displayed on the LCD panel in the first housing is enlarged and displayed on the LCD panel in the second housing so that the user can view the enlarged screen to make detailed specifications concerning the areas in strings or the areas in the screen. When continuous information is displayed on the LCD panels, it is possible to display duplicate information in a display portion of the two LCD panels near the hinges **6**A and **6**B, to omit the information corresponding to the physical gap between the LCD panels from the display, or to simply divide the displayed information at the ends of each LCD panel.

[**0089**] The user may intentionally switch between provision of a key input and viewing of displayed information. However, the display state of the two screens may automatically be changed depending on the state of the user's hand with respect to the touch panel. For example, if the user's hand has not touched the touch panel for at least a predetermined time, the display screen may be enlarged so as to cover the entire two screens with the display of the keyboard deleted. When the user places his or her hand in the place where the keyboard is displayed in such a way that the user pads the keyboard, that is, when the user places his or her fingers at the two points corresponding to the "F" and "J" keys, the computer may determine that the user is to operate the keyboard on the basis of the form of the user's fingers touching the touch panel. The computer may then switch to the display of the keyboard.

[**0090**] By thus appropriately assigning the two screen areas to output or input, it is possible to obtain a large display screen even in a small-sized portable personal computer. Further, when an input is to be provided, almost the same area as that in a notebook personal computer with a common mechanical keyboard can be used as an input interface by assigning the screen to the virtual keyboard as required.

[**0091**] If the keyboard has not been operated for at least a specified time, then for example, information succeeding the screen display in the first housing **2** is displayed in the second housing **4**. If the user has not operated the keyboard for a further extended time, both screens displayed in the first housing **2** and second housing **4** may be deleted or such a screen saver as displays moving images or characters may start operation.

[**0092**] Since the virtual keyboard or the like is displayed at the same position for an extended time, the image displayed on the LCD panel **18** in the second housing **4** may be dimmed in a shorter time than that displayed in the first housing **2**. Alternatively, the screen saver may be operated. Further when different systems are adopted for the display panel **8** in the first housing **2** and for the display panel in the second housing **4**, the amount of time before the screen saver starts operation may be determined on the basis of the lifetimes of the display devices **2** and **4**.

[**0093**] The user may change the functions and display manners of the displayed virtual keys. The user can also make a setting such that, for example, shortcut icons for activating applications can be used directly as functions of the keyboard. Further, the user may switch between keyboards for different districts such as a Japanese keyboard, an English keyboard, and a Japanese syllabary order keyboard without changing the hardware. The keyboard arrangement may be varied depending on the type of the user; that is, it is possible to determine whether or not to provide numeric keys, whether or not to provide a control key and a shift key in both right and left of the screen, whether a new line key is vertically or horizontally long, whether or not to provide function keys.

[**0094**] By displaying only the minimum number of keys required for a particular operation as virtual keys, it is possible to prevent the user from unintentionally touching an unwanted key to perform an unintentional operation. This is also effective in associating a limitation on the user's authority with the displayed keyboard arrangement to more clearly distinguish the authority of a user of a personal computer used for a particular application from that of the administrator of the personal computer, thus improving the security for applications intended for unspecified number of the

general public, for example, the security of a system for guiding transportation or of terminals provided at Internet cafes.

[0095] The personal computer shown in **FIGS. 1 and 2** has a smaller number of movable portions than a keyboard on which a large number of mechanical switches are arranged. The personal computer is thus expected to have improved reliability and allows its keyboard to be easily protected from dust or drips. In contrast to dust-proofing, in which the apparatus is protected from external dust, when the keyboard id used in a semiconductor plant, dust may be collected in the keyboard, which has a complicated structure or the collected dust may scatter. Further, mechanical movement may cause parts to rub against each other to generate dust. The present invention suppresses the accumulation, scattering, and generation of dust.

[0096] Furthermore, when for example, the user carries a conventional notebook personal computer with him or her, if the folded personal computer is subjected to a high external pressure or members such as the housings are bent by vibration or a shock, traces of the corners of key tops may be left on the screen. However, the personal computer according to the present invention shown in **FIGS. 1 and 2**, the planar screens contact each other at a radius of curvature far larger than that of the corners of the key tops, thus advantageously preventing the screens from being damaged.

[0097] A switch is provided which is used to determine that the two housings **2** and **4** are closed so that a process for invalidating inputs to the touch panel can be executed when the housings **2** and **4** are closed. This process can prevent the computer from malfunctioning when the computer with the housings closed is subjected to an external pressure. Further, by recording inputs to the touch panel while the housings are closed, it is possible to help find the cause of damage to the LCD panel or housings such as an excessive pressure.

[0098] **FIG. 9** shows a notebook personal computer comprising two-rotating-shaft hinges **130**A and **130**B each having two rotating shafts. The two housing **2** and **4** can be closed so that the LCD panels **8** and **18** sit opposite each other or that both LCD panels **8** and **18** face outward. The user can operate the personal computer on one of the LCD panels **8** and **18** while checking the state of the operation on the other LCD panel, by standing the LCD panels **8** and **18** on a desk between the housings **2** and **4** so that the maximum opening angle (at least 180°; for example, 270°) is set between the second housing **4** and the first housing **1** and that the LCD panels **8** and **18** both face outward and form the character Λ (capital lambda). The notebook personal computer used in such a form comprises a plurality of rubber feet at positions (not shown) where the housings **2** and **4** contact the desk surface when the LCD panels are stood on the desk while adjusting hinge angle so that the panels form the character Λ. The rubber feet are exposed from sides of the closed housings when the user carries the computer with him or her. The rubber feet can thus function as cushioning members when the apparatus is dropped owing to carelessness or the like.

[0099] A notebook personal computer of such a structure can be used for applications such as presentations for a small number of people. For example, the operator views information including detailed data relating to the presentation, while the viewers see only slides. Alternatively, both parties can view the same screen or mirrored images. In this case, when mirrored images are displayed, a character font is not mirrored, and other images are mirrored. For inputs, the following usage is possible: the operator can freely change data, while the viewers can provide only limited inputs. When the personal computer according to the embodiment of the present invention is used in this form, the rotating angle of the hinges **130**A and **130**B may be used to switch between the display of a side of the screen closer to the hinges as the top and the display of a side of the screen farther from the hinges **130**A and **130**B as the top. Further, the personal computer may comprise a sensor that senses the direction of gravity so as to automatically switch the top and bottom of the display screen regardless of the angle of the hinges **130**A and **130**B or the placement of the personal computer.

[0100] If the personal computer comprises a gravity sensor, even when, as shown in **FIG. 10A**, the first and the second housings **2** and **4** are rotated around the hinges **6**A and **6**B as shown by arrow **131**, without changing the angle of the hinges **6**A and **6**B, on a table such as a desk on which the personal computer is placed, to change the positional relationship of the first and second housings **2** and **4** with the desk, the plane almost parallel to the desk surface is switched to the input interface **133**, whereas the plane standing from the desk surface is switched to the display surface. This makes it possible to always provide a fixed input and display environment for the user regardless of the installation of the personal computer. This operation is not limited to the hinges **6**A and **6**B each having two rotating shafts.

[0101] **FIGS. 11A and 11B** shows a personal computer in which the first housing **2** and the second housing **4** are connected together using a hinge **132** having two rotating shafts. The hinge **132** has a first shaft **134** extending along the normal direction of the display surface of the second housing **4** and a second shaft **136** which can tilt the first housing **2** with respect to the second housing **4** and which is orthogonal to the first shaft **134** and parallel to the display surface. In a presentation application similar to that shown in **FIG. 9**, when the user, that is, the presenter operates the computer while viewing both display panels **8** and **18** as shown in **FIG. 11A**, the display panel **8** in the first housing **2** displays an image **136** such as a table or a graph, while the display panel **18** in the second housing **4** displays an operational interface **138**. When the presenter directs the display panel **8** in the first housing **2** toward presentees located opposite the presenter, the display panel **18** in the second housing **4** is provided, during the rotation of the hinge **132**, with a screen **140** similar to the one **136** displayed on the display panel **8** in the first housing **2** and an operational interface **142** having a reduced size as shown in **FIG. 11B**. Such display for presentation applications enables the presenter to make presentation using the same screens **136** and **140** while having conversations with the presentees.

[0102] **FIG. 12** shows an example in which the personal computer shown in **FIGS. 1 and 2** is installed on a stand **142** with a keyboard so as to be used in a desktop environment. In a mobile environment, the unitary personal computer is preferably provided with a larger screen and a human interface with a higher degree of freedom. However, in the desktop environment, a larger screen is given top priority. An external keyboard **144** or an external input device (not

shown) such as a touch panel is preferably connected to the personal computer so that the personal computer can offer two screens; the external input device serves as a keyboard **144**. As shown in **FIG. 12**, the personal computer main body is supported by the stand **142** on a support plate **152** on which a cushion member **150** is provided. When the personal computer main body is fixed to the stand **142**, the external input device or a power supply connector is connected to the personal computer main body. The stand **142** has a function called a port replicator or docking station. A docking connector **146** is placed in the connection between the stand **142** and the personal computer. Accordingly, the second housing **4**, into which a motherboard is incorporated, is connected to the stand **142**. A portion of the stand **142** to which the personal computer is fixed is preferably rotatable. As shown **FIG. 12**, the LCD panel **8** in the first housing **2** and the LCD panel **18** in the second housing **4** may be arranged vertically in parallel so as to form a continuous screen. Alternatively, a rotary joint **148** may be rotated to arrange the LCD panels horizontally in parallel so as to form a continuous screen. The rotary joint **148** has a rotating shaft near the hinges of the personal computer so that even when the personal computer is rotated, the two screens are arranged at almost an equal distance to the user. In **FIG. 12**, the keyboard **144** and the stand **142** are integrated together. The keyboard **144** and the stand **142** may be separately connected to the personal computer.

[**0103**] The LCD panels **8** and **18** may be arranged either vertically or horizontally in parallel. Preferably, the personal computer comprises a sensor that senses gravity so that information displayed on the screen including the virtual keyboard can be appropriately rotated depending on the sensed direction. This enables images to be always displayed in the correct direction with respect to the user. Such a configuration enables the screen and the input device to be appropriately arranged for each scene used in both desktop and mobile environments.

[**0104**] A screen display device and a processing circuit can be constructed on the same glass substrate by using a technique for forming an LSI on a glass substrate, the technique being called silicon-on-glass or system-on-glass. This serves to reduce the thickness and weight of the housings. **FIG. 13** shows an embodiment of the present invention in which a display device and a processing circuit are collectively constructed on glass substrates **154** and **156**. The two glass substrates **154** and **156** are rotatably connected together using a hinge **158**. Resin covers **160** and **162** are provided at ends of the glass substrates **154** and **156** in order to protect the glass substrates **154** and **156**. Further, a shaft of the hinge **158** is longer than the width of the glass substrates **154** and **156**. When the computer falls down, structural members such as the hinge **158** and the resin covers **160** and **162** serve as cushioning materials to prevent damage caused by a shock. The resin covers **160** and **162** prevent the two glass substrates **154** and **156** from colliding against each other when the hinge is set in a closed state. A protective layer composed of a resin film **164** (not shown) is bonded to a surface of each of the glass substrates **154** and **156** to prevent glass pieces from scattering if the glass is broken. In such an embodiment, the resin covers **160** and **162** and the resin film correspond to housing parts. A connector, a slot, or a radio communication antenna may be stored any of the resin covers **160** and **162** and hinge portion **158**; it is difficult to mount the connector, slot, or radio communication antenna on the glass substrate **154** or **156**.

[**0105**] In the embodiment, the pressure-sensitive touch panel **18**T is utilized as a device that receives an input corresponding to a hand touch. However, a function similar to that provided by the pressure-sensitive touch panel can be provided by an electromagnetic touch panel by installing, around the user's finger, a device having the same function as that of a stylus for the electromagnetic touch panel. It is also possible to emit a light beam of a particular wavelength to the neighborhood of the surface of the LCD panel **18** in the second housing **4** and to use sensors provided at two points to sense the reflected beam to determine where on the panel the user's finger is placed, on the basis of a technique such as triangulation.

[**0106**] Alternatively, the LCD panel may be utilized as a touch panel by incorporating an optical sensor element array into the LCD panel and providing the panel with both display and scanner functions so that the user's finger touching the panel surface can be sensed as an image. A panel having such functions is disclosed in Jpn. Pat. Appln. Publication Nos. 2002-313255, 2002-313273, and 2002-313309 and was put on the market for the first time by Toshiba Matsushita Display Technology Co., Ltd., in April, 2003 under the name of "Input Display". This technique makes it possible to load a barcode or business card information through the panel **14** in the second housing **4** and to recognize the contents of the loaded image information.

[**0107**] The input display can load information from paper or an article tightly contacted with the surface of the display. However, even when nothing contacts the surface of the input display, so that tangible information such as a shape or an image cannot be sensed, the input display can measure environmental light to recognize the brightness of the environment in which the apparatus is placed or the color of a light source, to automatically adjust the brightness and color temperature of a screen shown on the display in the first housing **2** or second housing **4**. The input display is effective on various applications; for example, the daytime and the nighttime are recognized to adjust the brightness of the screen in an environment such as a semiconductor plant or a tunnel where a source of light different from white light is used for illumination or when the apparatus is used outdoors.

[**0108**] **FIG. 14** shows an example of an apparatus comprising an input display **166**. In front of the input display **166**, built into the second housing **4**, a cylindrical lens **170** is fixed to a fixture **168** attached to the second housing **4**. The lens **170** forms an image on an image-loadable display surface of the input display **166**. This photographed image **168** is displayed on the LCD panel **8**. Utilizing the lens **170** as described above enables the input display **1166** to be used like a digital camera. A process for loading an image may also be executed on the areas other than the one to which the lens **170** is attached, to load the brightness and color of the environmental light in order to adjust exposure and white balance.

[**0109**] **FIG. 15** also shows an example of an apparatus comprising an input display. As shown in **FIG. 15**, the cylindrical lens **170** is placed on the input display **166**, built into the second housing **4** so as to incline from the input display **166**. The lens **170** forms an image on the surface of the image loadable display **166**. This personal computer can

thus be used as a terminal for a remote conference using communications over a network. The lens **170** is composed of a cylinder inclined to the perpendicular of the surface of the input display **166** so as to face the user, so that an image formed is elongated in the vertical direction. Accordingly, the aspect ratio of the image is corrected by software processing before the image is transmitted over the network.

[0110] The personal computer shown in **FIG. 15** can not only be used as a terminal for a remove conference but can also, for example, load a spatial gesture such as motion of the user's hand via the lens and use it as an operation instruction to execute the corresponding process.

[0111] **FIG. 16** shows a personal computer in which a camera is installed according to another embodiment of the present invention. The first housing **2** comprises two cameras **172** and **174**, and a space on the LCD panel **18** in the second housing **2** is photographed and loaded as an image. Comparison of images from the two cameras makes it possible to measure the distance to the user's hand or the like placed near the LCD panel in the second housing **4**. The images from the two cameras make it possible to determine whether or not the user's finger or the like is touching the screen of the LCD panel **18**, on which an interface **176** is displayed. The computer compares a temporal variation in the speed of the fingertip in the normal direction of the display surface a preset value. If the temporal variation in speed is larger than the preset value, the computer determines that a key or button has been depressed hard. If the temporal variation in speed is smaller than the preset value, the computer determines that the user's finger or hand is touching the surface of the LCD panel at a low pressure. The present embodiment uses the two cameras, but a single camera may be used provided that the distance can be determined with the single camera on the basis of focal distance or the like. Alternatively, it is possible to use a device which can carry out pointing in a three-dimensional space and which is disclosed in Jpn. Pat. Appln. KOKAI Publication No. 1999-265241 as "Information Input Apparatus and Method for Information Input and Recording Medium".

[0112] In the description of the above embodiment, the first housing **2** is provided with the first LCD panel **8**, and the second housing **4** is provided with the second LCD panel **18**. However, given a display device **180** which is flexible and bendable, the bendable display panel **180** may be extended across the first housing **2** and second housing **4** rotatably connected together by the hinges **6**A and **6**B and may be attached to both housings **2** and **4** as shown in **FIG. 17**. With the bendable display device **180**, a display area **180**A in the first housing **2** may be continuously connected to a display area **180**B in the second housing **4** so as to prevent the formation of an area between the areas **180**A and **180**B where no screen is displayed. This further improves the degree of freedom in display and the placement of the operation interface.

[0113] The present invention has been described in detail in conjunction with the embodiment of the notebook personal computer. However, the present invention is applicable to a smaller electronic apparatus such as a PDA. The present invention is also applicable to an apparatus such as a foldable cellular phone that enables e-mail or WEB browsing; for such a cellular phone, portability is inconsistent with the size of the screen, and such a cellular phone has different input forms suitable for the respective applications; making a phone call requires only numbers to be input but writing a mail requires characters to be input, and WEB browsing can mostly be achieved simply by operating the cursor.

[0114] The inventor has already developed a technique for additionally providing, on the touch panel-installed panel **18**, a flexible member with concaves and convexes corresponding to the arrangement of virtual keys, as an assistance to inputs. This invention may be combined with the personal computer according to the present invention. Placing a flexible sheet with concaves and convexes on the touch panel **18** allows various input interfaces to be automatically changed. The sheet with concaves and convexes can be provided far more inexpensively than input peripheral devices even when the user requests an input interface which is substantial, that is, which has concaves and convexes and which is deformed under force.

[0115] The invention described above in detail provides an electronic apparatus that is excellent in portability, operability, visibility, and reliability.

[0116] Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

What is claimed is:

1. An electronic apparatus comprising:

a first display device comprising a first housing and a first display screen which is held in the first housing;

a second display device comprising a second housing and a second display screen which is held in the second housing, the second display screen comprising a sensor which generates a sensor output signal depending on an input on the second display screen;

a connecting mechanism configured to connect the first and second housings together and be able to adjust an opening angle of the first housing and the second housing;

a display processing section configured to display a first display image on the first display screen and a first interface image on the second display screen;

a determining section configured to determine an instruction to the first interface image on the basis of the sensor output signal; and

a control section configured to control the display processing section in response to the instruction to display a second display image in place of the first display image on the first display screen and display a second interface image in place of the first interface image on the second display screen.

2. The electronic apparatus according to claim 1, wherein the connecting mechanism sets the opening angle of the first housing and the second housing so that the first and second display screens can be viewed from opposite sides of the electronic apparatus, and the first and second display screens

display the second display image and the second interface image corresponding to substantially the same image or the second display image and second interface image which are in a mirrored relationship.

3. The electronic apparatus according to claim 1, wherein the connecting mechanism sets the opening angle of the first housing and the second housing so that the first and second display screens can be viewed from one side of the electronic apparatus, and the display processing section substantially display a continuous image on the first and second display screens, the continuous image corresponding to a combination of the first display image and the second interface image.

4. The electronic apparatus according to claim 1, wherein the connecting mechanism sets the opening angle of the first housing and the second housing so that the first and second display screens can be viewed from one side of the electronic apparatus, and the second display screen is switched between display of the second interface image on the first interface image and non-display of the second interface image on the first interface image, the display of the second interface image on the first interface image being displayed on top of the first interface image as a translucent or opaque image.

5. The electronic apparatus according to claim 1, wherein the sensor comprises a touch panel configured to sense plural levels of input intensity on the basis of intensity of an electromagnetic wave or an input contact area on the second display, and the control section changes display of the first interface image depending on the input intensity level on the touch panel.

6. The electronic apparatus according to claim 1, wherein the first display device further comprises a light source incorporated into the first housing to illuminate the first display screen, and the first housing comprises a structure configured to guide illumination light from the light source to the second display device as backlight illumination or a front-light illumination.

7. The electronic apparatus according to claim 1, wherein the second display device further comprises a light source incorporated into the second housing to illuminate the second display screen, and the second housing comprises a structure configured to guide illumination light from the light source to the first display device as backlight illumination or a front-light illumination.

8. The electronic apparatus according to claim 1, wherein the connecting mechanism comprises a hinge comprising a plurality of rotating shafts.

9. The electronic apparatus according to claim 1, wherein the second display screen comprises an LCD panel and an optical sensor element array provided on the LCD panel, which input an externally input image.

10. The electronic apparatus according to claim 1, wherein the first and second display screens forms one flexible and bendable display unit.

11. A foldable display device comprising:

a first device having a first display screen to display application images;

a second device having a second display screen to display interface images and an input sensor provided around the second display screen to sense an input position of touching or a movement on the second display screen;

a connecting mechanism configured to arbitrarily set an angle of the first display screen of the first device and the second display screen of the second device and to be capable to be folded;

an input processor to converting an input position sensed by the sensor into an input data to the display processor, and

a display processor to generate application images to be displayed on the first display screen and interface images to be displayed on the second display screen,

wherein the display processor generates a first interface image indicating distinctly displaying the input position after receiving the input data on the second display screen, and generates a first application image reflecting the input data on the first display screen.

12. The display device according to claim 11, wherein the interface image is a keyboard image having a plurality of key areas.

13. The display device according to claim 11, wherein the interface image is a mouse image.

14. The display device according to claim 12, wherein the first interface image is a first keyboard image wherein one of key area corresponding to the input data is displayed differently from other key areas.

15. The display device according to claim 13, wherein the first interface image is a first mouse image wherein one of clicked portion corresponding to the input data is displayed differently from other portions.

16. The display device according to claim 11, wherein the display processor comprising a memory storing a default interface image to be displayed first when the display device is activated.

17. The display device according to claim 11, wherein the display processor controls the second display screen and the second display screen so at to screen save images when input data is not detected for a predetermined period.

18. A portable computer, comprising:

a flat panel having a first display panel and a second display panel, that is foldable along a centerline and that a surface of the second display panel approaches to a surface of the first display panel when they are folded;

a touch panel sensor provided at least on a second display panel to detect a user's input operation;

a display processor to supply display data to the first display panel and the second display panel; and

a display controller to control the display processor in at least two modes comprising,

a first mode where the display processor supplies an application image to the first display panel while supplying an interface image to the second display panel so as to use the second display panel as an input device, and

a second mode where an application image is divided into two part and one part of the application image is supplied to the second display panel and the other part of the application image is supplied to the first display panel so as to use the first and second display panels as a one extended screen.

19. The portable computer according to claim 18, wherein the interface image is an image of a keyboard or a mouse.

* * * * *

Exhibit 1008

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(54) **MULTIPLE POSITION COMPUTER DISPLAY ARM**

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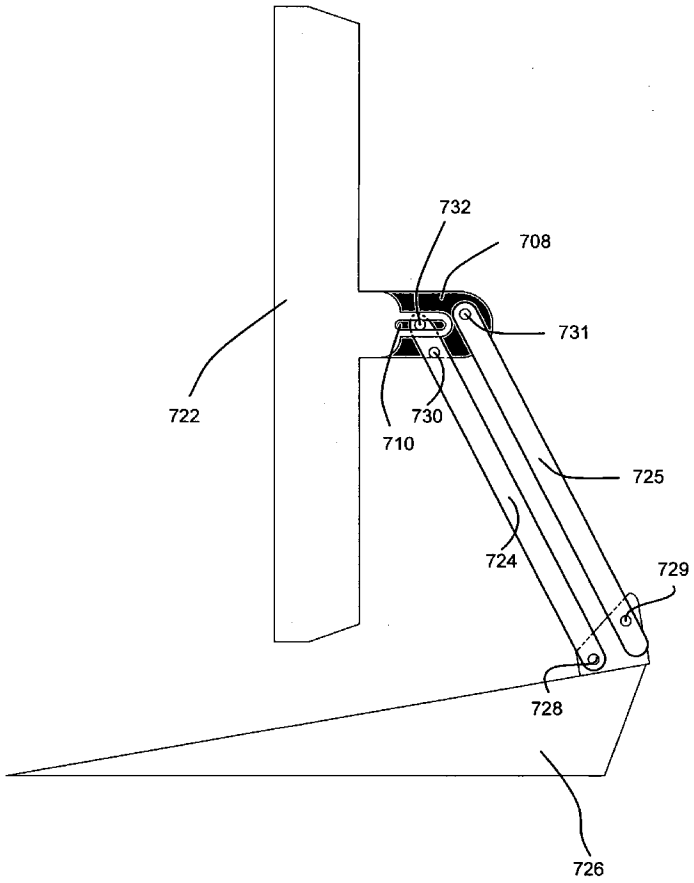
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(57) **ABSTRACT**

Described is a computer display arm that couples a monitor to a base in a manner facilitates display monitor movement between various positions, including preset positions that may be generally optimized to match typical computer usage modes. In one implementation, an arm, which may be an articulating arm, includes or is otherwise associated with a mechanism that guides the user, if desired, to convenient stopping positions for different types of interaction. For example, preset stopping positions may be provided for conventional (e.g., mouse and keyboard) workstation-like interaction, video (e.g., DVD movie) playback, stand-up (walk-up) touch-screen interaction, and/or for pen input, similar to a tablet computing device. Users are able to position the monitor display screen between the preset positions if desired, and also may vary the positioning at the preset and/or other stopping points, to an extent. Software such as user interface code can change to match the current position.



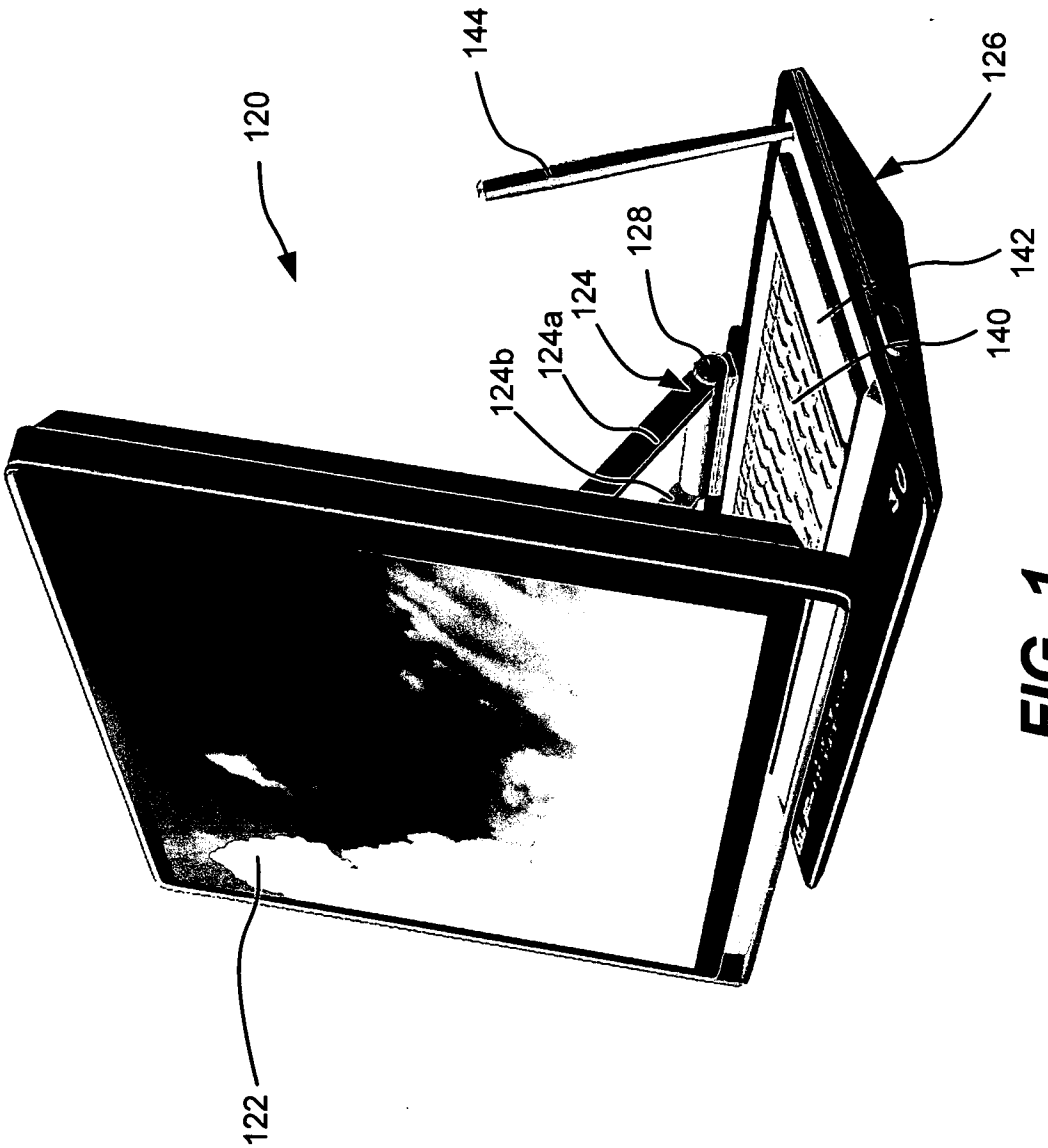


FIG. 1

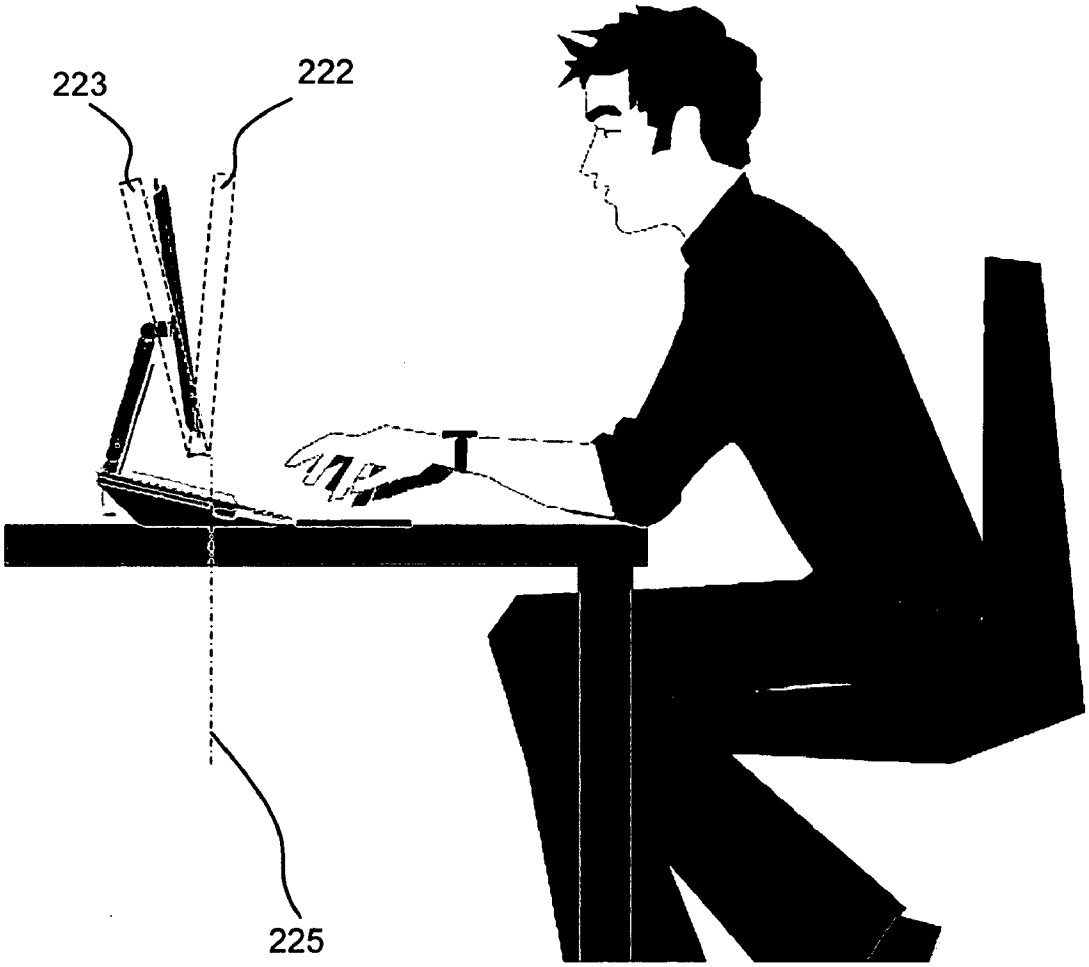


FIG. 2

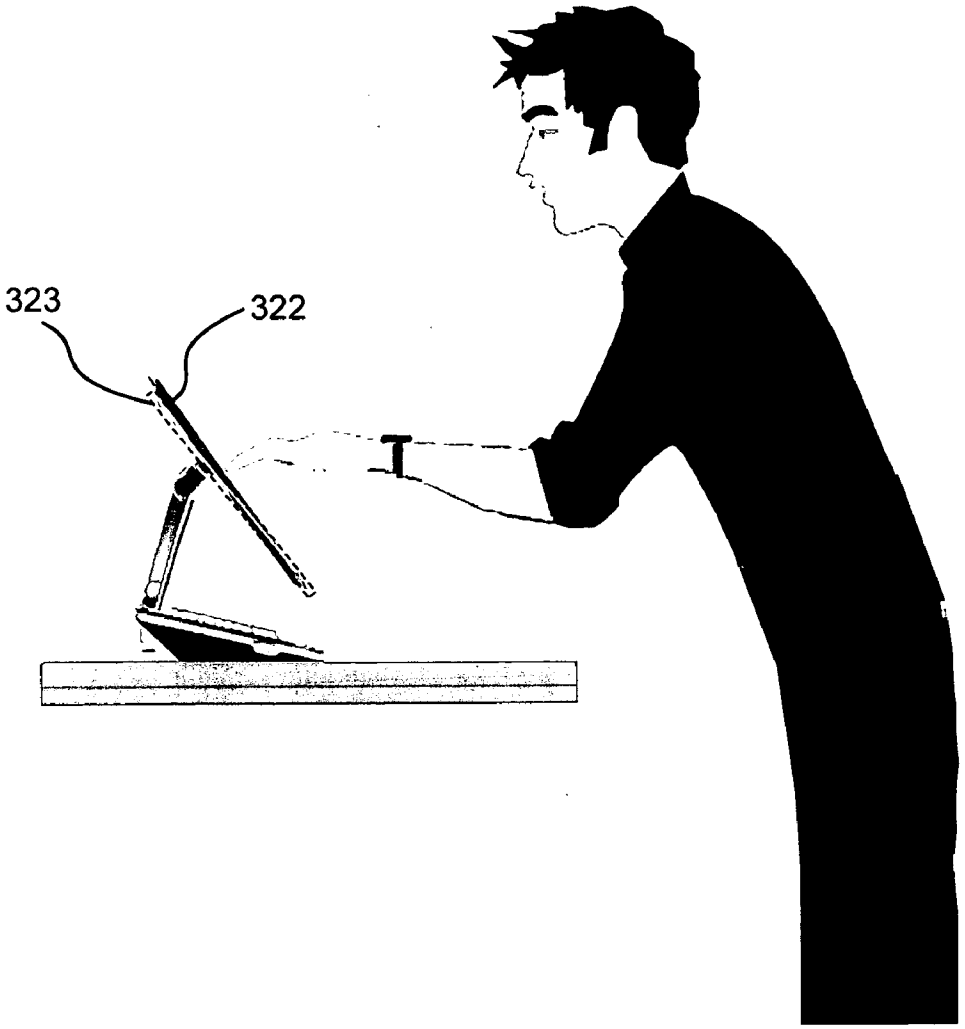


FIG. 3

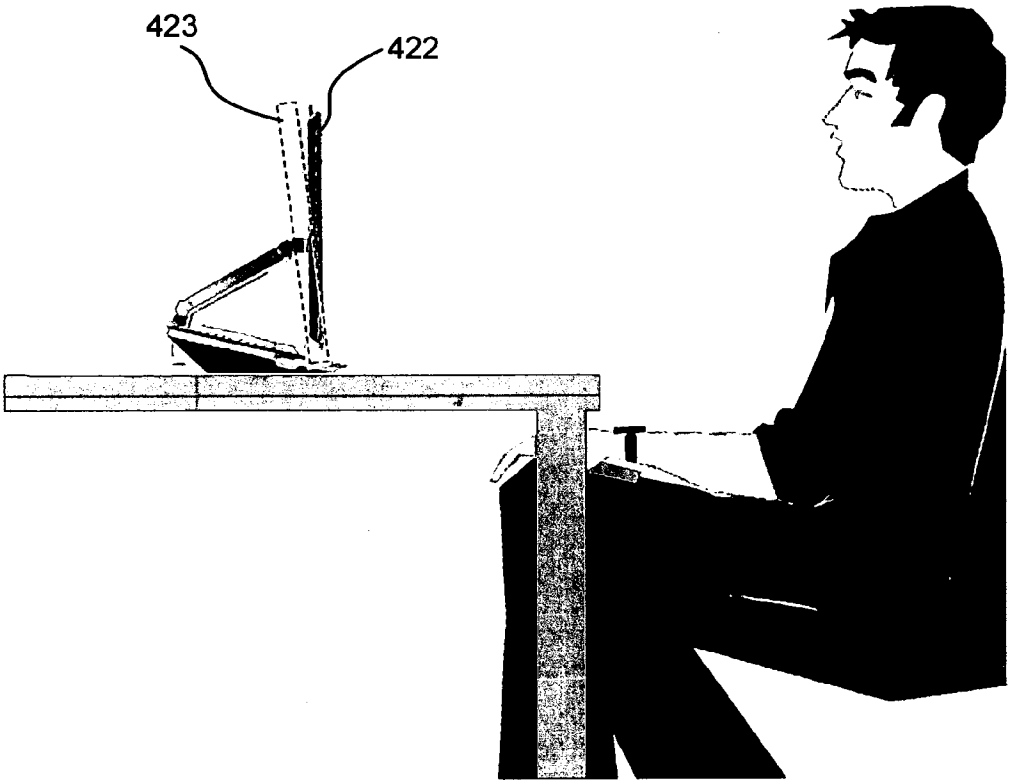


FIG. 4

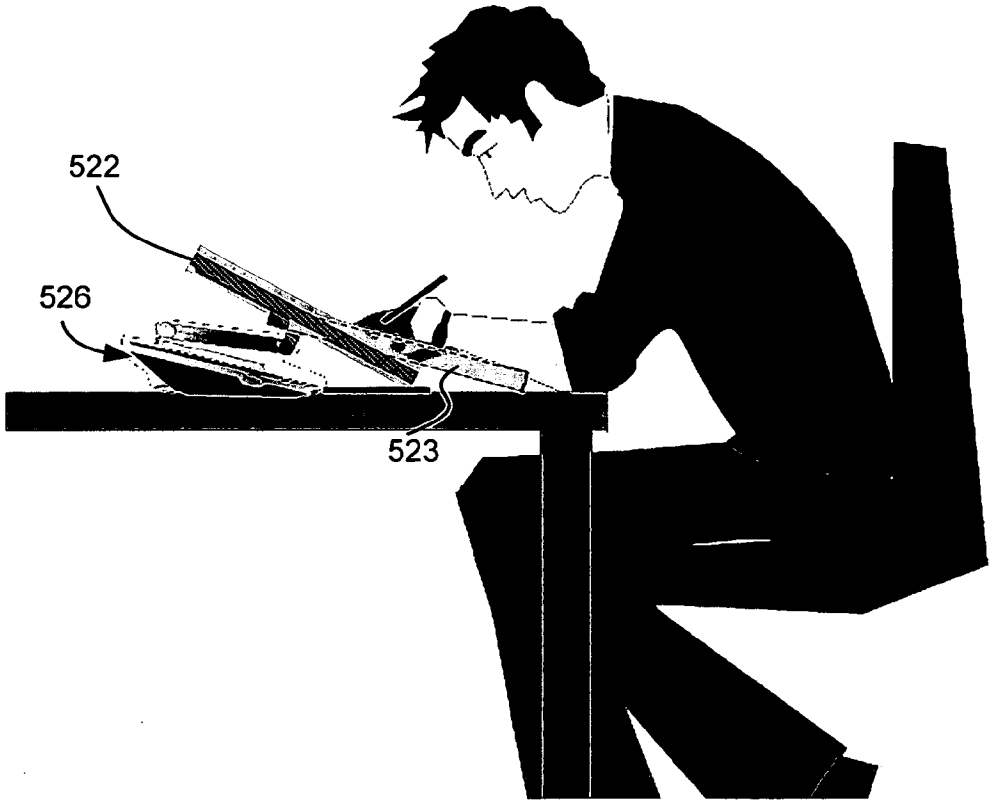


FIG. 5

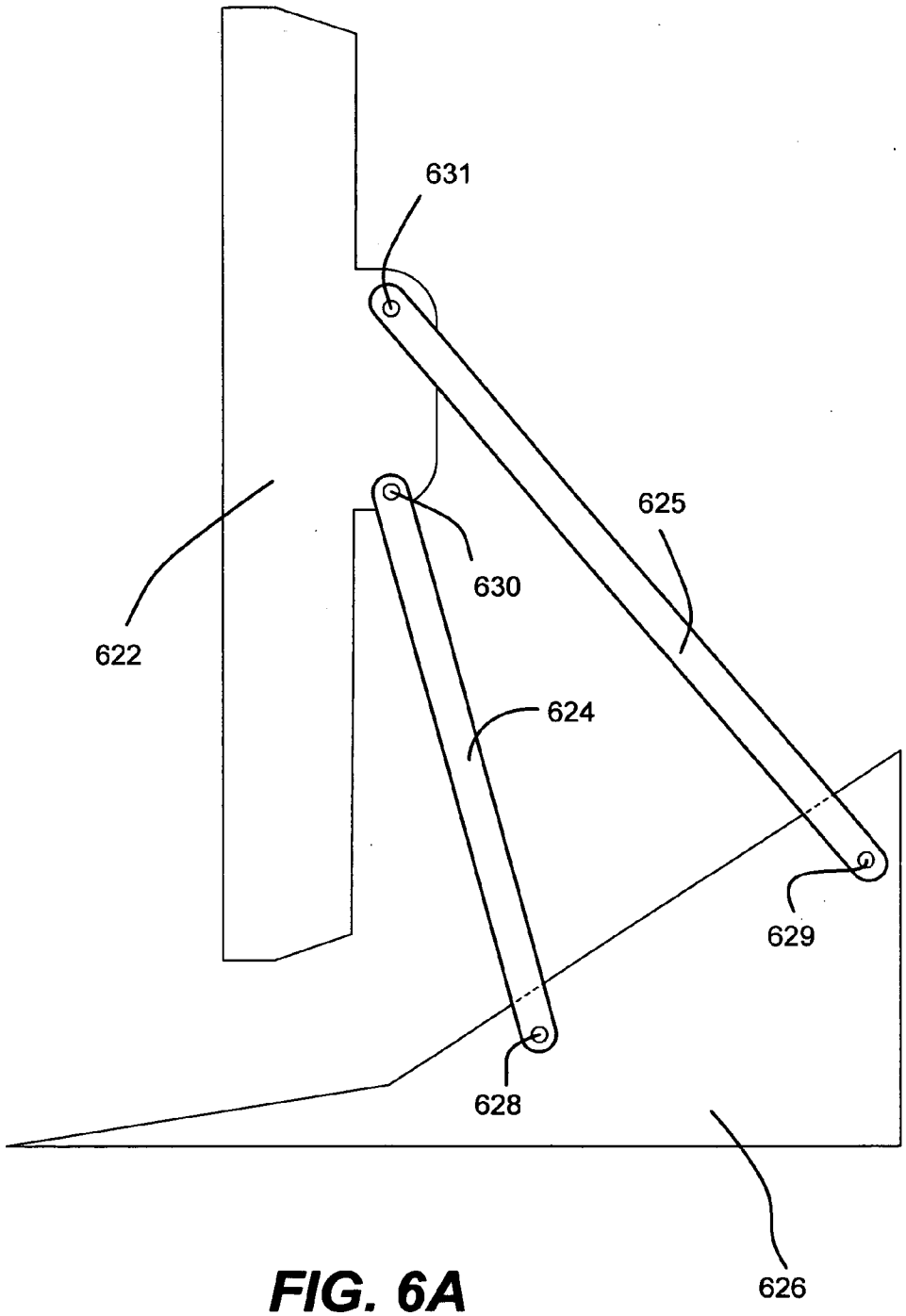


FIG. 6A

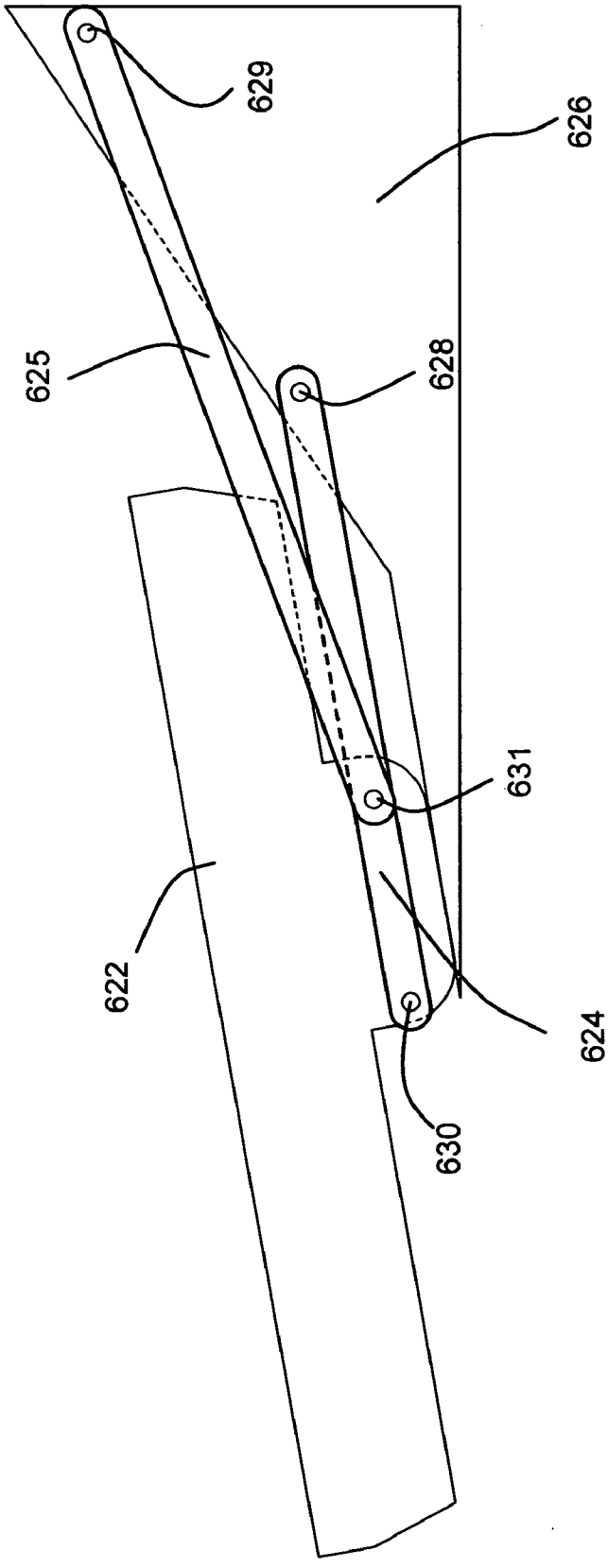


FIG. 6B

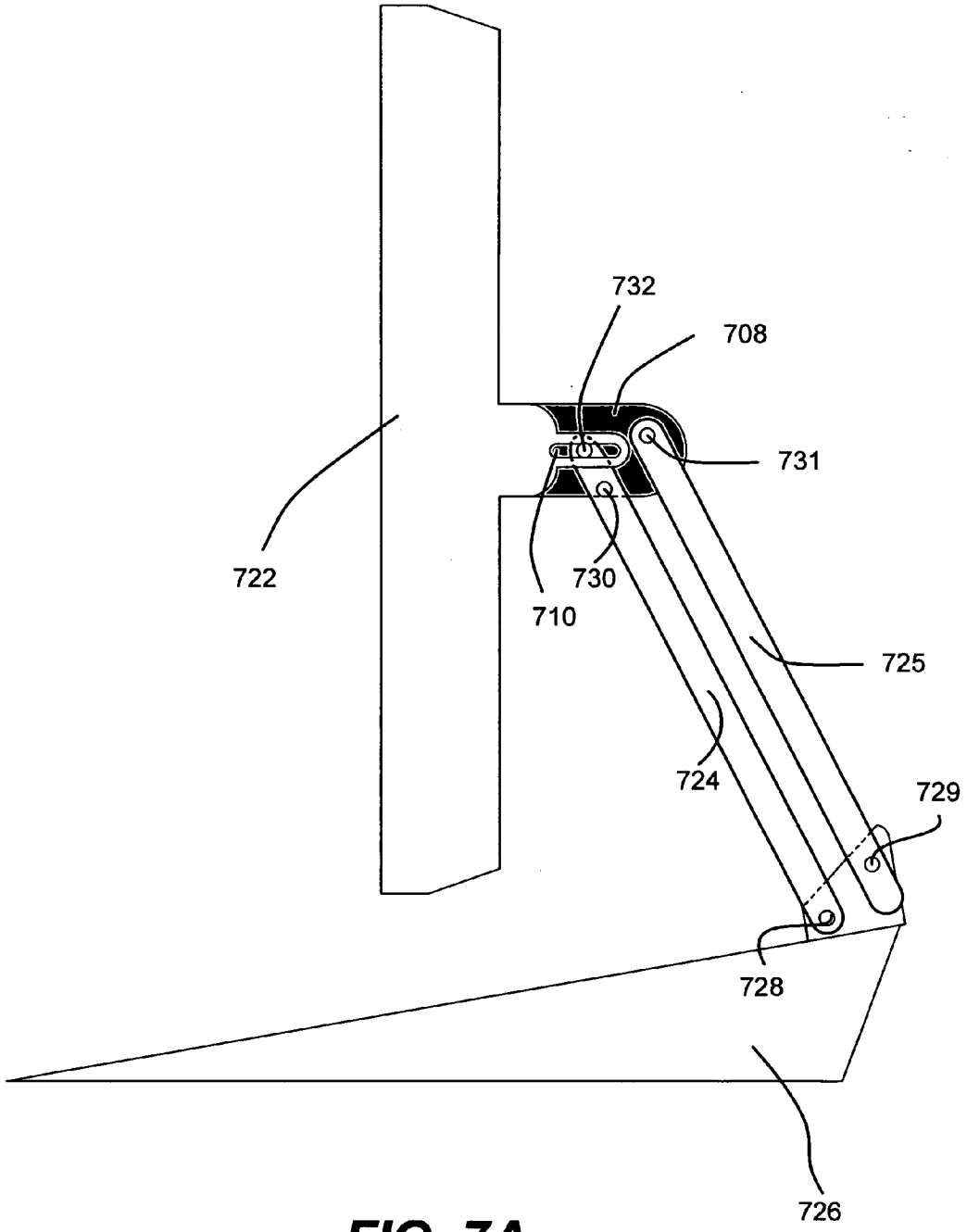


FIG. 7A

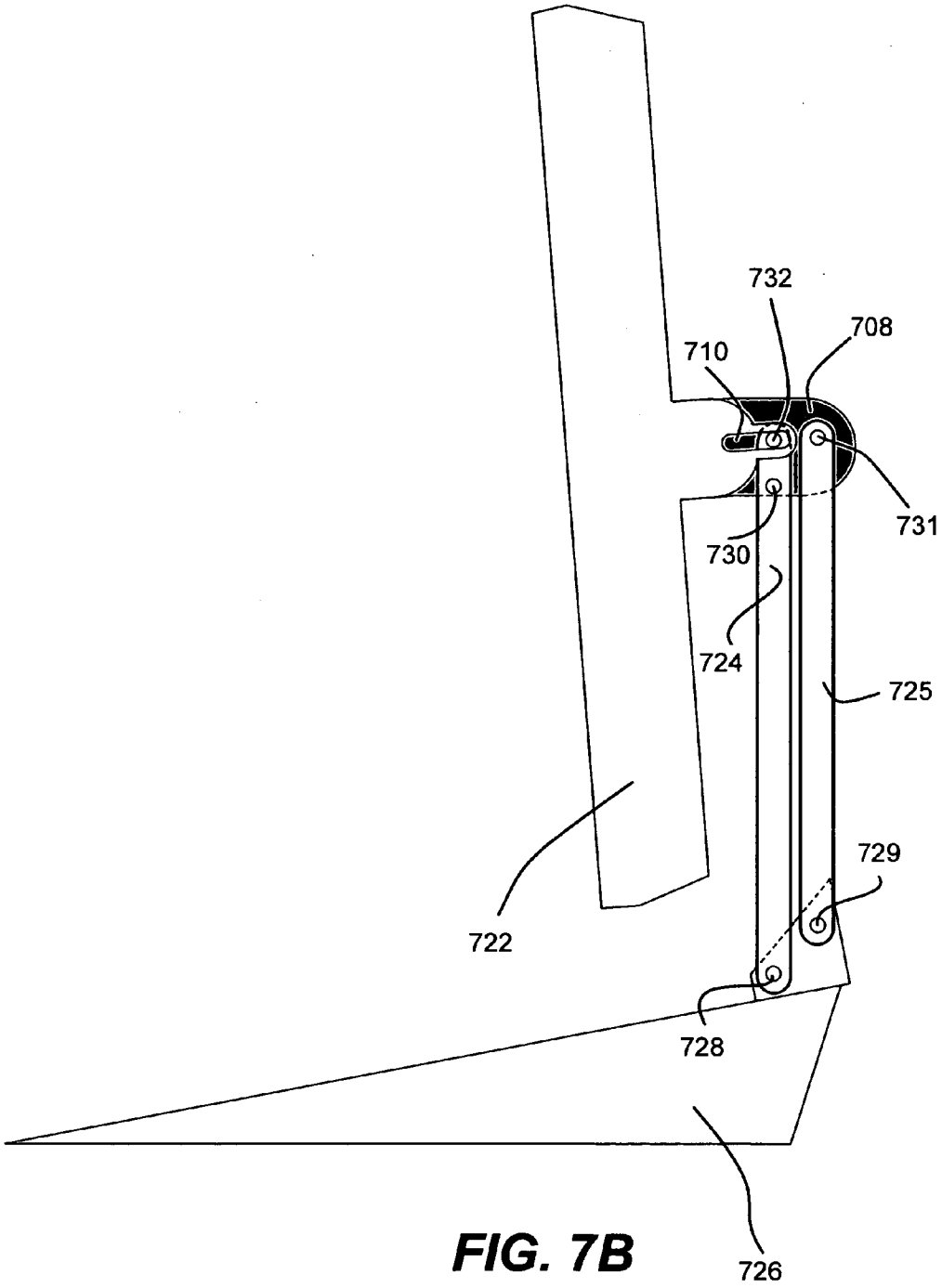


FIG. 7B

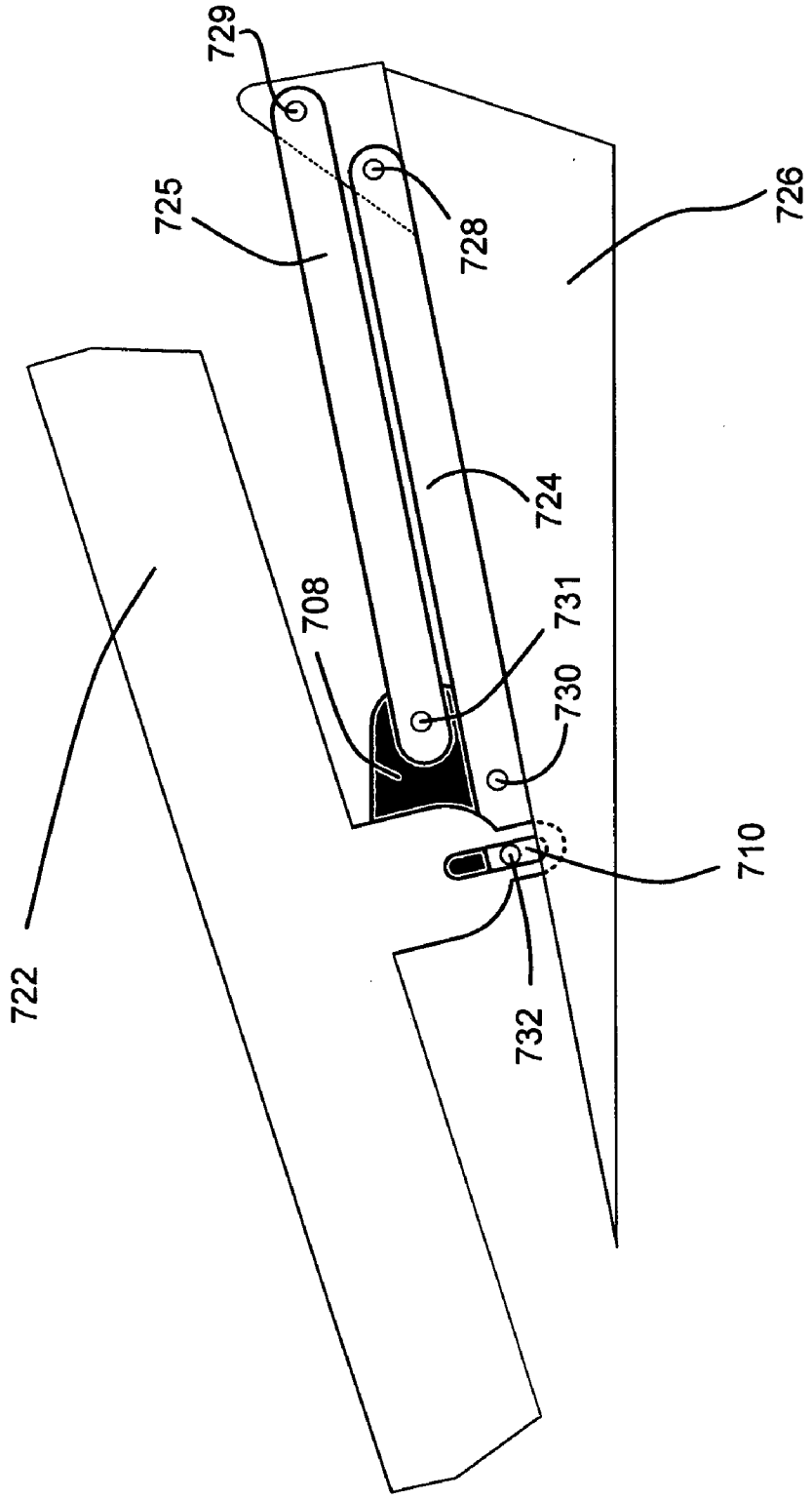


FIG. 7C

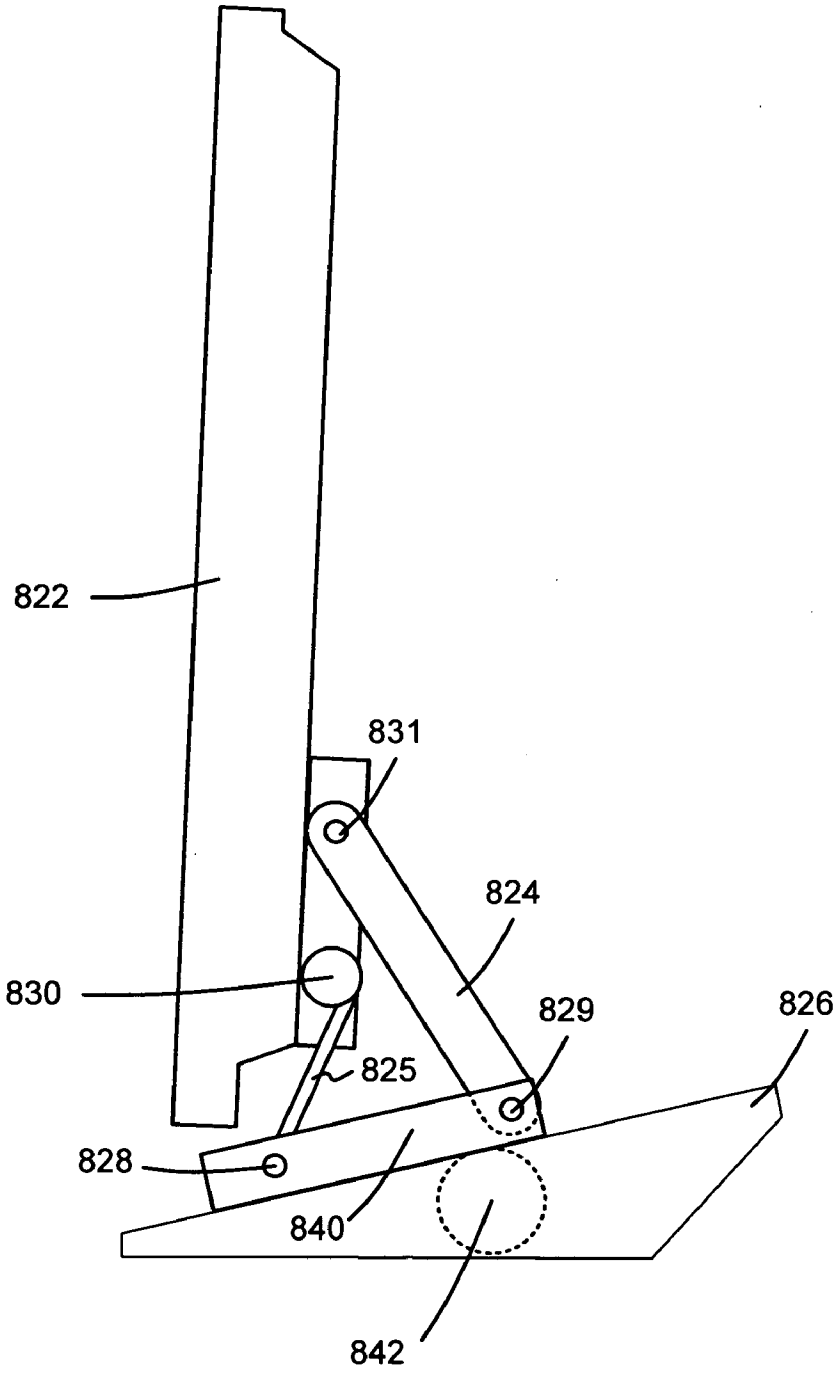


FIG. 8A

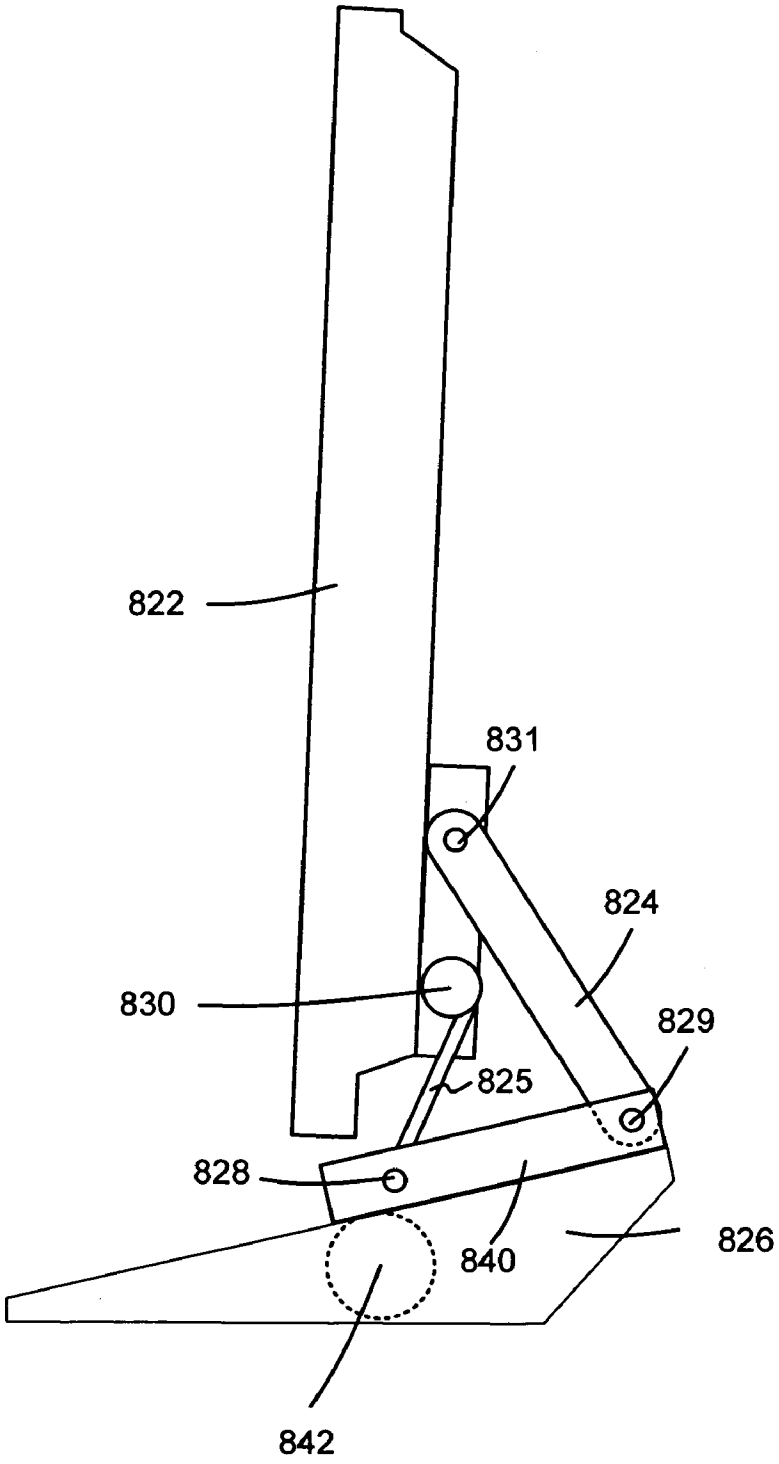


FIG. 8B

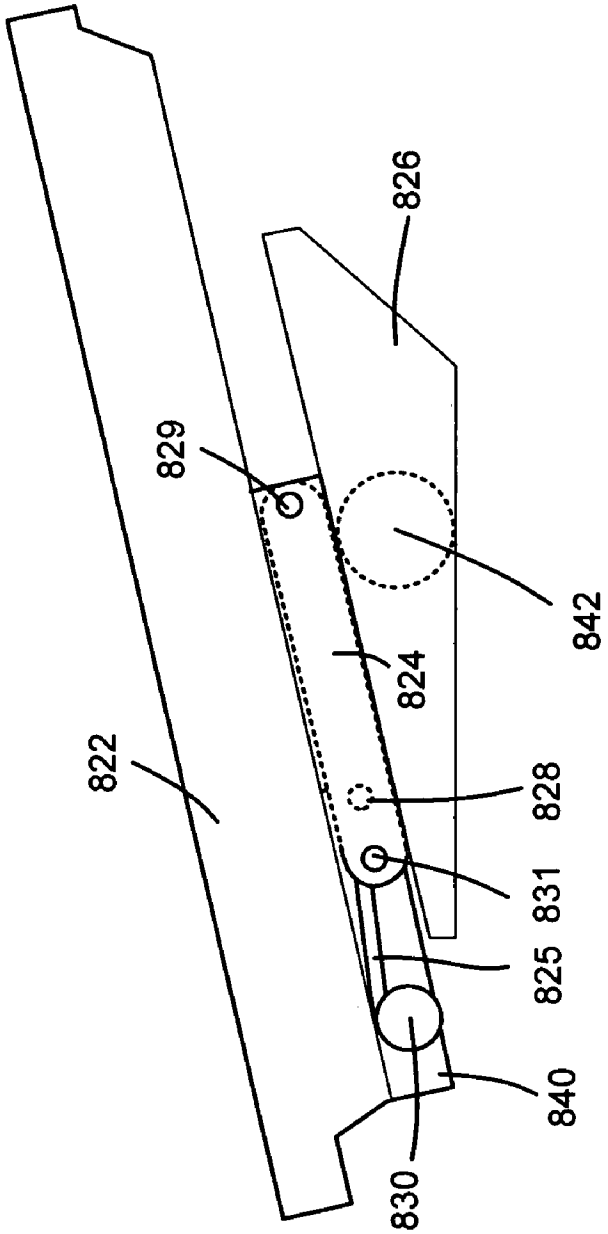


FIG. 8C

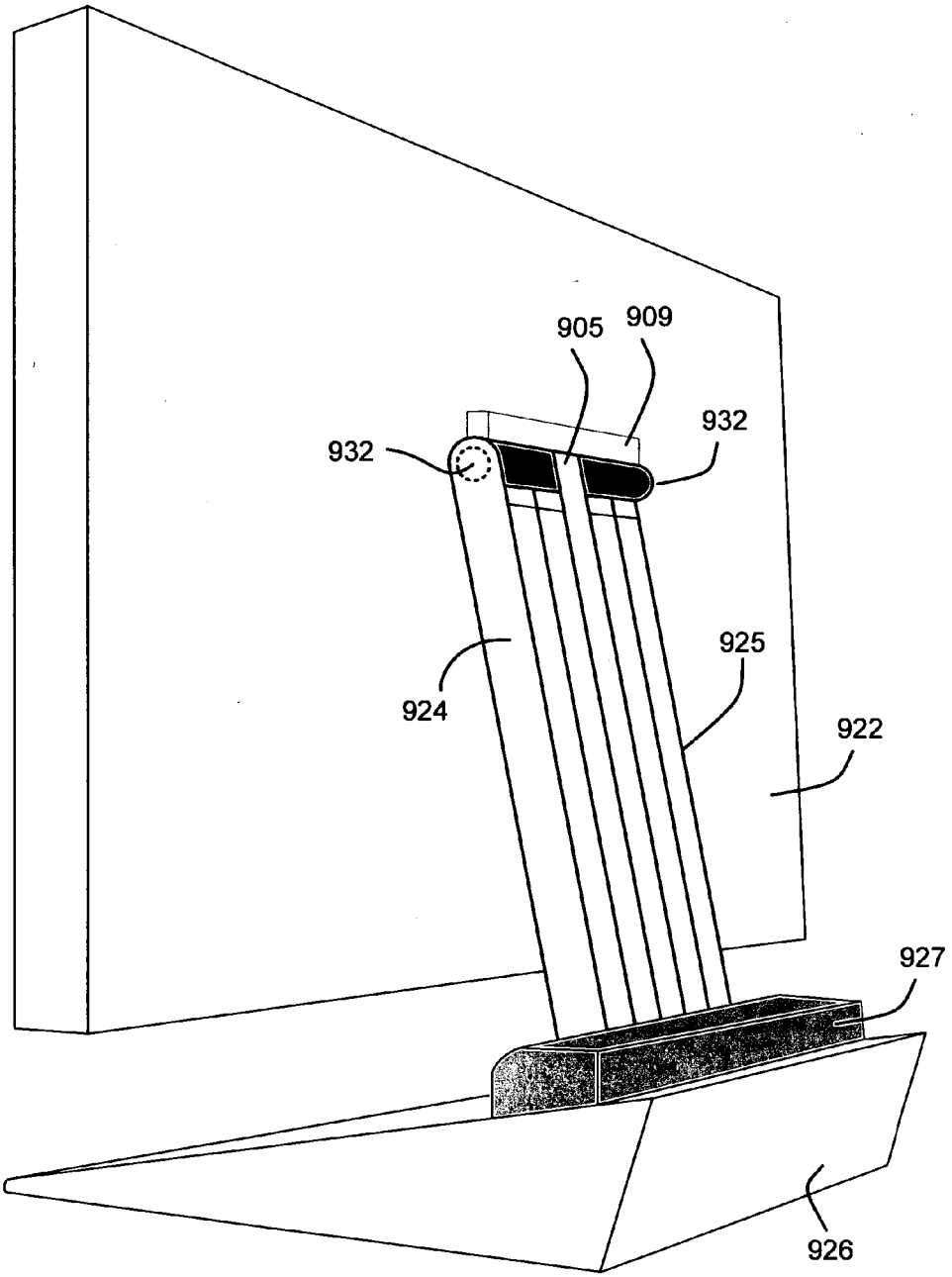


FIG. 9A

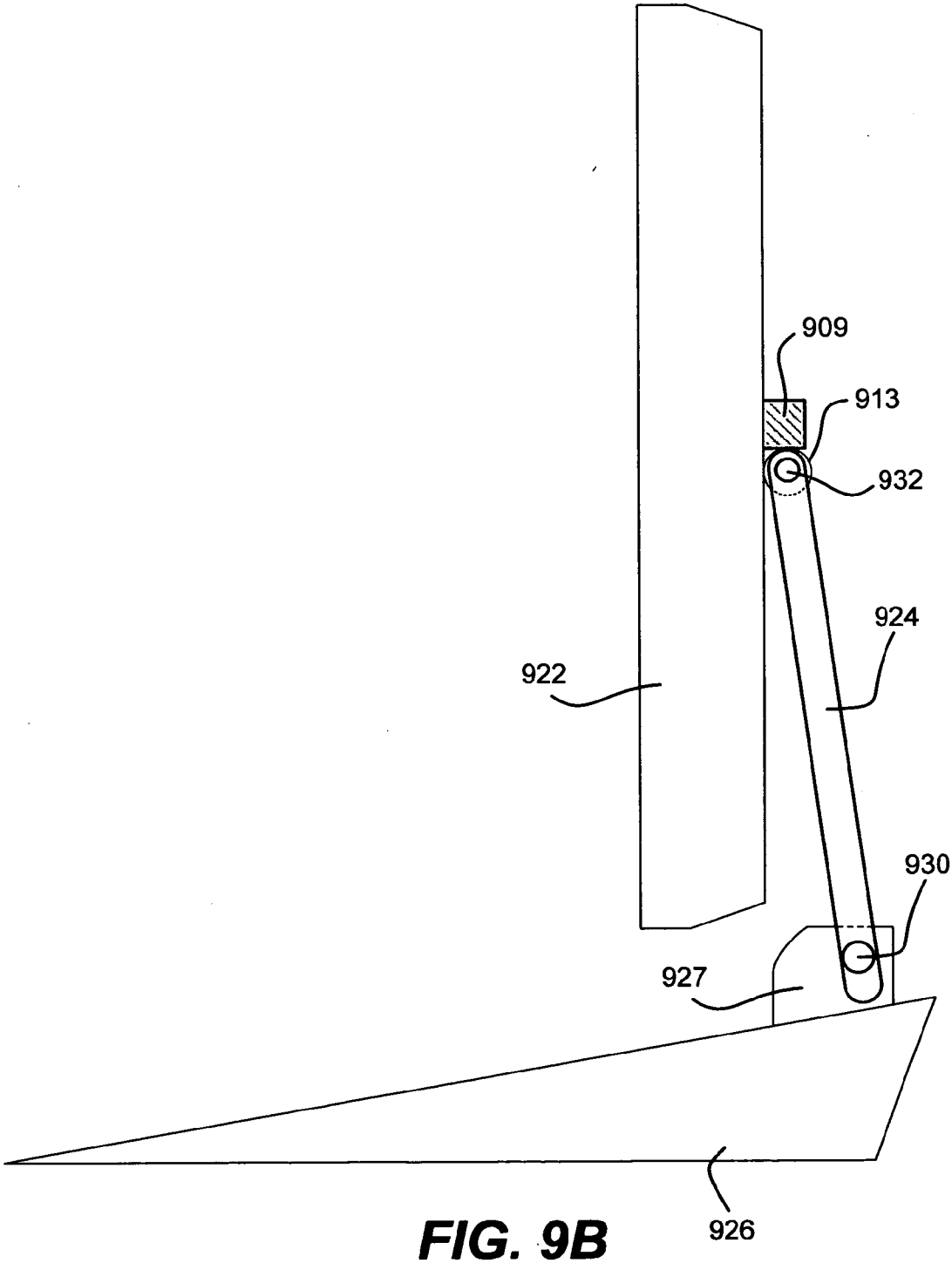


FIG. 9B

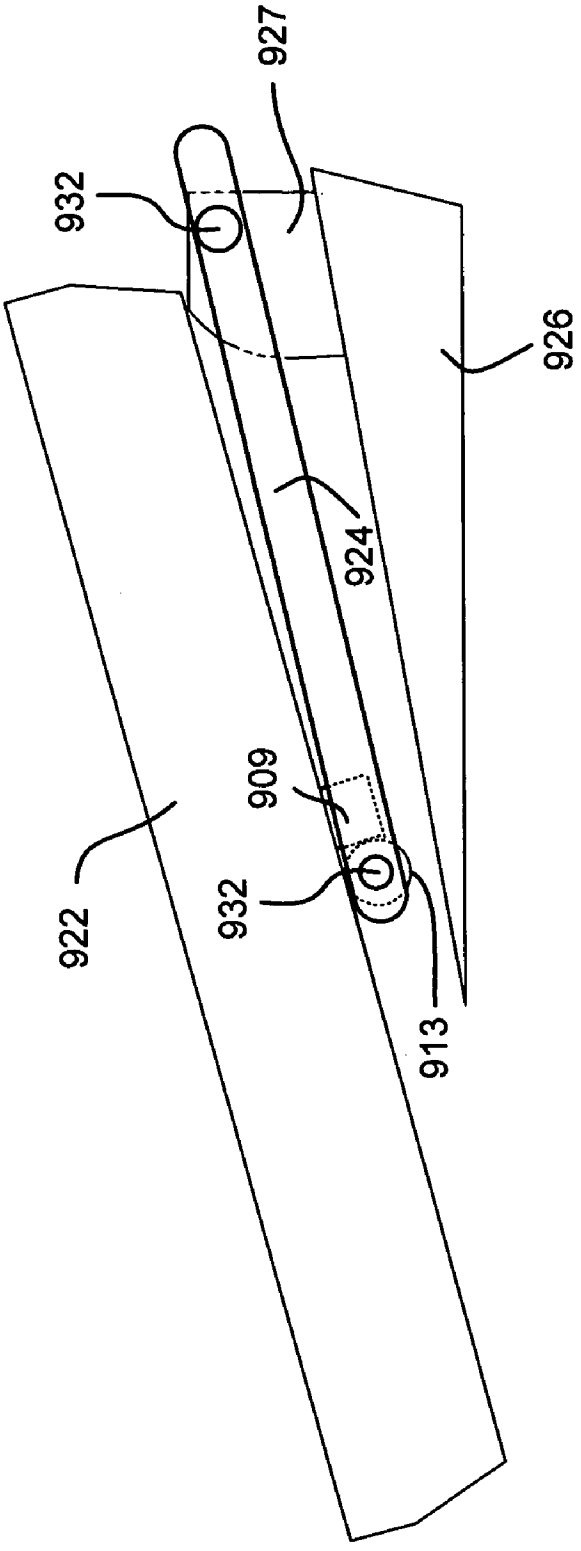


FIG. 9C

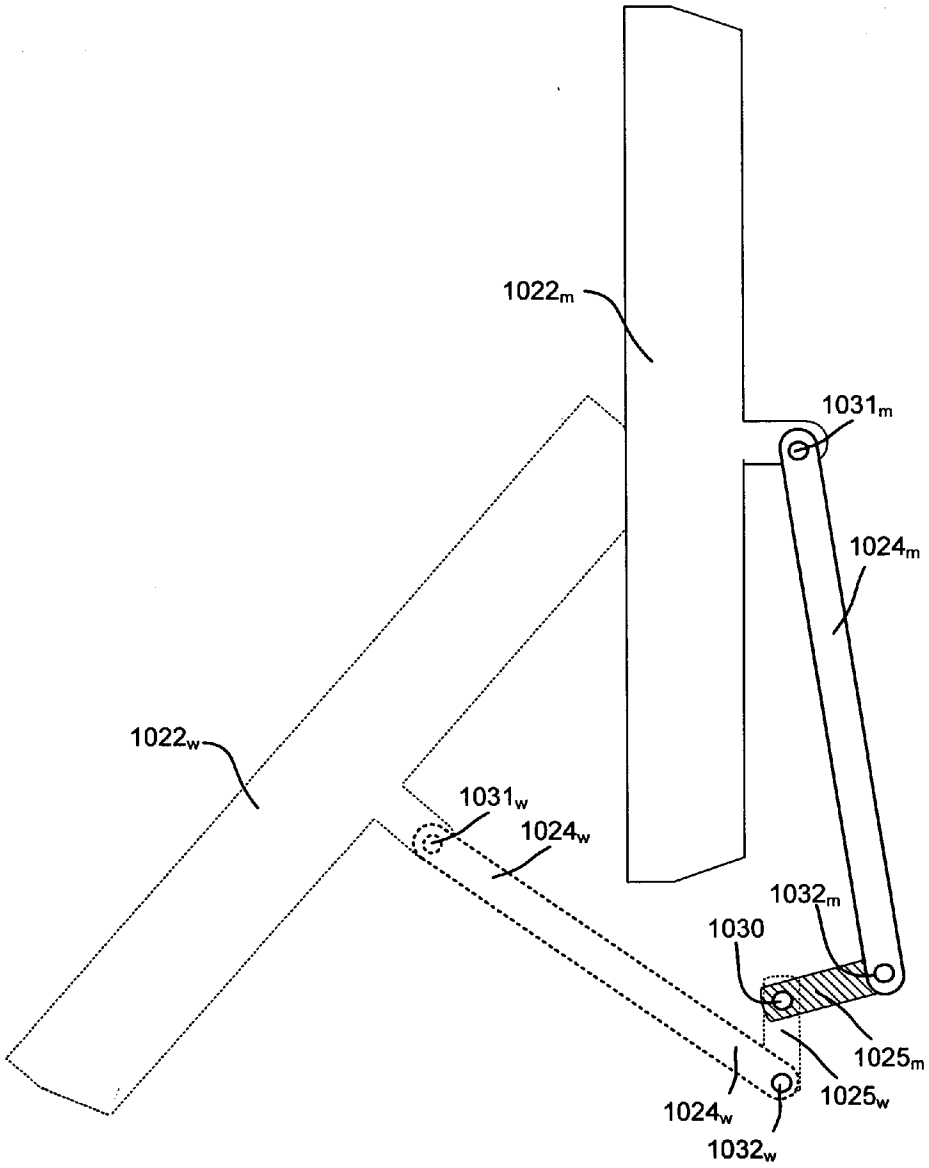

1022m
1031m
1024m
1022w
1031w
1024w
1032m
1030
1025m
1025w
1024w
1032w

FIG. 10A

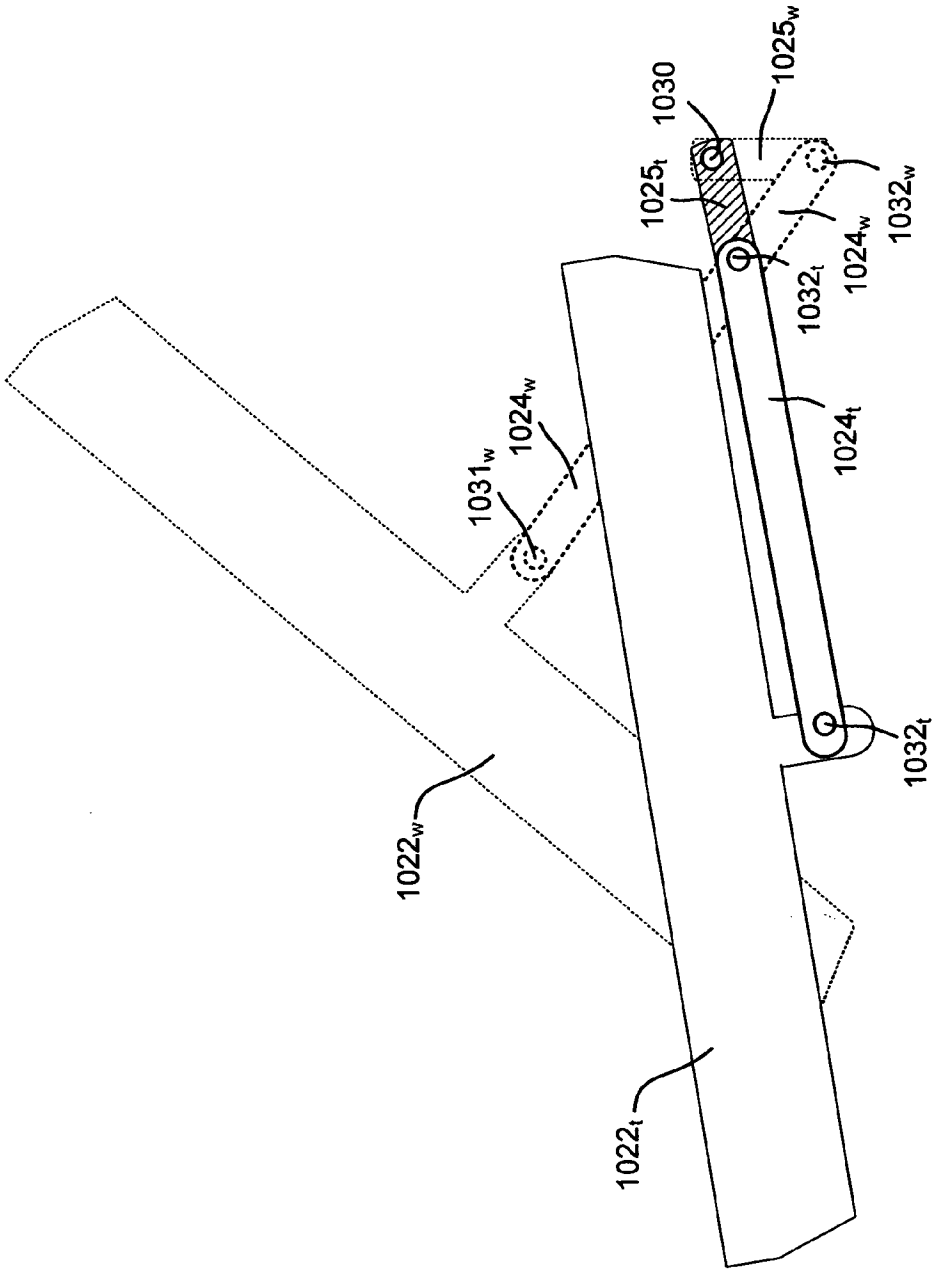

1025w
1030
1025t
1032w
1024w
1032t
1024t
1024w
1031w
1032t
1022w
1022t

FIG. 10B

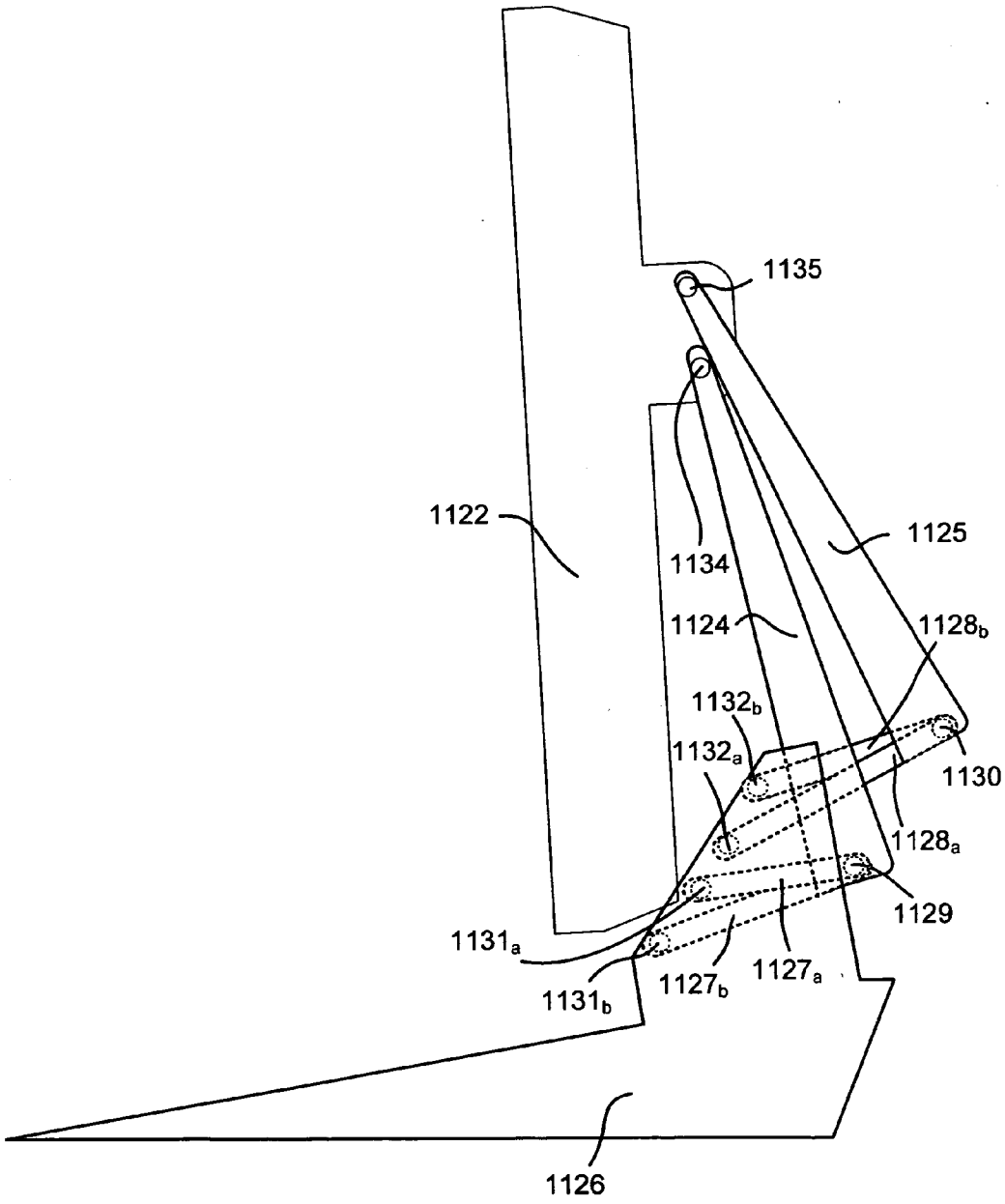

1135
1122
1125
1134
1124
1128_b
1132_b
1132_a
1130
1128_a
1129
1131_a
1131_b
1127_b
1127_a
1126

FIG. 11A

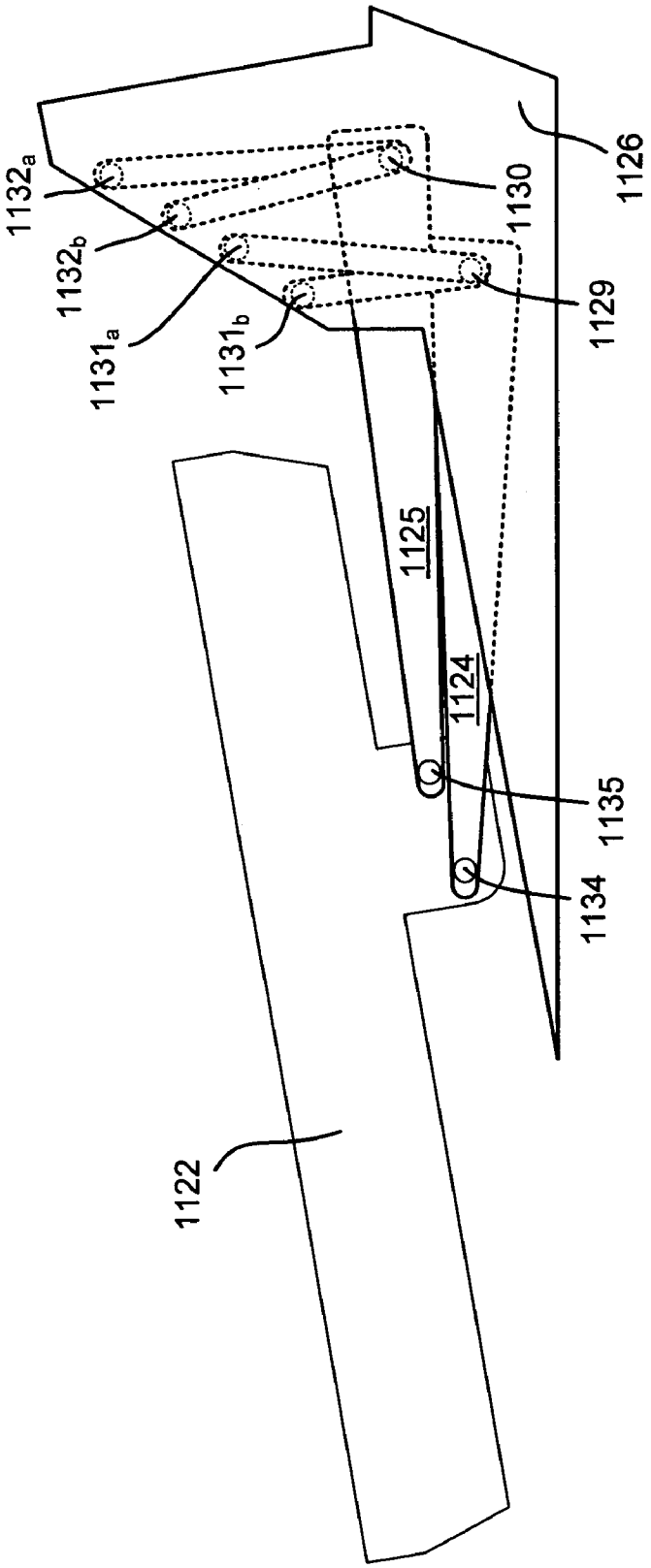

1132a
1132b
1131a
1131b
1130
1126
1129
1125
1124
1135
1134
1122

FIG. 11B

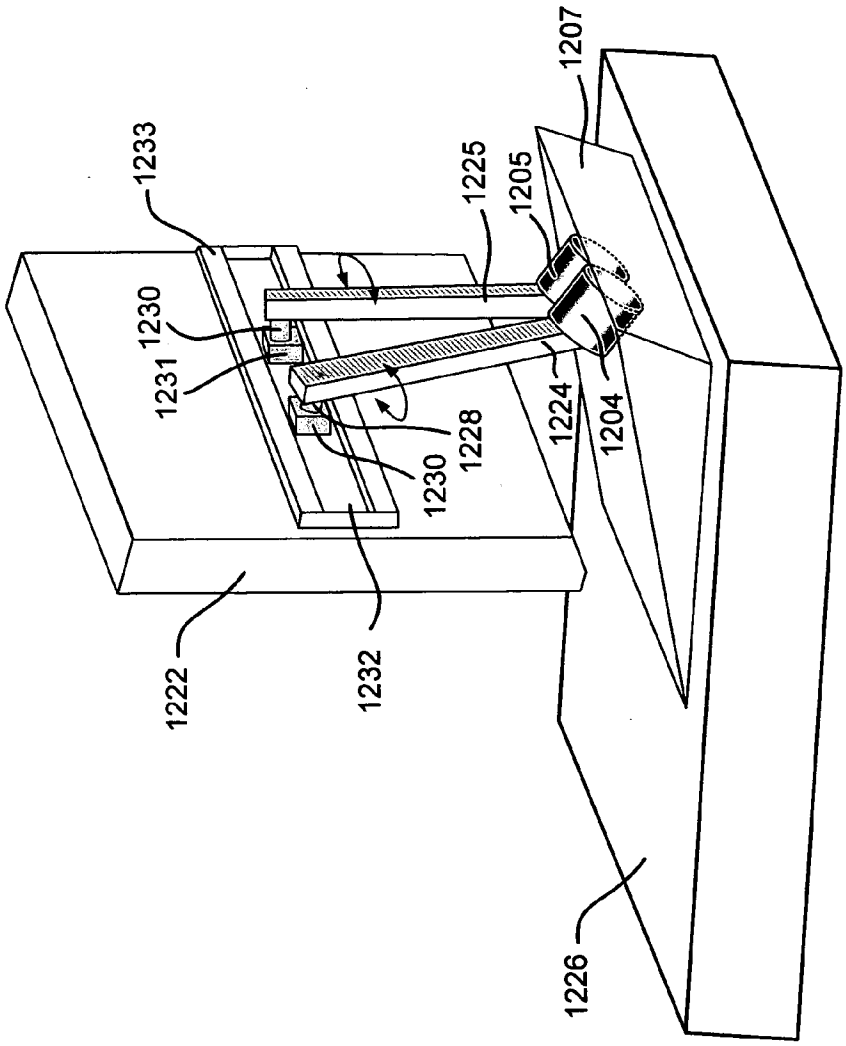

1207
1233
1225
1205
1230
1231
1224
1204
1228
1230
1222
1232
1226

FIG. 12A

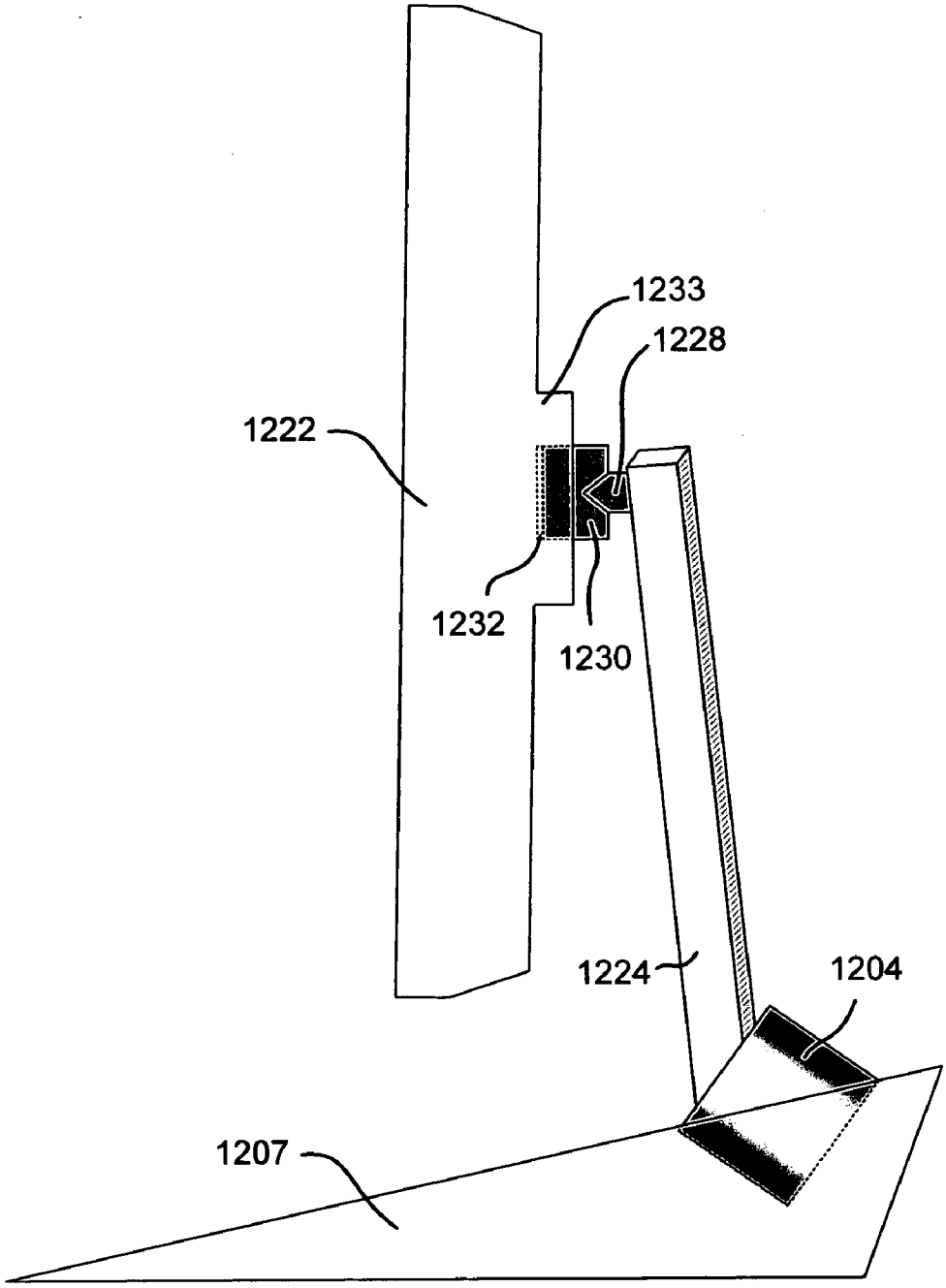


FIG. 12B

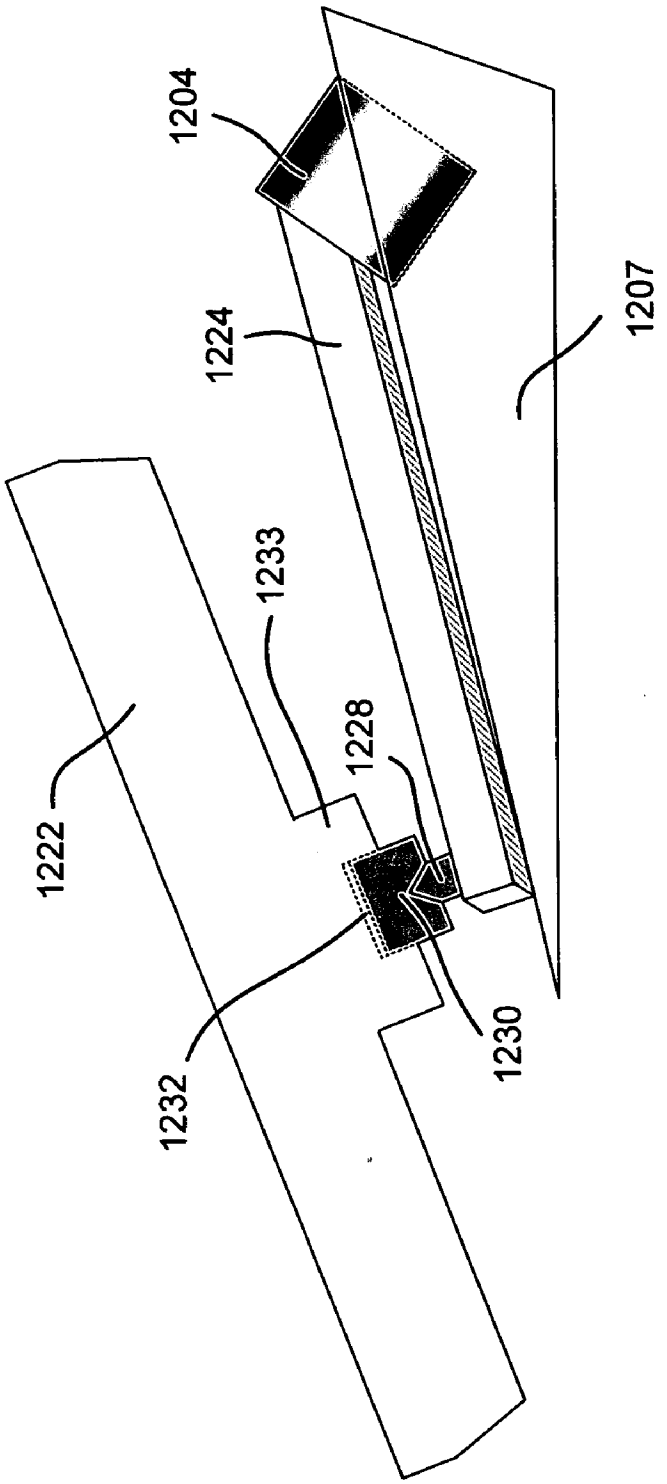


FIG. 12C

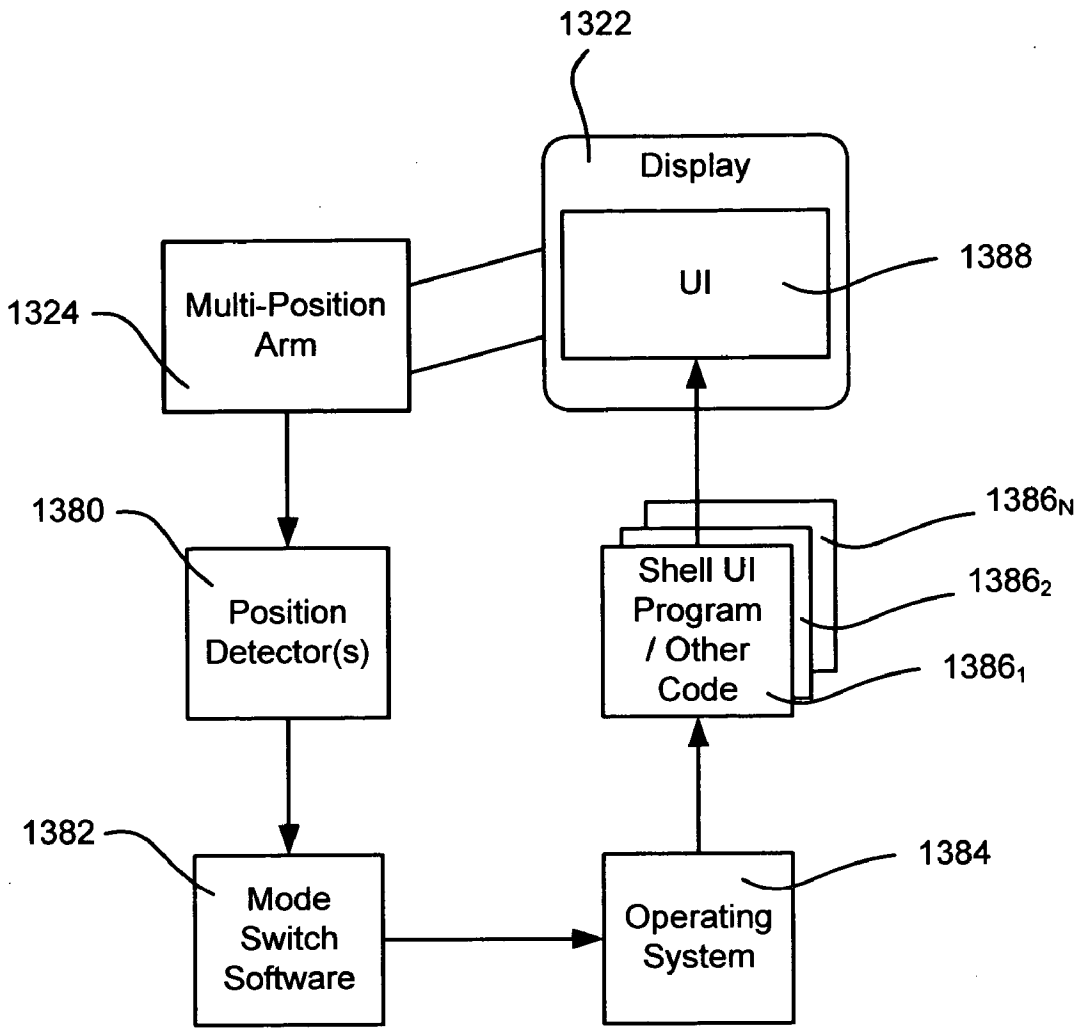

1322
Display
UI
1388
1324
Multi-Position Arm
1380
Position Detector(s)
1386N
Shell UI Program / Other Code
1386₂
1386₁
1382
Mode Switch Software
1384
Operating System

FIG. 13

MULTIPLE POSITION COMPUTER DISPLAY ARM

BACKGROUND

[0001] Computer users interact with computer systems in various ways and for various purposes. One way users interact is visually, through a display monitor. At present, the display monitor screens of many computer systems are frequently positioned at approximately a two-foot operating distance from the user's face.

[0002] While display monitors are sometimes adjustable in height, and generally provide a limited tilt/viewing angle, they do not offer flexibility for usage beyond traditional viewing posture and angles. For example, in addition to displaying visible output, many contemporary display monitors are configured for touch and/or pen input via an LCD digitizer screen. However, standalone display monitors (and even those physically coupled to a desktop computer or laptop computer) are typically positioned for workstation-like interaction, and, for example, are not capable of being readily positioned for touch and/or pen input.

SUMMARY

[0003] Briefly, various aspects of the present invention are directed towards a computer display arm that couples a monitor to a base in a manner facilitates display monitor movement between various positions, may include preset positions that may be generally optimized to match typical computer usage modes. In one implementation, an arm, which may be an articulating arm, includes or is otherwise associated with a mechanism that guides the user, if desired, to convenient stopping positions for different types of interaction. For example, preset stopping positions may be provided for conventional (e.g., mouse and keyboard) workstation-like interaction, video (e.g., DVD movie) playback, stand-up (walk-up) touch-screen interaction, and/or for pen input, similar to a tablet computing device. Users are able to position the monitor display screen between the preset positions if desired, and also may vary the positioning at the preset and/or other stopping points, to an extent.

[0004] The software that is currently loaded and executing on the computer system that is providing output to the display monitor, including the current user interface shell code, can be automatically changed to match the current display monitor position, including a preset position that corresponds to a current user interaction mode.

[0005] Other advantages will become apparent from the following detailed description when taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The present invention is illustrated by way of example and not limited in the accompanying figures in which like reference numerals indicate similar elements and in which:

[0007] FIG. **1** shows an illustrative example of general-purpose computing system components including an arm that positions a computer monitor into one example usage mode.

[0008] FIG. **2** is a representation of a workstation mode in which a monitor is substantially upright and positioned to provide access to input devices.

[0009] FIG. **3** is a representation of a walk-up mode in which a monitor is positioned to facilitate touch or pen input without requiring the user to sit down, or adjust the display for direct use.

[0010] FIG. **4** is a representation of a media consumption mode in which a monitor is positioned to facilitate viewing while concealing input devices to an extent.

[0011] FIG. **5** is a representation of a walk-up mode in which a monitor is positioned to facilitate pen input.

[0012] FIGS. **6**A and **6**B are side view representations of a four bar arm for positioning a monitor between a substantially upright position and a substantially flat (e.g., tablet mode) position, respectively.

[0013] FIGS. **7**A-**7**C are side view representations of a four bar arm with a slot for positioning a monitor between a substantially upright (e.g., media consumption) position to a forward-leaning (e.g., workstation) position and a substantially flat (e.g., tablet mode) position, respectively.

[0014] FIGS. **8**A-**8**C are side view representations of a four bar arm with a sliding rack and pinion mechanism for positioning a monitor between a substantially forward (e.g., media consumption) position to a pushed-back (e.g., workstation) position and a substantially flat (e.g., tablet mode) position, respectively.

[0015] FIG. **9**A is a perspective view of an arm based mechanism with a cable for positioning a monitor;

[0016] FIGS. **9**B and **9**C are side view representations of a monitor using the mechanism of FIG. **9**A for positioning a monitor between a substantially upright position and a substantially flat (e.g., tablet mode) position, respectively.

[0017] FIGS. **10**A and **10**B are side view representations of a monitor using an articulating arm mechanism for positioning a monitor between a substantially upright (e.g., workstation or media consumption) position to a leaned-back (e.g., walk-up) position and a substantially flat (e.g., tablet mode) position.

[0018] FIGS. **11**A and **11**B are side view representations of a monitor using an articulating arm mechanism for positioning a monitor between a substantially upright (e.g., workstation or media consumption) position to a substantially flat (e.g., tablet mode) position, respectively.

[0019] FIG. **12**A is a perspective view of an arm based mechanism with twin arms that move within a slot and turn for positioning a monitor.

[0020] FIGS. **12**B and **12**C are side view representations of a monitor using the mechanism of FIG. **12**A for positioning a monitor between a substantially upright position and a substantially flat (e.g., tablet mode) position, respectively.

[0021] FIG. **13** is a block diagram representing how a computer system may change operating modes based on a current position of a display (e.g., corresponding to a current interaction mode) coupled to a multiple position arm.

DETAILED DESCRIPTION

[0022] Various aspects of the technology described herein are directed towards a computer display arm that positions a computer display monitor among multiple positions,

including preset positions that match typical usage modes. Various mechanical and electromechanical means are described as examples for implementing the present invention, and it will be readily appreciated that the examples herein are non-limiting. Further, computer monitors/displays are described herein as examples, however it is understood that any device capable of displaying visible output is equivalent. As such, any of the description set forth herein are non-limiting examples, and the present invention may be used various ways that provide benefits and advantages in computing and viewing in general.

[0023] Turning to FIG. **1** of the drawings, there is shown a perspective view of an example computer system **120**. As represented in FIG. **1**, a display monitor **122** is connected to a display arm **124** which is currently positioned such that the top of the display monitor **122** is tilted slightly back relative to the bottom of the display monitor **122**. In this particular example, the display arm **124** comprises two arms **124***a* and **124***b* attached to the display monitor **122**. Although not explicitly shown in FIG. **1**, the arm's attachment to the display monitor **122** may be in virtually any practical way, typically one in which the monitor screen **122** may tilt at least to some extent relative to the arm angle.

[0024] A base **126** supports the display arm **124** in a manner that allows the display arm to pivot around an axis **128**. The base **126** may include computer components such as a processor and memory, or some or all of such components may be provided elsewhere, including in the housing of the monitor **122**. As will be understood, the arm **124** and its pivoting coupling (at least at one end) allows the monitor **122** to be positioned in a number of ways relative to the base **126**. The positioning may be stabilized in virtually any way, including by friction, stops (e.g., detents), contact with the underlying surface (e.g., table or desk), braking, springs, counterweights and so forth, including any combination of these and other mechanisms.

[0025] Also represented in the example of FIG. **1** is a keyboard **140** and remote control device **142**, shown in a retracted position. For example, a user may desire such positioning for viewing audiovisual content, and may control such operation by removing the remote control **142**. In the event that the screen is touch and/or pen-sensitive, the user also may interact with the computer system via the display monitor **122** using a pen **142** or the like.

[0026] FIGS. **2-5** provide examples of typical usage modes for user interaction with a computer system, and in particular the computer system's display monitor. As will become readily apparent, a combination of hinge points and arm extensions designed to work together create a smooth movement of the display across a range of multiple positions. Some of the positions are preset, such as a mostly upright (productivity or workstation) position, a walk-up (touch screen) position, a forward (entertainment/media viewing) position, and a table level (pen interaction/tablet) position. Each preset position of the display may provide the user with one or more noticeable "stops" that are integrated into the hinge mechanism. When at a stop, additional tilt and the like may allow further fine-tuning within a range. Stops may be sensed in any way, such as physically and/or audibly sensed by a user or device, optically sensed, and/or may be controlled by motorized settings, and so forth. The stops aid in the ability of the user to maneuver the monitor into the optimized positions for viewing and/or touch/pen interaction. The arm mechanism may also provide smooth and intuitive movement for users as it transitions between the stops, and may allow for intermediate positions. Note that the display arm may be customized for a given monitor, or may provide for coupling to multiple sizes of monitors, such as relatively lightweight LCD flat panel displays.

[0027] FIG. **2** provides an example of a workstation mode, such as in a position with the monitor having a backward tilt angle from −5 degrees (dashed box **222**) to +15 degrees (dashed box **223**) from vertical (dashed line **225**), although another range such as plus or minus fifteen degrees or more is also configurable. The actual angle may be user configurable; for example, the user may set up the mechanism such that the arm has a stop when the monitor is at a backward tilt angle of +10 degrees to vertical.

[0028] In the example of FIG. **2**, this user's workstation position is also set such that the bottom of display is approximately four inches off of the desk, with access to input devices, e.g., a keyboard and pointing device. If present, an auxiliary display is also likely visible in such a mode.

[0029] FIG. **3** provides an example of the arm being hinged to provide a walk-up mode, such as in a position with the monitor **322** having a backward tilt angle of −45 degrees, which may be adjustable to an extent (e.g., dashed box **323**). In the example of FIG. **3**, the walk-up mode typically provides user interaction via a touch-screen interface. Such a mode is useful in environments where users need quick access to information, such as in a family's kitchen where users can leave messages for one another, quickly check the weather or traffic, look up phone numbers, and so forth.

[0030] In one implementation of the walk-up mode wherein the display is used primarily for touch-screen operation and/or distance viewing, one or more interactive mechanisms such as the transport (media) controls, power on/off button and auxiliary display information remain easily accessible. This is a result of the physical location provided by the design, namely at the front edge. The location of these mechanisms facilitates interaction with the computer system, including when the keyboard does not exist or is stored behind the display and is therefore not easily accessible.

[0031] FIG. **4** provides an example of a media consumption mode, typically for viewing video where the bulk of user interaction is simply viewing. In FIG. **4**, the arm is hinged such that the monitor screen **422** has been positioned forward, resulting in the input devices barely visible, if at all. The represented monitor screen **422** has zero vertical tilt, but the tilt may be adjustable within a reasonable range (dashed box **423**). As described above with reference to FIG. **1**, any necessary interaction, such as to get a movie started, may be accomplished in the modes of FIG. **2** or **3**, or via remote control and/or touch-screen operation while in the media consumption mode exemplified in FIG. **4**.

[0032] FIG. **5** provides another example mode, e.g., referred to as a pen/stylus or tablet mode, in which a user interacts with the display monitor screen **522** using a pen or the like. In this mode, to facilitate writing, the tablet-type monitor screen is at an acute angle with its underlying table or desk, for example ten degrees (dashed box **523**) to twenty

degrees (box **22**) from horizontal. For stability, any tilt is limited, as in this example the front edge of the display monitor is in contact with the underlying table or desk, and there is no substantial left-right rotation. If the base **526** provides an apparatus (e.g., a receptacle) for holding a pen/stylus for tablet input, as does the base **126** in the example of FIG. **1**, easy access to the pen/stylus may be provided when in this mode.

[**0033**] Between the various modes the user may be able to set the display screen to any angle, such as counterbalanced by friction. Springs, lever-released latching mechanism, and other suitable mechanisms may help position the display screen as desired at the stops or at any location between the stops.

[**0034**] As can be seen, via a set of arms, one of which may be an articulating arm, multiple preset modes (which may be user configurable, at least to an extent) may be provided. The number of modes may depend on a particular type of monitor, e.g., a touch/pen sensitive monitor may have tablet and walk-up modes, while display-only monitors may not. Less than all modes may be provided, e.g., another system may include preset stops corresponding to workstation, media consumption and tablet modes, but not a preset stop corresponding to a walk-up mode. Still other modes are feasible, e.g., a cleaning/maintenance mode, a protective storage mode, and so forth. Depending on the type of mechanism, e.g., a motor-driven mechanism, a user may be able to set the modes and stop positions exactly as desired, or if not fully user-configurable, may choose to ignore certain stops that are not desired.

[**0035**] Various examples of articulating arm implementations have been configured and are represented in FIGS. **6**A-**12**C. For example, FIGS. **6**A and **6**B are side views of a four-bar implementation for positioning a monitor **622** (only two bars, or arms **624** and **625** are visible in FIGS. **6**A and **6**B due to the side view) between multiple positions. As can be seen, FIG. **6**A represents a media consumption mode, and FIG. **6**B a tablet mode. As will be apparent, a workstation mode (not shown) can be provided by moving the monitor backwards relative to the base.

[**0036**] In general, in FIGS. **6**A and **6**B the bars **624** and **625** pivot on the base **626** via pivot points **628** and **629**. The opposite end of the bars **624** and **625** are coupled to the monitor **622** (or a bracket or the like fixed to the monitor) at pivot points **630** and **631**. The monitor **622** may be moved between these and other positions by manual or motor-driven operation. Various stopping mechanisms such as detents may be used to signify to the user, and to an extent hold the monitor **622**, when the monitor **622** is in one of the preset modes.

[**0037**] As another example, FIGS. **7**A-**7**C are side views of a four-bar implementation with a cam **708** and slot **710** for positioning a monitor **722** between multiple positions. Again only two bars **724** and **725** are visible because of the side view. As can be seen, FIG. **7**A represents a media consumption mode, FIG. **7**B a workstation mode and FIG. **7**C a tablet mode.

[**0038**] In general, as represented in FIGS. **7**A-**7**C the bars **724** and **725** pivot on the base **726** via pivot points **728** and **729**. The monitor **722** is coupled to the bars **724** and **725** via the cam **708**. More particularly, the opposite end of the bars **724** and **725** are coupled to the cam **708** at pivot points **730**, **731** and **732**, and the distal end of the bar **724** moves within the slot **710**.

[**0039**] As is readily apparent from FIGS. **7**A-**7**C, the cam **708** rotates relative to the bars **724**, **725** and the monitor **722**. Again, any suitable mechanism may be used as a stop among the preset stopping positions that provide the different usage modes. Note that a walk-up mode is not shown, however it is readily apparent in FIGS. **7**A-**7**C that the monitor **722** can be positioned at approximately a forty-five degree angle, with a stop present if a preset walk-up mode is desired.

[**0040**] FIGS. **8**A-**8**C represent an alternative arm mechanism that facilitates positioning a monitor **822** in multiple positions, including positions corresponding to preset modes. In this example implementation, there is a four bar arrangement with a linear slide, using a sliding rack **840** with a pinion **842** to provide smooth linear movement back and forward relative to a base **826**. The bars **824** and **825** provide rotation, as they are coupled to the sliding rack **840** at pivot points **828** and **829**, and are coupled to the monitor (directly or indirectly via a coupling such as a bracket or frame fixed to the monitor) at pivot points **830** and **831**.

[**0041**] FIG. **8**A generally corresponds to a media consumption mode, with the monitor slid forward on the pinion. Although not specifically shown in FIG. **8**A, a more vertical tilt may be accomplished by rotating the top of the monitor forward. FIG. **8**B corresponds to a workstation mode, with the monitor slid back on the pinion, thereby exposing more of the base to facilitate access to a keyboard, for example.

[**0042**] FIG. **8**C corresponds to a tablet mode, and is accomplished by the four bars rotating to a position that is essentially parallel with the monitor and base. As apparent from FIG. **8**C, the monitor (or coupling) may contact the underlying supporting surface to enhance stability.

[**0043**] FIGS. **9**A-**9**C show another alternative implementation, in which a rotating cable, belt or band **905**, works with two arms **924** and **925** to achieve various positions for a monitor **926**, including positions corresponding to preset modes. FIG. **9**A provides a perspective view, while FIG. **9**B is demonstrates the workstation mode and FIG. **9**C demonstrates the tablet view.

[**0044**] The cable, belt or band **905** may be motorized, or may otherwise provide a guide/friction that helps the monitor maintain a desired positioned between modes or other positions. In FIGS. **9**B and **9**C, the arm **924** (only one is visible due to the side view) is shown coupled to a mounting **927** on the base **926** at pivot point **930**. The opposite end of the arm **925** is coupled to the monitor **922** via a bracket **909** and cylinder **913** or the like to provide rotation at pivot point **932**.

[**0045**] FIG. **10**A shows another alternative example implementation, in which a monitor transitions between a substantially upright mode (e.g., a media consumption mode shown in solid figures) and a walk-up mode (shown in dashed representations). FIG. **10**B the monitor transitioning between walk-up mode (shown in dashed representations) and a tablet mode (shown in solid figures). In FIGS. **10**A and **10**B, each component is labeled with a subscript indicative of the mode, e.g., the arm **1024** is labeled $\mathbf{1024}_m$ for the media consumption mode, $\mathbf{1024}_w$ for the walk-up mode, and $\mathbf{1024}_t$ for the tablet mode. The only exception is the pivot

point **1030**, which remains fixed regardless of the monitor's mode and corresponding position. For purposes of simplicity, when referring to a component independent of a particular position, each component may be referred to herein without its subscript.

[**0046**] In FIGS. **10**A and **10**B, only one set of arms **1024** and **1025** is visible. The longer arm **1024** is coupled to the monitor **1022** via pivot point **1031**. The shorter arm **1025** is coupled to the longer arm at pivot point **1032**, and coupled to a base or other support surface at the pivot point **1030**. As can be seen in FIGS. **10**A and **10**B, the arms **1024** and **1025** rotate relative to one another, relative to the monitor and relative to the fixed pivot point **1030**.

[**0047**] The upright mode in FIG. **10**A is shown with long arm $\mathbf{1024}_m$ being rotated to a somewhat vertical position, with the short arm $\mathbf{1025}_m$ extending rearward from the fixed point **1030** at roughly a right angle to the long arm $\mathbf{1024}_m$. The walk-up mode is shown in FIGS. **10**A and **10**B with the long arm $\mathbf{1024}_w$ being rotated to a somewhat perpendicular position relative to the monitor $\mathbf{1022}_w$ and the short arm $\mathbf{1025}_w$ descending generally vertically from the fixed pivot point **1030**.

[**0048**] The tablet mode in FIG. **10**B is shown as being achieved by having the long and short arms $\mathbf{1024}_t$ and $\mathbf{1025}_t$, respectively, extending from the fixed pivot point **1030** somewhat parallel to the monitor $\mathbf{1022}_t$. Rotation may be manual or motor driven.

[**0049**] FIGS. **11**A and **11**B show a somewhat similar implementation, with two long arms **1124** and **1125** per side and each arm coupled to a base **1126** via two short arms **1127***a*, **1127***b*, **1128***a* and **1128***b*. The short arms **1127***a*, **1127***b*, **1128***a* and **1128***b* couple to the long arms at pivot points **1129** and **1130**, and are coupled for rotation to the base **1126** at fixed pivot points **1131***a*, **1131***b*, **1132***a* and **1132***b*. The long arms couple to the monitor **1122** at points **1134** and **1135**.

[**0050**] As can be seen, the monitor transition from the workstation mode of FIG. **11**A to the tablet mode of FIG. **11**B, with other positions in between, which may correspond to preset modes. To this end, the long arms **1124** and **1125** and short arms **1127***a*, **1127***b*, **1128***a* and **1128***b* pivot such that the bottom of the monitor **1122** rotates forwards and downwards relative to the base **1126** and the base's fixed pivot points **1131***a*, **1131***b*, **1132***a* and **1132***b*.

[**0051**] Yet another example implementation is represented in FIGS. **12**A-**12**C. In this implementation, two arms **1224** and **1225** rotate inwardly and outwardly, and turn/spin (as represented by the double-headed arrows around the arms) relative to a base **1226** at the arm's distal ends. To this end, rotors **1204** and **1205**, which may be motorized, respectively couple the arms **1224** and **1225** to a ramped part **1207** of the base **1226**. The rotors may be motorized.

[**0052**] The opposite ends of the arms **1224** and **1225** are fixed to cylinders **1228** and **1229**, which in turn pivotally couple to guides **1230** and **1231** that laterally slide along a slot **1232** of a frame **1233** mounted to the back of the monitor **1222**.

[**0053**] As seen in FIGS. **12**A-**12**C, the rotation and turning of the arms **1224** and **1225** slide the guides **1230** and **1231** in the slot **1232**, causing the monitor to rotate. In these examples, the rotation is from the monitor being in a substantially upright position (FIG. **12**B) to a mostly flattened (e.g., tablet mode) position (FIG. **12**C). Note that the turning of the arms may be seen in FIGS. **12**B and **12**C by the shaded side of the arm **1224** turning over relative to the rotor **1204**.

[**0054**] As can be seen from the above examples, there are numerous ways to implement an arm or set of arms to position a monitor to correspond to desirable usage modes.

[**0055**] In addition to providing the various positions corresponding to interaction modes, the computer providing the content to display can change software operating modes to match the corresponding monitor position. By way of example, FIG. **13** shows a multiple-position arm **1324** coupled to a position detection means **1380**, such as one or more switches, a counter (such as motor rotations), an optical sensor or sensors and/or essentially any equivalent mechanism or mechanisms that can report a signal indicative of the current position (at least once movement has stopped) to a computer system. Note that the exact position need not be known, e.g., the display monitor may be known to be positioned between two preset stops, thereby providing information from which software can be loaded, even though the exact location between those stops may not be detectable in a given system.

[**0056**] The position detector means **1380** is coupled (e.g., via a hardware to software interface) to mode switch software **1382** running on the computer system. In general, the mode switch software **1382** comprises policy or the like, which may be user configurable preference data, as to what shell user interface and/or other software should be operational in each position, including positions between preset modes. The mode switch software **1382**, which may be any program such as an application and/or operating system component, reports the position-based decision to the operating system **1384**, which in turn loads a corresponding shell user interface and/or other program or programs (e.g., $\mathbf{1386}_1$) as necessary to configure the computer system user interface display **1388** and running programs to match the current mode. Some delay may be provided to avoid loading and changing software until it is likely that a user has settled on a particular position and/or interaction mode rather than transitioning between modes.

[**0057**] By way of example, when the arm is positioned such that the display monitor is in the media consumption mode, media player software may be loaded and automatically executed. In the tablet mode, tablet operating system components such as including handwriting recognition software may be loaded and automatically executed. In the walk-up mode, a touch-screen shell program configured to provide convenient access to walk-up types of information (e.g., weather, messages, the internet and so forth) may be loaded. In the workstation mode, typical shortcuts and other information used for working/productivity or other computer usage (e.g., gaming) may be displayed.

[**0058**] Note that any of the software modes may be per user or group, e.g., the workstation mode may display different user accounts from which to select, optionally enter a password and so forth so that multiple users can share a computer. Moreover, the various modes that are available to each user can match that particular user's preference, and

there is no need to provide an option to switch user accounts when the same user has transitioned from one position to another.

[0059] The system may persist personal settings for the display; e.g., once the system identifies the user, or a change in the user, the system may automatically switch to that user's default display position. This can happen automatically, e.g., through biometric sensors, or other sensing technologies such as face recognition and/or proximity sensors. Such settings also may be application specific. For example, if the system detects the user is launching a television or other media application program, the system may automatically switch to the user's media consumption mode, e.g., a vertical flat position. The positions can also be manually changed, such as triggered from a button on the display or keyboard.

[0060] The system may include animation software or provide other output describing the positioning mechanism. This software can automatically run during position switching, or can be manually triggered.

[0061] While the invention is susceptible to various modifications and alternative constructions, certain illustrated embodiments thereof are shown in the drawings and have been described above in detail. It should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention.

What is claimed is:

1. A system, comprising:

a mechanism that couples a display monitor to a base, the mechanism including at least one arm having a set of at least two stops, the arm moveable between positions corresponding to each of the stops, each stop corresponding to an operating mode of operation.

2. The system of claim 1 further comprising means for adjusting the monitor an additional amount relative to at least one position corresponding to a stop.

3. The system of claim 1 wherein one operating mode of operation corresponds to a workstation mode that facilitates access to at least one input device.

4. The system of claim 2 wherein the workstation mode corresponds to a range of tilt angles between negative fifteen degrees vertical to positive fifteen degrees vertical.

5. The system of claim 1 wherein one operating mode of operation corresponds to a mode optimized for media consumption.

6. The system of claim 1 wherein the media consumption mode conceals at least part of an input device or other controls and/or displays that are unnecessary for media viewing.

7. The system of claim 1 wherein one operating mode of operation corresponds to a walk-up mode that facilitates touch and/or pen input, and wherein the walk-up mode corresponds to a range of tilt angles between negative sixty degrees vertical to negative thirty degrees vertical.

8. The system of claim 1 wherein one operating mode of operation corresponds to a tablet mode that facilitates pen input.

9. The system of claim 8 wherein the tablet mode corresponds to a position in which the bottom of the monitor is stabilized by a fixed surface.

10. The system of claim 1 wherein the stops correspond to at least one of visible, audible and/or tactile feedback.

11. The system of claim 1 wherein the mechanism that couples the display monitor to the base includes a pair of arms that each extend from the base and couple to the display monitor for sliding in a lateral direction relative to the display monitor, and rotate relative to the display monitor.

12. The system of claim 1 wherein the mechanism comprises an articulating arm having at least two fixed members that are pivotally coupled to one another.

13. The system of claim 1 wherein the mechanism comprises a four-bar arm mechanism having two pairs of bars apart from one another.

14. The system of claim 1 wherein the mechanism that couples the display monitor to the base includes a sliding rack and pinion mechanism.

15. The system of claim 1 further comprising software change means for changing software corresponding to the operating mode.

16. In a computing environment including a computer system and monitor, a method comprising:

detecting a current position of a monitor coupled to a movable arm; and

changing a software mode to correspond to the current position.

17. The method of claim 16 wherein the current position corresponds to a current user interaction mode of a set of possible modes, the set containing a workstation mode, a media consumption mode, a walk-up mode, and a tablet mode, and wherein changing the software mode to correspond to the current position comprises changing a user interface based on the current interaction mode.

18. A system, comprising:

a mechanism that couples a display monitor to a base, the mechanism including at least one arm having at least two stops, the arm moveable between positions corresponding to each of the stops, each stop corresponding to an operating mode of a set of possible modes, the set containing a workstation mode, a media consumption mode, a walk-up mode, and a tablet mode.

19. The system of claim 18 further comprising a computing device that outputs data to the display monitor, a detection mechanism that detects a current position of the display monitor, and software change means coupled to the detection mechanism for changing at least some software running in the computing device based upon the current position.

20. The system of claim 18 wherein the mechanism that couples the display monitor to the base comprises at least one type of positioning means of a set, the set containing, an articulating arm having at least two fixed members that are pivotally coupled to one another, a four-bar arm mechanism having two pairs of bars apart from one another, a pair of arms that each extend from the base and couple to the display monitor for sliding in a lateral direction relative to the display monitor and rotate relative to the display monitor, and/or an arm mechanism coupled to a base via a sliding rack and pinion mechanism.

* * * * *

Exhibit 1017

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(54) DATA PROCESSING DEVICE

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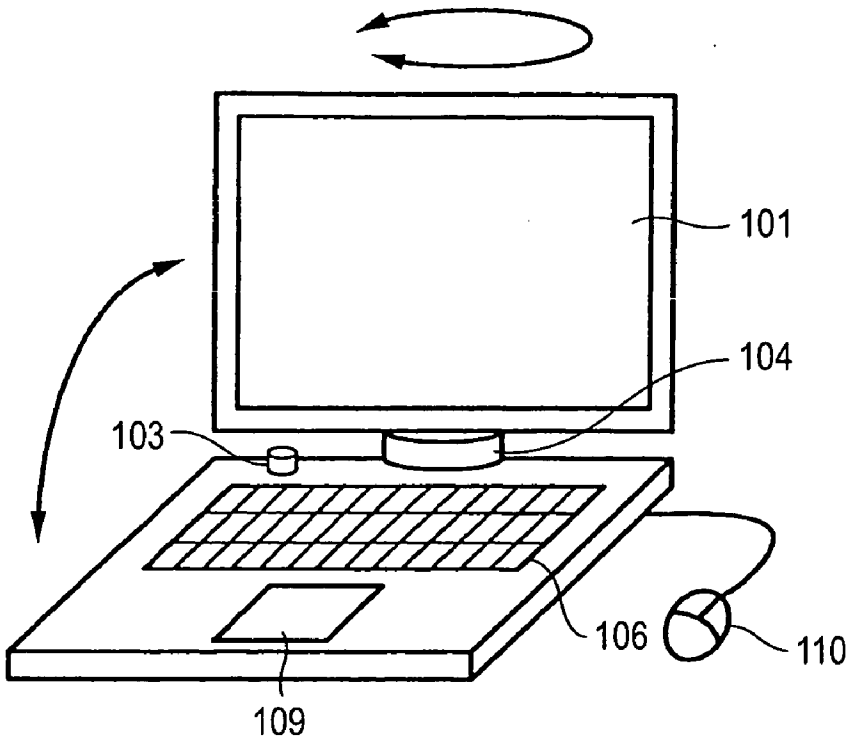
(51) **Int. Cl.**[7] **G09G 5/00**

(52) **U.S. Cl.** **345/179**

(57) **ABSTRACT**

A data processing device includes plural input modes which is capable of, for instance, automatically determining whether the device is in a notebook mode or a tablet mode, thereby enabling a user to use the data processing device by use of an interface suitable for the mode without performing any particular operation for choosing the interface.

The data processing device includes a display which is integrally configured with a tablet, a mode determination section which determines an input mode on basis of the tablet, and a mode controller which switches a user interface on basis of the result of determination of the mode determination section. When configured as described above, the convertible data processing device can automatically determine whether the device is in a notebook mode or a tablet mode, and provide a user with an interface suitable for the mode. Accordingly, comfortable operability can be realized.



NOTEBOOK MODE
ROTATION SWITCH: 0°
RECLOSABLE SWITCH: OPEN

FIG. 1

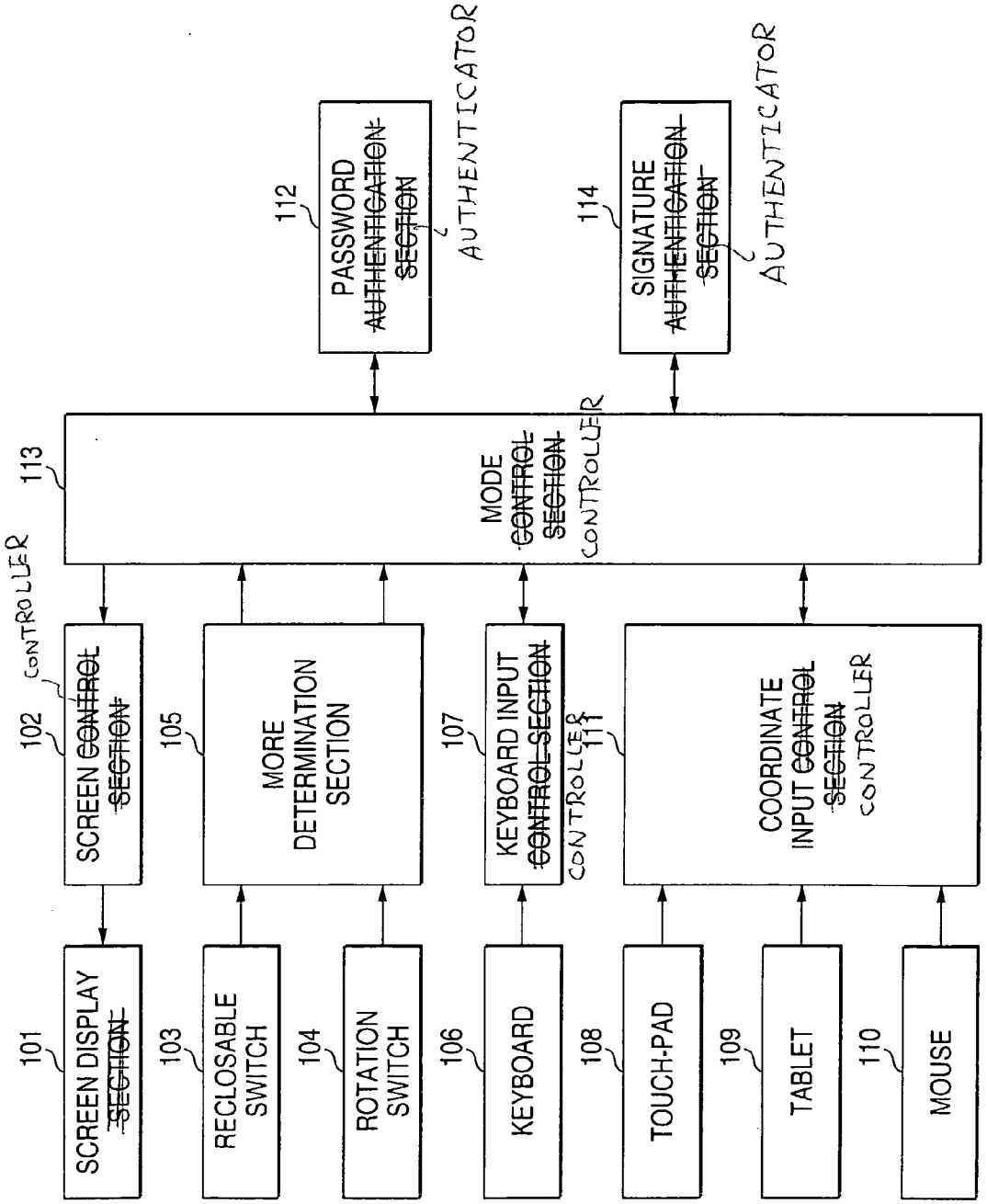
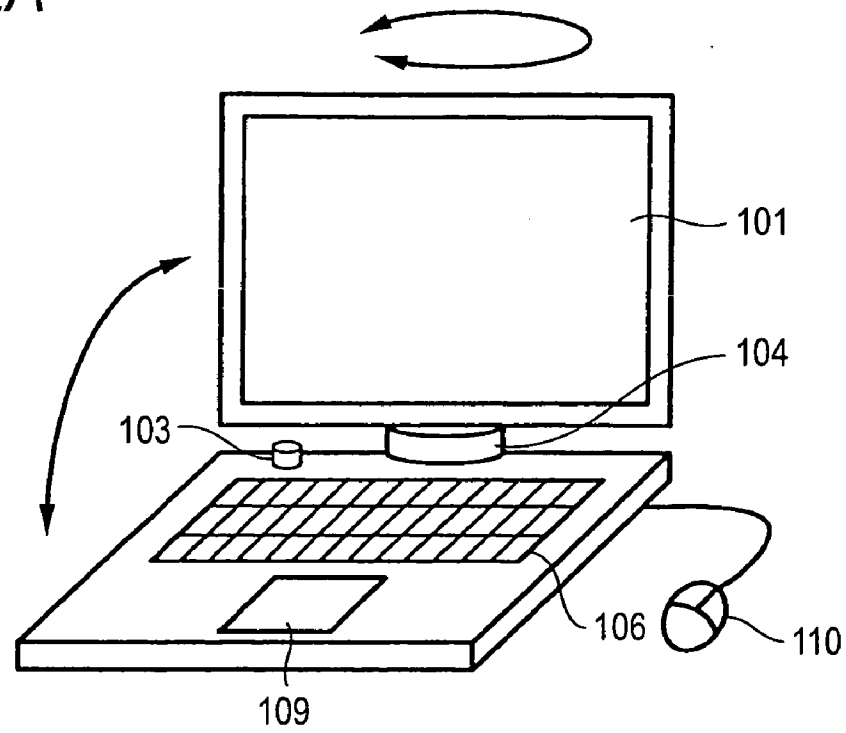
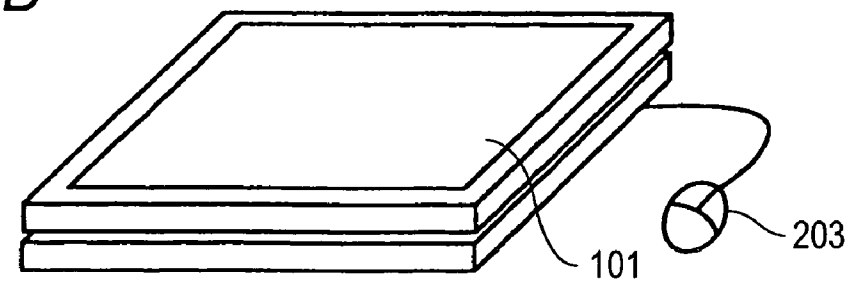

112
PASSWORD AUTHENTICATION SECTION
AUTHENTICATOR
114
SIGNATURE AUTHENTICATION SECTION
AUTHENTICATOR
113
MODE CONTROL SECTION
CONTROLLER
CONTROLLER
102
SCREEN CONTROL SECTION
105
MORE DETERMINATION SECTION
107
KEYBOARD INPUT CONTROL SECTION
CONTROLLER
111
COORDINATE INPUT CONTROL SECTION
CONTROLLER
101
SCREEN DISPLAY SECTION
103
RECLOSABLE SWITCH
104
ROTATION SWITCH
106
KEYBOARD
108
TOUCH-PAD
109
TABLET
110
MOUSE

FIG. 2A



NOTEBOOK MODE
ROTATION SWITCH: 0°
RECLOSABLE SWITCH: OPEN

FIG. 2B



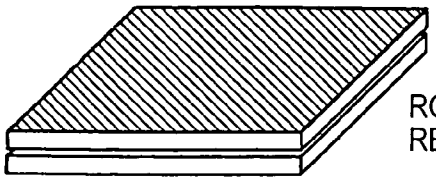
TABLET MODE
ROTATION SWITCH: 180°
RECLOSABLE SWITCH: CLOSED

FIG. 3

		RECLOSABLE SWITCH	
		OPEN	CLOSED
ROTATION SWITCH	0°	NOTEBOOK MODE	NOTEBOOK MODE
	180°	NOTEBOOK MODE	TABLET MODE

FIG. 4A

POWER-OFF

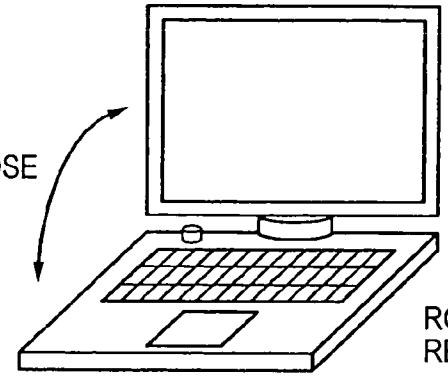


ROTATION SWITCH: 0°
RECLOSABLE SWITCH: CLOSED

FIG. 4B

NOTEBOOK MODE

OPEN/CLOSE

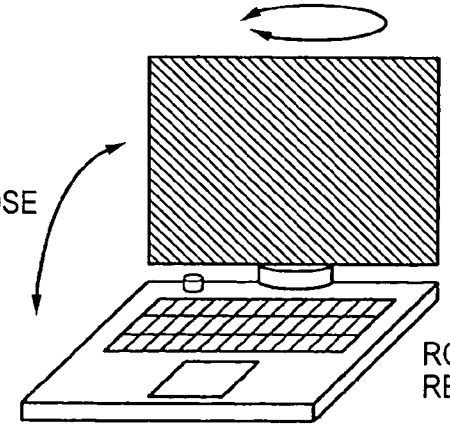


ROTATION SWITCH: 0°
RECLOSABLE SWITCH: OPEN

FIG. 4C

NOTEBOOK MODE

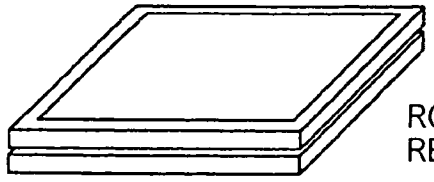
OPEN/CLOSE



ROTATION SWITCH: 180°
RECLOSABLE SWITCH: OPEN

FIG. 4D

TABLET MODE



ROTATION SWITCH: 180°
RECLOSABLE SWITCH: CLOSED

FIG. 5

	NOTEBOOK MODE	TABLET MODE
CURSOR	DISPLAY NORMAL MOUSE CURSOR	DISPLAY NO CURSOR OR DISPLAY DEDICATED CURSOR
COMPONENT SIZE IN SCREEN	DISPLAY IN NORMAL SIZE	DISPLAY ENLARGED FROM NORMAL SIZE
CLICK OPERATION	DOUBLE CLICK	SINGLE CLICK
POINTER TRAIL	DISPLAY CURSOR MOTION MADE BY DRAGGING	DISPLAY TRAIL IN A LINE
KEYBOARD INPUT	ACCEPTED	NOT ACCEPTED
INPUT BY TOUCH-PAD	ACCEPTED	NOT ACCEPTED
INPUT BY PEN	NOT ACCEPTED	ACCEPTED
SOFTWARE	WHEN SWITCHING FROM TABLET MODE TO NOTEBOOK MODE, SOFTWARE PERTAINING TO TABLET MODE IS STOPPED	WHEN SWITCHING FROM NOTEBOOK MODE TO TABLET MODE, SOFTWARE PERTAINING TO TABLET MODE STAYS RESIDENT
LOG-ON	AUTHENTICATION BY INPUT OF PASSWORD AT LOG-ON	AUTHENTICATION BY INPUT OF SIGNATURE AT LOG-ON

FIG. 6A

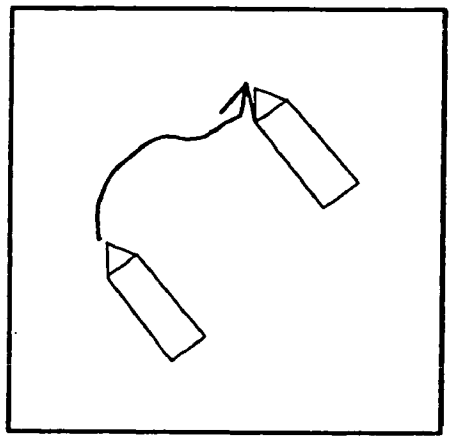


FIG. 6B

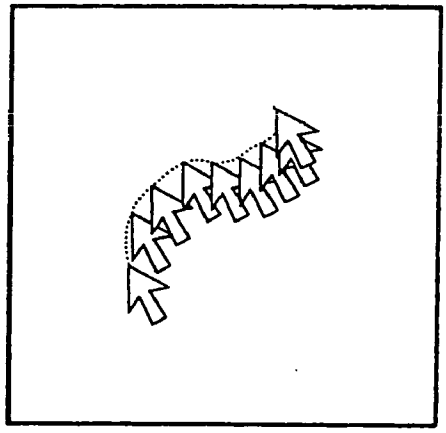
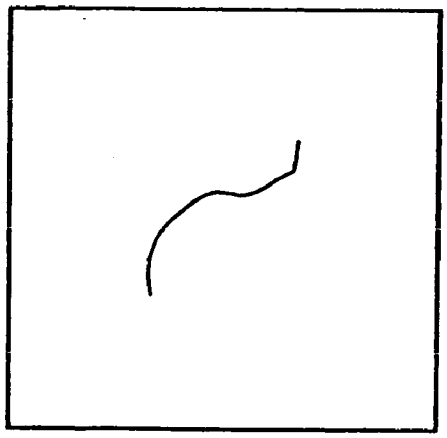


FIG. 6C



DATA PROCESSING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority from the prior Japanese Patent Applications No. 2003-385340 filed on Nov. 14, 2003; the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a data processing device, such as a computer, a personal digital assistant, or a word processor, having two or more input modes including a mode where a keyboard or a touch-pad is used while the device is in an open state (notebook mode) as is the case with a normal notebook PC, and a mode where a pen is used while the device is in a collapsed state (tablet mode).

[0004] 2. Description of the Related Art

[0005] Conventional data processing devices having a plurality of input modes has two modes, e.g., a mode (a notebook mode) where input is effected by a keyboard and a mouse and a mode (a tablet mode) where input is effected by handwriting with a pen, or the like. In a data processing device having a plurality of input modes, the type of input means to be employed and direction thereof during use, and the like, change greatly from one mode to another. For instance, in the notebook mode, there are many situations where a keyboard and a touch-pad are used from the front as in the case of a normal notebook PC. In contrast, in the tablet mode, a device is supposed to be used on a device from desired directions thereof.

[0006] As described above, in consideration of the fact that the direction—in which the user uses the data processing device—differs in many cases between, e.g., the notebook mode and the tablet mode, the user switches the direction of a screen display or that of input means in accordance with directions assigned respectively to the notebook mode and the tablet mode, in a data processing device having a plurality of input modes (see, e.g., JP2003-296033 (kokai) ([0019], FIG. 4)).

[0007] A data processing device typified by a notebook PC assumes usage by use of a keyboard and a mouse. Accordingly, many data processing devices having a plurality of input modes adopt a user interface for a notebook mode, which users often find to be inconvenient, especially in a tablet mode.

[0008] For this reason, in many data processing devices having a plurality of input modes, input means as well as the direction of a screen display used by the user often change between, e.g., the notebook mode and the tablet mode. Accordingly, the user himself/herself switches the mode. Furthermore, in addition to the direction of the screen display, there also arises a problem of the user feeling inconvenience when a single input means is employed for both the notebook mode and the tablet mode.

SUMMARY OF THE INVENTION

[0009] The present invention has been conceived in view of the above circumstances and provides a data processing device having a plurality of input modes which is capable of, for instance, automatically determining whether the device is in a notebook mode or a tablet mode, thereby enabling a user to use an interface suitable for the current mode.

[0010] According to first aspect of the present invention, a data processing device includes a display integrally configured with a tablet, a mode determination unit to determine whether or not a current mode is an input mode employing the tablet, and a mode controller to switch a user interface on basis of a result of determination of the mode determination unit.

[0011] According to second aspect of the present invention, a data processing device includes a display integrally configured with a tablet, an input unit, an input controller to control input information input by the input unit, a mode determination unit to determine whether or not a current mode is an input mode employing the tablet, and a mode controller to switch whether or not to accept the input information in accordance with a result of determination of the mode determination unit.

[0012] According to third aspect of the present invention, a data processing device includes a display integrally configured with a tablet, an input unit, a mode determination unit to determine whether or not a current mode is an input mode employing the tablet, and a mode controller to switch an operation mode to be performed by way of the input unit in accordance with a result of determination of the mode determination unit.

[0013] According to fourth aspect of the present invention, a data processing device includes a display integrally configured with a tablet, an input unit, a mode determination unit to determine whether or not a current mode is an input mode employing the tablet, and a mode controller to switch a mode of displaying information input by way of the input unit in accordance with a result of determination of the mode determination unit.

[0014] According to fifth aspect of the present invention, a data processing device includes a display integrally configured with a tablet, a mode determination unit to determine whether or not a current mode is an input mode employing the tablet, and a mode controller to switch software to be operated on basis of a result of determination of the mode determination unit.

[0015] According to sixth aspect of the present invention, a data processing device includes a display integrally configured with a tablet, an authenticator to logon, a mode determination unit to determine whether or not a current mode is an input mode employing the tablet, and a mode controller to switch an authentication mode in accordance with a result of determination of the mode determination unit.

[0016] According to seventh aspect of the present invention, a portable device includes a display integrally configured with a input in a tablet mode, a input unit to input in a notebook mode, a mode determination unit to determine whether a current mode is the notebook mode or the tablet mode, and a mode controller to switch a user input interface on basis of a result of determination of the mode determination unit.

[0017] According to the present invention, in a data processing device having a plurality of input modes, an inter-

face suitable for the current mode can be automatically provided to a user. Accordingly, operation efficiency of the user can be enhanced. Particularly, there is automatically performed switching to an appropriate interface in the tablet mode without causing the user to perform a special operation, and hence the user can operate the data processing device with comfort.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] **FIG. 1** is a block diagram showing a configuration of a data processing apparatus according to an embodiment of the present invention;

[0019] **FIGS. 2A and 2B** are diagrams showing a notebook mode and a tablet mode;

[0020] **FIG. 3** is a diagram showing an example mode determination;

[0021] **FIGS. 4A** to **4**D are diagrams showing switching between modes;

[0022] **FIG. 5** is a diagram showing an example of processing pertaining to switching between a notebook mode and a tablet mode; and

[0023] **FIGS. 6A** to **6**C are diagrams showing examples of trails displayed on screens.

DETAILED DESCRIPTION OF THE INVENTION

[0024] Hereinafter, an embodiment of the invention will be described by reference to the drawings.

[0025] **FIG. 1** is a block diagram showing a data processing device of the present invention. The data processing device shown in **FIG. 1** includes a screen display **101**, a screen controller **102**, a reclosable switch **103**, a rotation switch **104**, a mode determination section **105**, a keyboard **106**, a keyboard input controller **107**, a to touch-pad **108**, a tablet **109**, a mouse **110**, a coordinate input controller **111**, a password authenticator **112**, a mode controller **113**, and a signature authenticator **114**.

[0026] **FIG. 2A** shows a notebook mode of a data processing device, such as a convertible notebook PC, and **FIG. 2B** shows a tablet mode thereof.

[0027] The reclosable switch **103** is a switch for detecting an open state and a collapsed state of, e.g., a convertible data processing device. The rotation switch **104** is a switch for detecting a rotation in a direction different from that opening/closing action of the display screen of the convertible data processing device. The screen controller **102** controls on-screen displayed components, such as a mouse cursor, a button, a menu, and a scroll bar. The keyboard input controller **107** accepts input from the keyboard **106**, however, when the mode controller **113** determines that the input from the keyboard **106** cannot be accepted, the keyboard input controller **107** does not output the input from the keyboard **106**. The coordinate input controller **111** accepts inputs from the mouse **110**, the tablet **109**, and the touch-pad **108**. However, when the mode controller **113** determines that input from an arbitrary one of the mouse **110**, the tablet **109**, and the touch-pad **108** is unacceptable, the coordinate input controller **111** does not output that input.

[0028] The signature authenticator **114** checks similarity between a signature input at the time of logon and a signature which has been registered in advance, by use of a signature collation processing technique (see, e.g., "Study on Identification of Signature by Tree-Matching," Shingaku-Giho, D-II, Vol. J75-D-II, No. 1, pp. 31-38, 1992), and when the signature is authenticated, the signature authenticator **114** permits the logon. Meanwhile, the password authenticator checks whether a password (a character string) coincides with the password which has been registered in advance, when the passwords coincide, the password authenticator **114** permits the logon.

[0029] As shown in **FIG. 3**, the mode determination section **105** determines whether or not the device is in the tablet mode, on the basis of the states of the reclosable switch **103** and the rotation switch **104**. In the illustrated example, the device is determined to be in the tablet mode when the reclosable switch is open, and the rotation switch **104** is at 180°.

[0030] **FIGS. 4A** to **4**D show mode switching from a power-off mode through the tablet mode. **FIG. 4A** shows a power-off state where the screen display **101** is folded so as to face the keyboard **106** and the touch-pad **108**. When the screen display **101** is opened, a view such as that shown in **FIG. 4B** is acquired, so that the device enters the notebook mode. When the display **101** is rotated about the reclosable section by 180° (**FIG. 4C**), and the display **101** is closed such that the surface opposite the screen faces the keyboard **106** and the touch-pad **108**, the device enters the tablet mode as shown in **FIG. 4D**.

[0031] **FIG. 5** shows an example of processing pertaining to switching between the notebook mode and the tablet mode. With regard to a cursor displayed on a screen, in the notebook mode a normal mouse cursor is displayed. In contrast, in the tablet mode, the cursor is not displayed, so that the user will not be distracted with parallax or time delay, or a dedicated cursor different from that of the normal cursor is displayed, for instance, as shown in **FIG. 6A**. Displayed components, such as a mouse cursor, a button, a menu, and a scroll bar, in the tablet mode are displayed in a magnified manner as compared to those in the normal notebook mode. With regard to operation modes typified in click operation, in the notebook mode a double click is adopted. In contrast, in the tablet mode, a single click is chiefly adopted, because input is mainly performed by a pen on the tablet.

[0032] Furthermore, with regard to display of a pointer trail on the screen, in the notebook mode where input is mainly performed by the mouse **110**, cursor motion caused by dragging of the mouse **110** is displayed as shown in **FIG. 6B**. In the tablet mode, a trail traced by pen input is displayed in a form of a stroke as shown in **FIG. 6C**. In the notebook mode, input by the keyboard **106** and input by the touch-pad **108** are accepted. However, in the tablet mode, input by the keyboard **108** and input by the touch-pad **108** are not accepted. Meanwhile, in the notebook mode, input by a pen (tablet) is not accepted, whereas such input is accepted in the tablet mode.

[0033] Furthermore, at the time of switching from the notebook mode to the tablet mode, software pertaining to the tablet stays resident. In contrast, at the time of switching to the notebook mode, the software pertaining to the tablet is stopped. With regard to logon to the data processing device, in the notebook mode, authentication is processed with use of a password, in the tablet mode, authentication is processed by input of a signature.

[0034] As described above, in the notebook mode, input and operations are mainly performed by the keyboard **106**,

the touch-pad **108**, and the mouse **110**. In the tablet mode, input and operations are mainly performed by a pen. Accordingly, upon acceptance of the result determined by the mode determination section **105**, the mode controller **113** switches a user interface to a suitable one for the mode so as to provide the user with a suitable interface for the operation method.

[**0035**] By virtue of the above configuration, operation efficiency of the user can be enhanced. Particularly, there is automatically performed switching to an appropriate interface in the tablet mode without causing the user to perform a special operation, and hence the user can operate the data processing device with comfort.

What is claimed is:

1. A data processing device comprising:

a display integrally configured with a tablet;

a mode determination unit to determine whether or not a current mode is an input mode employing the tablet; and

a mode controller to switch a user interface on basis of a result of determination of the mode determination unit.

2. The data processing device according to claim 1, wherein the mode determination unit makes a determination on basis of opening/closing and rotation of on the display.

3. The data processing device according to claim 1, wherein the mode controller changes a mouse cursor displayed on the display.

4. The data processing device according to claim 1, wherein the mode controller changes sizes of an item displayed on the display.

5. A data processing device comprising:

a display integrally configured with a tablet;

an input unit;

an input controller to control input information input by the input unit;

a mode determination unit to determine whether or not a current mode is an input mode employing the tablet; and

a mode controller to switch whether or not to accept the input information in accordance with a result of determination of the mode determination unit.

6. A data processing device comprising:

a display integrally configured with a tablet;

an input unit;

a mode determination unit to determine whether or not a current mode is an input mode employing the tablet; and

a mode controller to switch an operation mode to be performed by way of the input unit in accordance with a result of determination of the mode determination unit.

7. A data processing device comprising:

a display integrally configured with a tablet;

an input unit;

a mode determination unit to determine whether or not a current mode is an input mode employing the tablet; and

a mode controller to switch a mode of displaying information input by way of the input unit in accordance with a result of determination of the mode determination unit.

8. A data processing device comprising:

a display integrally configured with a tablet;

a mode determination unit to determine whether or not a current mode is an input mode employing the tablet; and

a mode controller to switch software to be operated on basis of a result of determination of the mode determination unit.

9. A data processing device comprising:

a display integrally configured with a tablet;

an authenticator to logon;

a mode determination unit to determine whether or not a current mode is an input mode employing the tablet; and

a mode controller to switch an authentication mode in accordance with a result of determination of the mode determination unit.

10. A portable device comprising:

a display integrally configured with a input in a tablet mode;

a input unit to input in a notebook mode;

a mode determination unit to determine whether a current mode is the notebook mode or the tablet mode; and

a mode controller to switch a user input interface on basis of a result of determination of the mode determination unit.

11. The portable device according to claim 10, wherein the mode determination unit makes a determination on basis of opening/closing and rotation of the display.

12. The portable device according to claim 10, further comprising:

a reclosable switch configured to detect an opening/closing of the display; and

a rotation switch configured to detect a rotation angle of the display, wherein

the mode determination unit makes a determination on basis of combination of the opening/closing and the rotation angle.

13. The portable device according to claim 10, wherein the mode controller changes a mouse cursor displayed on the display.

14. The portable device according to claim 10, wherein the mode controller changes sizes of an item displayed on the display.

15. The portable device according to claim 10, wherein the input unit is at least one of keyboard, touch-pad ,and mouse; and

the input in the tablet mode is inputted by handwriting with a pen.

* * * * *

Exhibit 1018

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(54) INFORMATION PROCESSING APPARATUS HAVING FUNCTION OF CHANGING ORIENTATION OF SCREEN IMAGE

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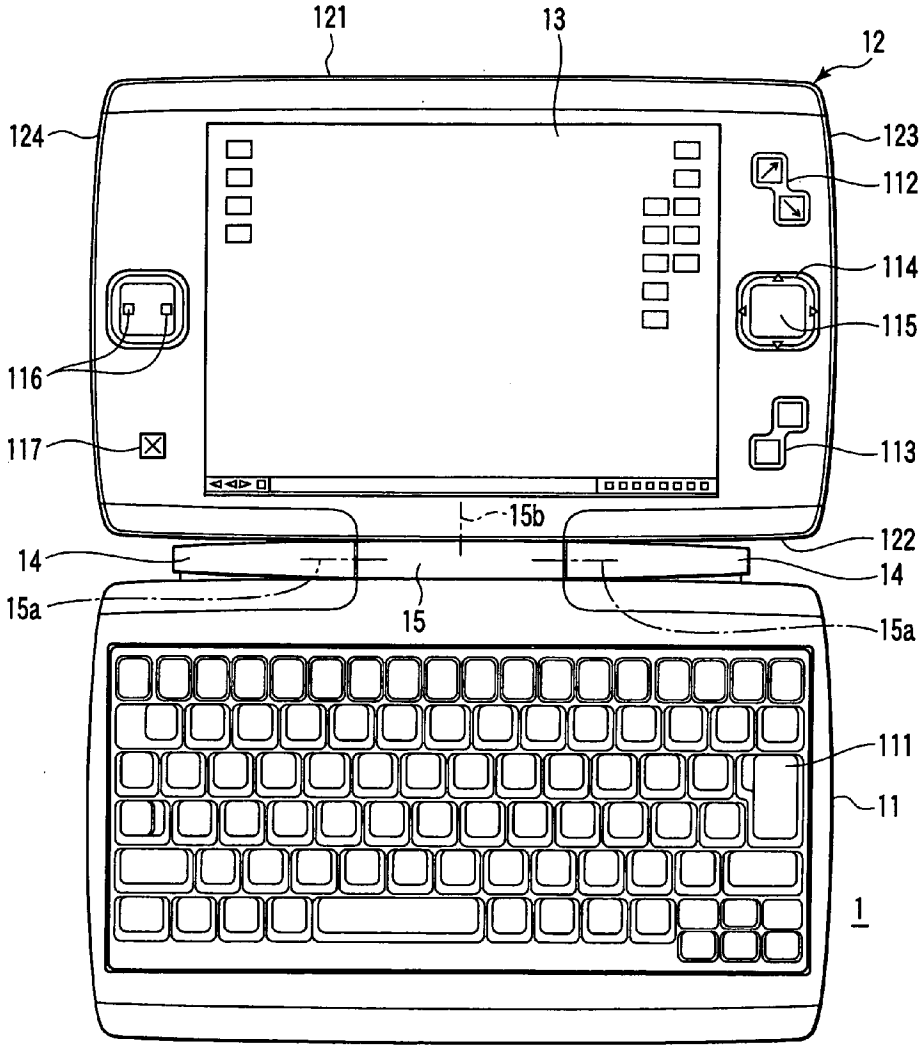
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(52) **U.S. Cl.** **345/158**

(57) **ABSTRACT**

An information processing apparatus includes a housing with a top surface, a keyboard placed on the top surface of the housing, a display unit with a front surface and a rear surface, supported by the housing and rotated between a closed position in which the keyboard is covered and an open position in which the keyboard is exposed, a sensor which senses an angle formed between the front surface of the display unit and the top surface of the housing, and a display device provided in the display unit to display a screen image in one of a first orientation in which a bottom-end portion of the screen image is located toward the housing and a second orientation in which a top-end portion of the screen image is located toward the housing in accordance with the angle sensed by the sensor.



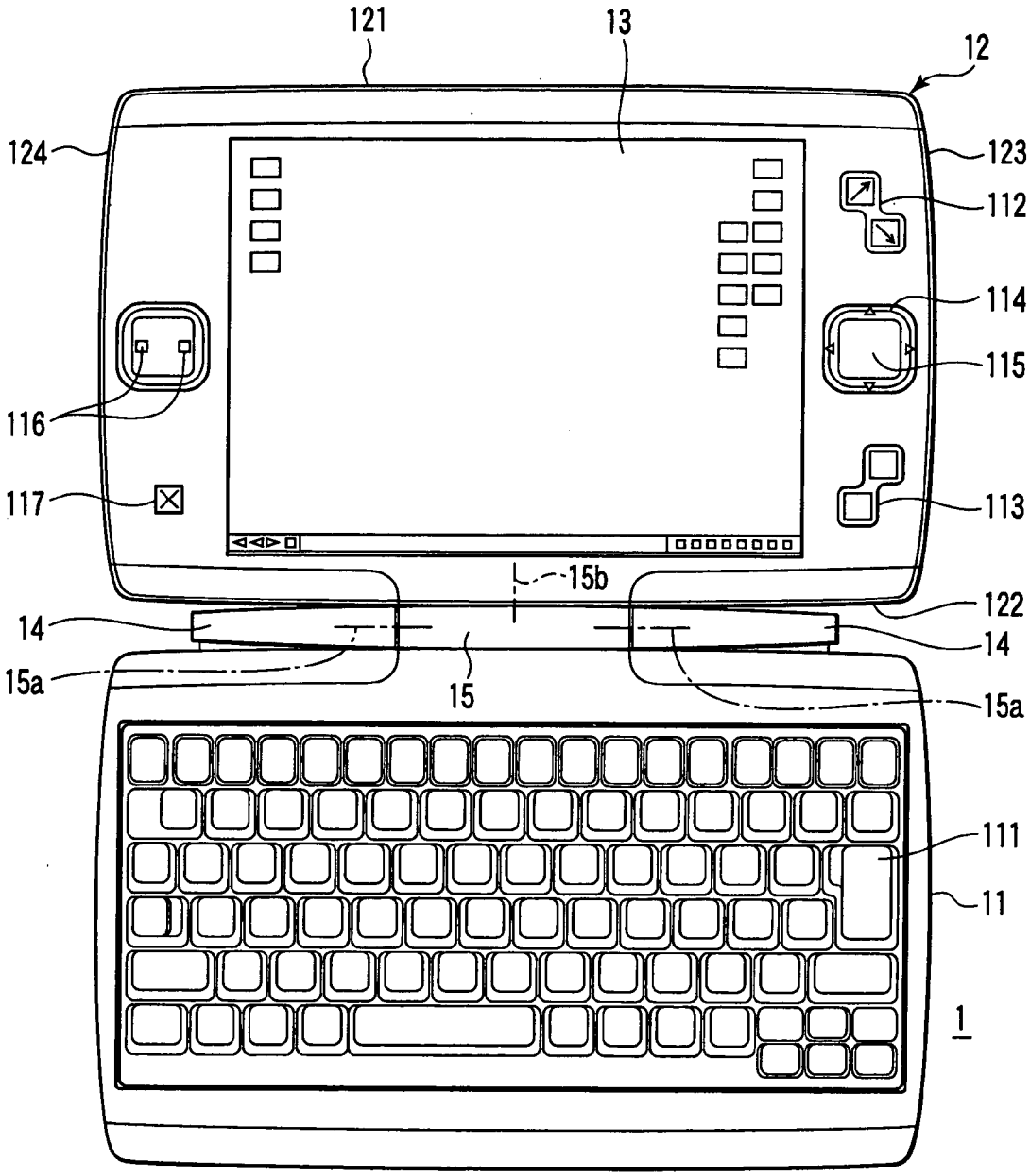

121
13
12
124
123
112
114
115
116
117
113
15b
122
14
14
15a
15
15a
111
11
1

FIG. 1

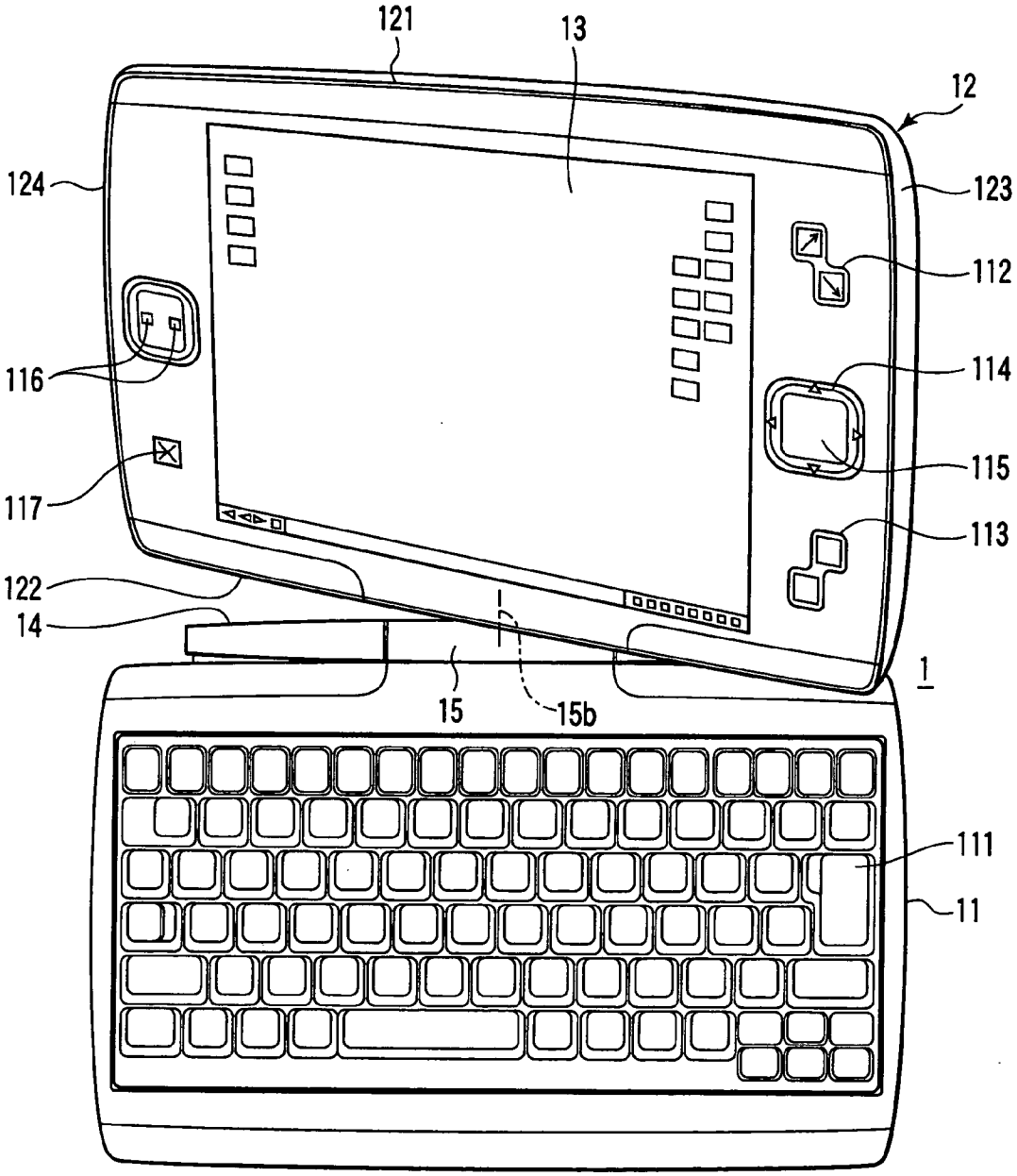


FIG. 2

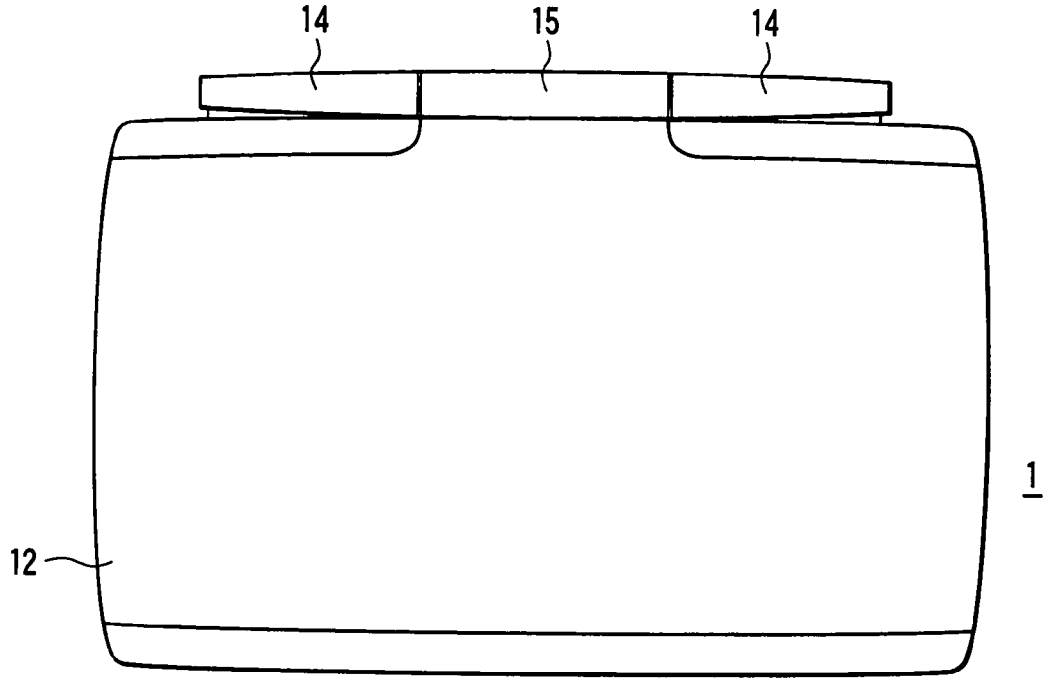


FIG. 3

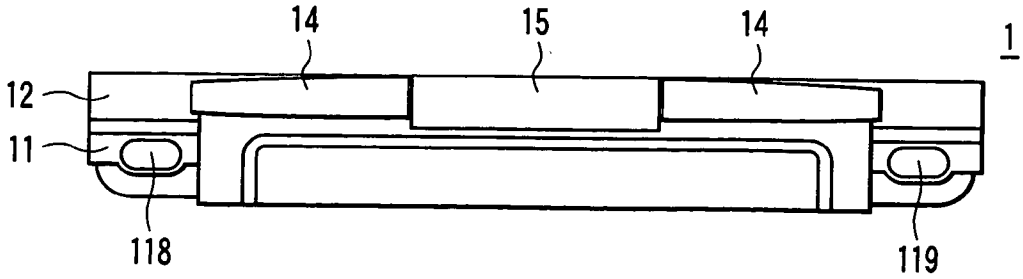


FIG. 4

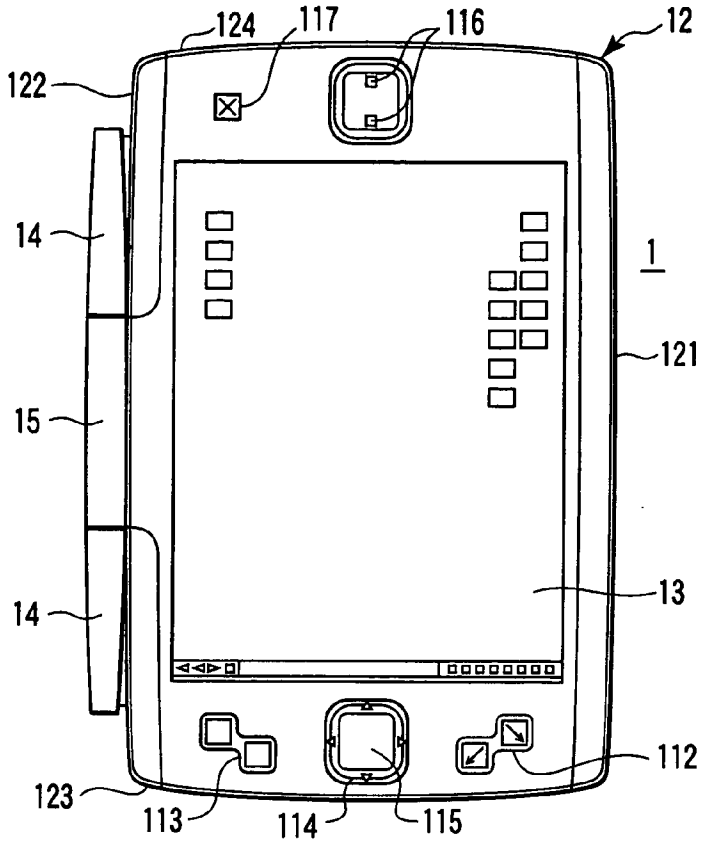

124
117
116
12
122
14
1
121
15
14
13
112
123
113
114
115

FIG. 5

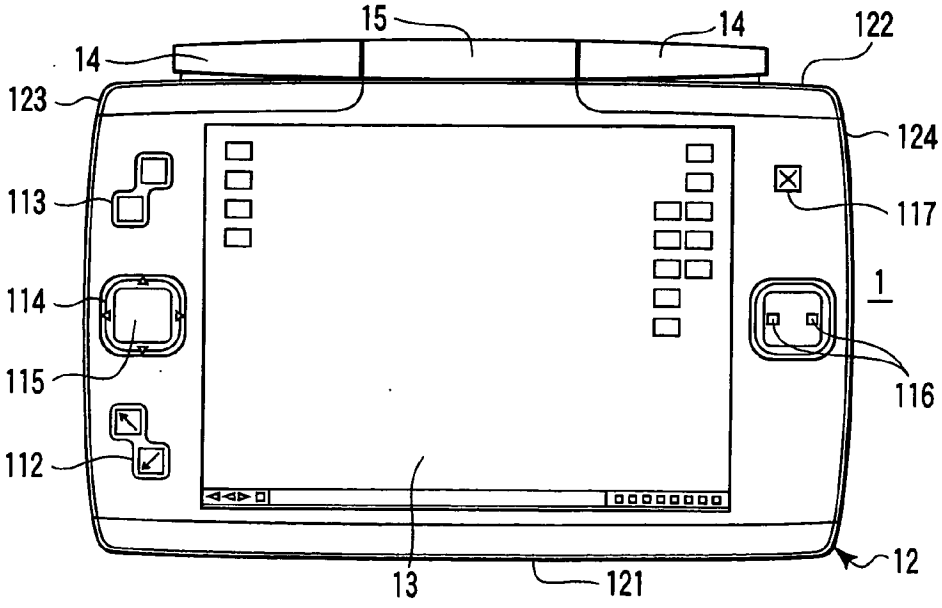

15
14
122
14
123
124
113
117
114
1
115
116
112
13
121
12

FIG. 6

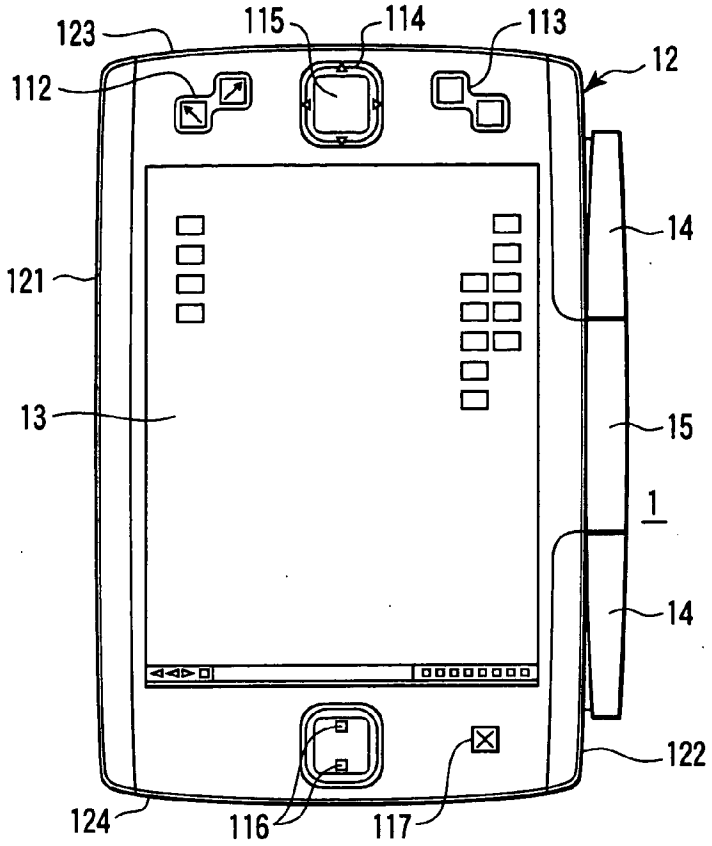

123
115
114
113
12
112
14
121
13
15
1
14
122
124
116
117

FIG. 7

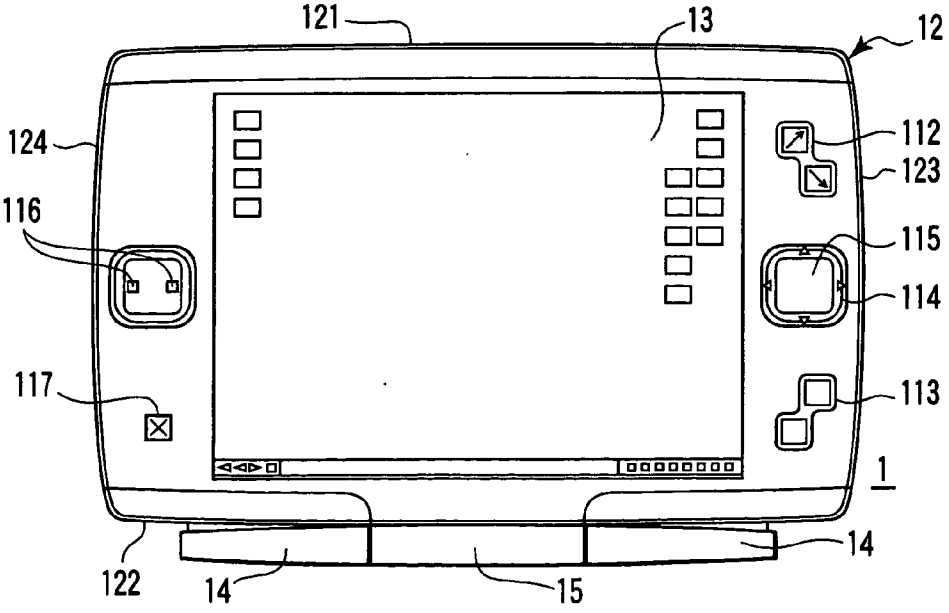

121
13
12
124
112
123
116
115
114
117
113
1
14
122
14
15

FIG. 8

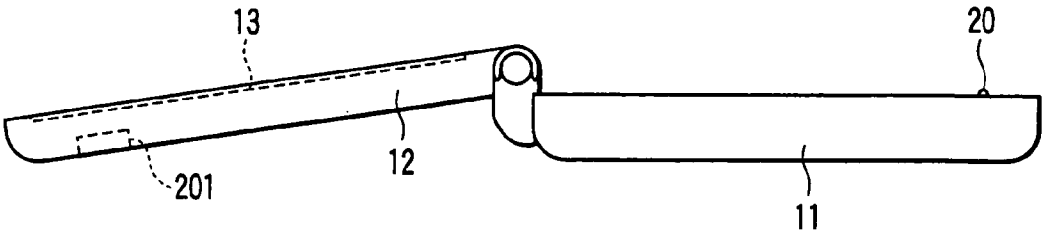

13
20
201
12
11

FIG. 9

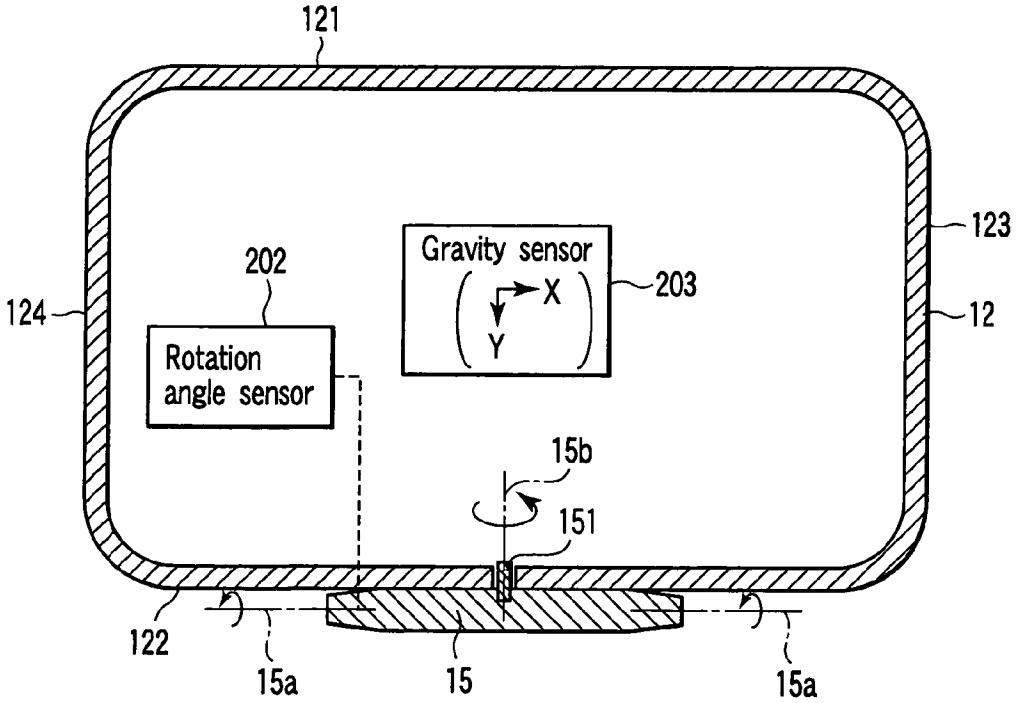

121
123
202
Gravity sensor
203
X
Y
124
12
Rotation angle sensor
15b
151
122
15a
15
15a

FIG. 10

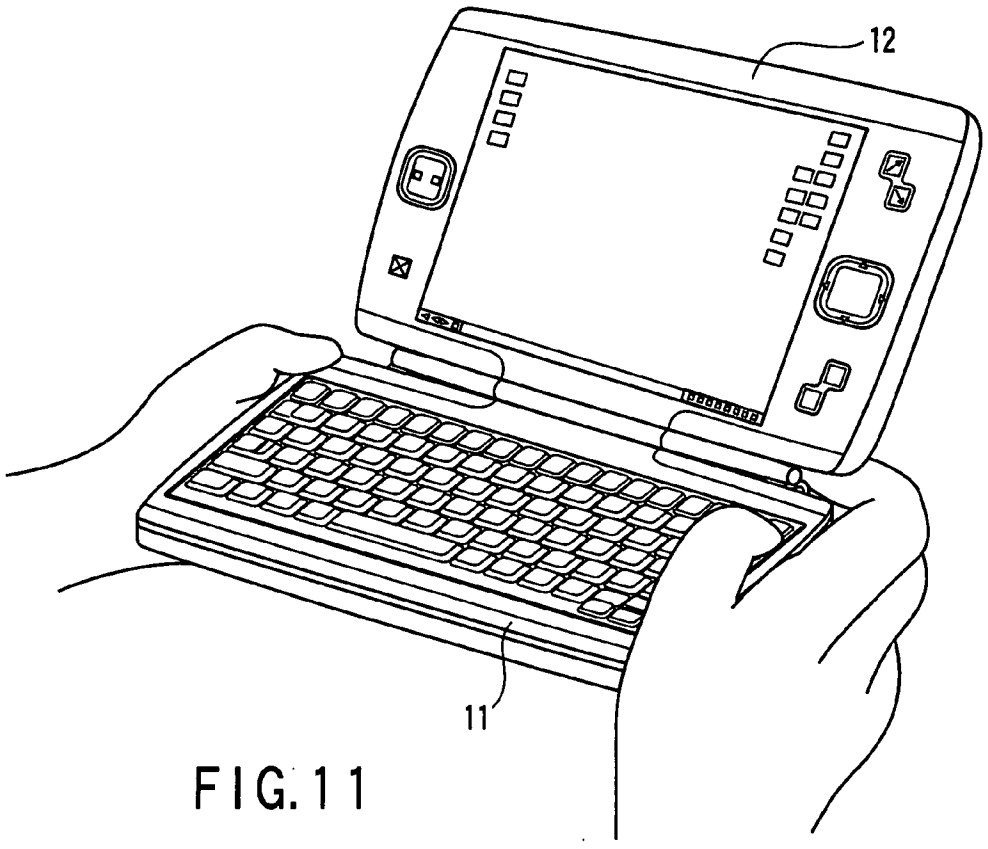


FIG. 11

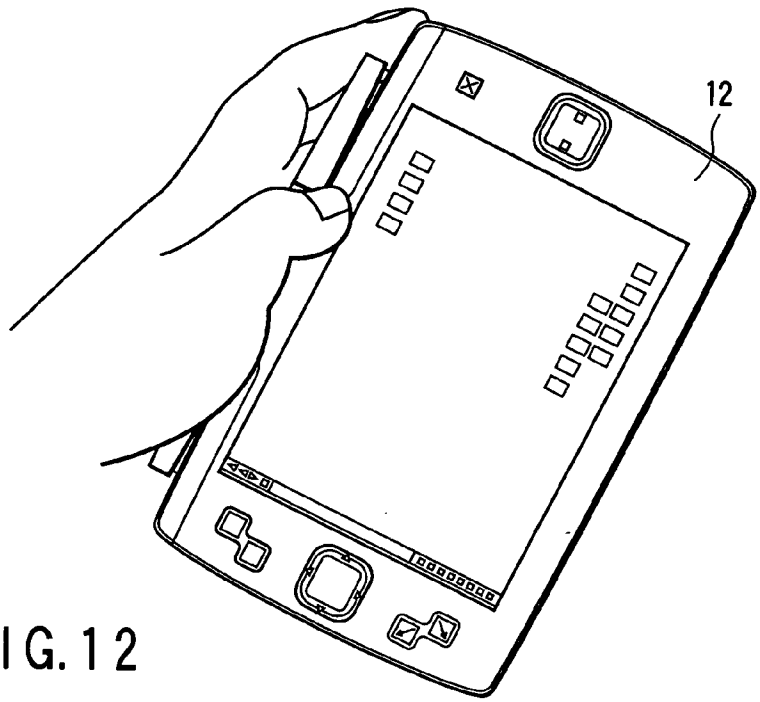


FIG. 12

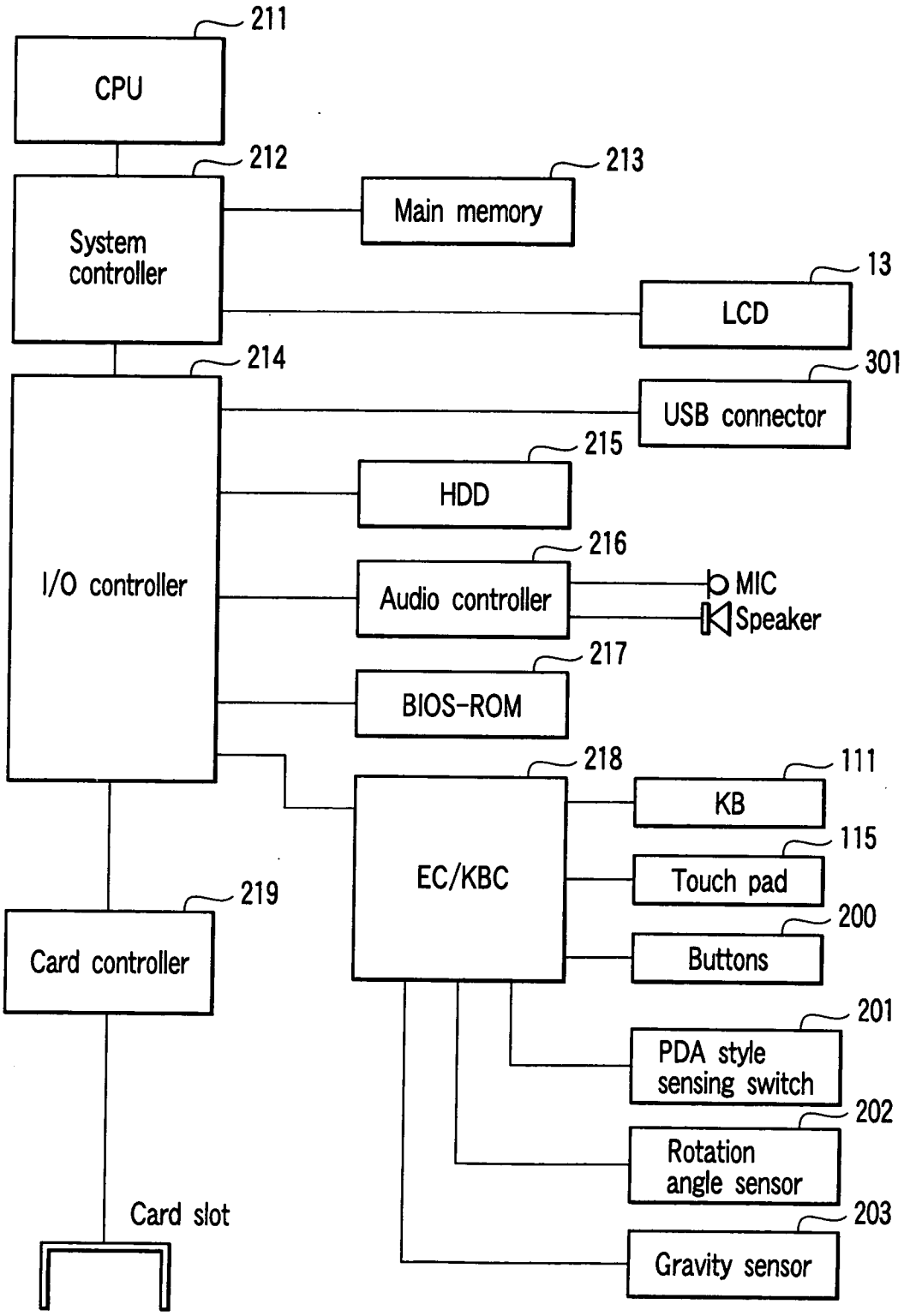

211
CPU
212
System controller
213
Main memory
13
LCD
214
I/O controller
301
USB connector
215
HDD
216
Audio controller
MIC
Speaker
217
BIOS-ROM
218
EC/KBC
111
KB
115
Touch pad
200
Buttons
219
Card controller
201
PDA style sensing switch
202
Rotation angle sensor
203
Gravity sensor
Card slot

FIG. 13

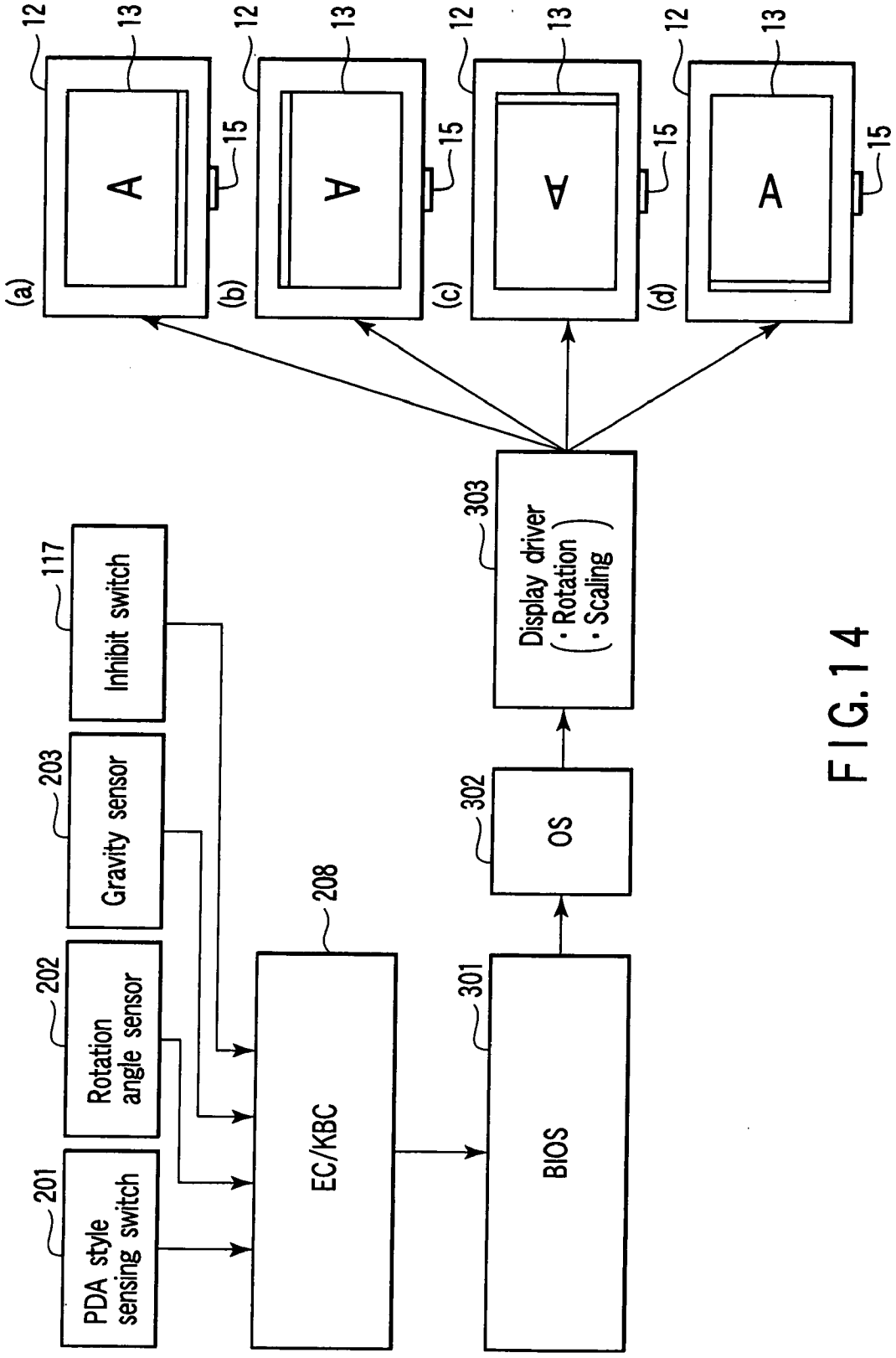

(a)
(b)
(c)
(d)
12
13
15
A
303
Display driver
(· Rotation
· Scaling)
302
OS
301
BIOS
208
EC/KBC
201
PDA style sensing switch
202
Rotation angle sensor
203
Gravity sensor
117
Inhibit switch

FIG. 14

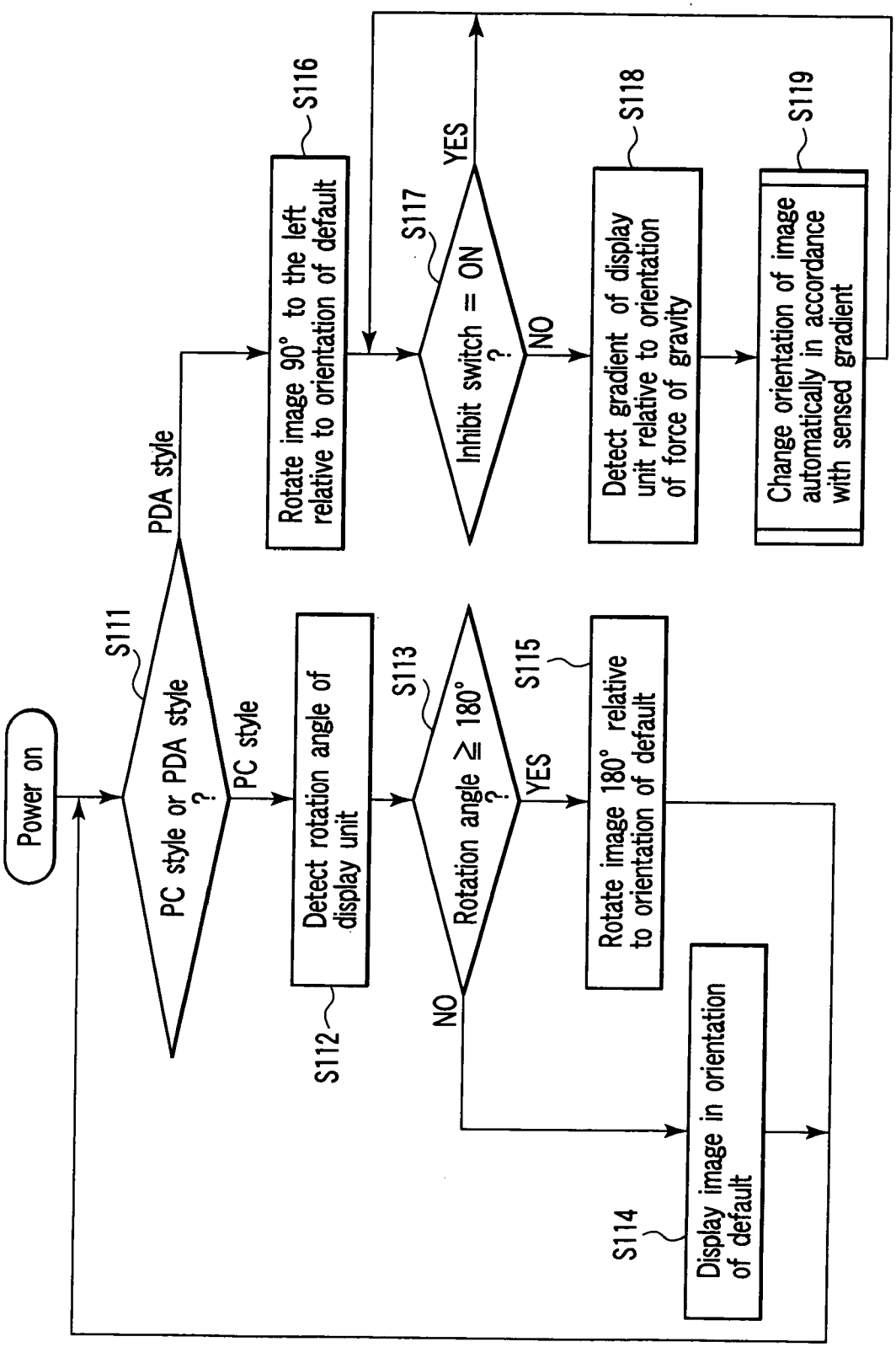

Power on
S111
PC style or PDA style ?
PC style
PDA style
S112
Detect rotation angle of display unit
S113
Rotation angle ≧ 180° ?
NO
YES
S114
Display image in orientation of default
S115
Rotate image 180° relative to orientation of default
S116
Rotate image 90° to the left relative to orientation of default
S117
Inhibit switch = ON ?
YES
NO
S118
Detect gradient of display unit relative to orientation of force of gravity
S119
Change orientation of image automatically in accordance with sensed gradient

FIG. 15

INFORMATION PROCESSING APPARATUS HAVING FUNCTION OF CHANGING ORIENTATION OF SCREEN IMAGE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority from prior Japanese Patent Application No. 2003-327692, filed Sep. 19, 2003, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an information processing apparatus such as a portable computer.

[0004] 2. Description of the Related Art

[0005] Various portable computers, such as notebook personal computers and hand-held personal computers, have recently been developed. This type of portable computer has a housing with a keyboard on its top surface and a display unit rotatably attached to the housing. While the display unit is open, a user can input information using a keyboard while seeing a display screen of the display unit.

[0006] If, however, the user orients the portable computer to the partner who faces the user to let the partner see the display screen, the user cannot operate the keyboard.

[0007] Pen-based computers with no keyboards, such as PDA (Personal Digital Assistants), have also recently been developed. Most of the pen-based computers include a housing and a flat panel display built in the housing.

[0008] U.S. Pat. No. 5,566,098 discloses a pen-based computer having a function of varying an orientation of a screen image displayed on a display. In this pen-based computer, the orientation of the screen image is varied in response to user's operations of mercury switches or sensing results of the mercury switches.

[0009] The technology of the above U.S. Patent is however directed to a pen-based computer including a display unit and a housing that are formed integrally as one component. It does not take into consideration the control of the orientation of a screen image in a portable computer having a housing with a keyboard on its top surface and a display unit rotatably attached to the housing.

BRIEF SUMMARY OF THE INVENTION

[0010] According to an embodiment of the present invention, there is provided an information processing apparatus comprising a housing with a top surface, a keyboard placed on the top surface of the housing, a display unit with a front surface and a rear surface, supported by the housing and rotated between a closed position in which the keyboard is covered and an open position in which the keyboard is exposed, a sensor which senses an angle formed between the front surface of the display unit and the top surface of the housing, and a display device provided in the display unit to display a screen image in one of a first orientation in which a bottom-end portion of the screen image is located toward the housing and a second orientation in which a top-end portion of the screen image is located toward the housing in accordance with the angle sensed by the sensor.

[0011] According to another embodiment of the present invention, there is provided an information processing apparatus comprising a housing with a top surface, a keyboard placed on the top surface of the housing, a display unit with a rear surface and a front surface in which a display screen is exposed, the display unit being supported by the housing and set in one of a first style which allows the display unit to rotate between a closed position in which the keyboard is covered and a first open position in which the display screen and the keyboard are exposed and a second style in which the rear surface covers the keyboard and the display screen is exposed, an angle sensor which senses an angle formed between the display screen and the top surface of the housing, an orientation sensor which senses an orientation of the display unit relative to force of gravity, a placement position sensor which senses which of the first style and the second style the display unit is set in, means for varying an orientation of a screen image displayed on the display screen between an orientation in which a bottom-end portion of the screen image is located toward the housing and an orientation in which a top-end portion of the screen image is located toward the housing in accordance with the angle sensed by the angle sensor when the placement position sensor senses that the display unit is set in the first style, and for varying the orientation of the screen image to locate the top-end portion of the screen image in a position higher than the bottom-end portion thereof relative to the force of gravity in accordance with the orientation of the display unit sensed by the orientation sensor when the placement position sensor senses that the display unit is set in the second style.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0012] The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention, and together with the general description given above and the detailed description of the embodiments given below, serve to explain the principles of the invention.

[0013] **FIG. 1** is an external view of an information processing apparatus according to an embodiment of the present invention.

[0014] **FIG. 2** is an external view of the information processing apparatus shown in **FIG. 1**, the display unit of which rotates in a horizontal direction.

[0015] **FIG. 3** is a top view of the information processing apparatus shown in **FIG. 1**, the display unit of which is closed.

[0016] **FIG. 4** is a rear view of the information processing apparatus shown in **FIG. 1**, the display unit of which is closed.

[0017] **FIG. 5** is a top view of the information processing apparatus shown in **FIG. 1**, which is set in a PDA style.

[0018] **FIG. 6** is a top view of the information processing apparatus shown in **FIG. 1**, which turns 90 degrees to the right in a PDA style.

[0019] **FIG. 7** is a top view of the information processing apparatus shown in **FIG. 1**, which turns 180 degrees in a PDA style.

[0020] **FIG. 8** is a top view of the information processing apparatus shown in **FIG. 1**, which turns 90 degrees to the left in a PDA style.

[0021] **FIG. 9** is a sketch of a PDA-style sensing switch provided in the display unit of the information processing apparatus shown in **FIG. 1**.

[0022] **FIG. 10** is a sketch of two sensors provided in the display unit of the information processing apparatus shown in **FIG. 1**.

[0023] **FIG. 11** is an illustration of the information processing apparatus shown in **FIG. 1**, which is used in a PC style.

[0024] **FIG. 12** is an illustration of the information processing apparatus shown in **FIG. 1**, which is used in a PDA style.

[0025] **FIG. 13** is a block diagram showing a system configuration of the information processing apparatus shown in **FIG. 1**.

[0026] **FIG. 14** is an illustration of a control operation for an automatic image rotating function performed by the information processing apparatus shown in **FIG. 1**.

[0027] **FIG. 15** is a flowchart showing an example of a procedure for an automatic image rotating function control operation carried out by the information processing apparatus shown in **FIG. 1**.

DETAILED DESCRIPTION OF THE INVENTION

[0028] An embodiment of the present invention will now be described with reference to the accompanying drawings.

[0029] **FIG. 1** shows an outward appearance of an information processing apparatus according to an embodiment of the present invention. The information processing apparatus is implemented as a hand-held portable personal computer **1** that is much smaller than a notebook personal computer.

[0030] The portable personal computer **1** includes a computer main body **11** and a display unit **12**. The computer main body **11** is configured by a thin, rectangular box-type housing. The housing contains different electronic components that make up a portable personal computer, such as a CPU (Central Processing Unit), a memory, a chip set and a hard disk drive. The housing includes a rectangular case with an opening at the top and a cover joined to the case so as to cover the opening of the case. A keyboard placement area is formed on the top surface of the housing, or the top surface of the computer main body **11**. A keyboard **111** is placed on the keyboard placement area. The keyboard **111** is a key set including a plurality of keys (key switches) for inputting key data to the CPU. The computer main body **11** has a pair of hinges **14** at the rear end. The hinges **14** are parts for supporting the display unit **12**.

[0031] The display unit **12** includes a thin, rectangular display unit main body with a top-end portion **121**, a bottom-end portion **122**, a right-end portion **123** and a left-end portion **124**. A flat panel display unit, e.g., an LCD (Liquid Crystal Display) **13** is provided in the display unit main body. The display unit **12** includes a rear surface and a front surface in which the display screen of the LCD **13** is exposed. The LCD **13** is mounted on the front of the display unit main body such that its display screen can be exposed. The display screen of the LCD **13** is located almost in the center of the display unit **12**. The LCD **13** is implemented as a touch screen device that is capable of recognizing a position indicated by a stylus (pen) or a user's finger.

[0032] A support member **15** is attached to the center of the bottom-end portion **122** of the display unit main body. The hinges **14** support the support member **15** such that the display unit **12** rotates around a first central axis **15***a* that extends in parallel to the outer surface of the computer main body **11**. Thus, the display unit **12** is supported rotatably between an open position (a first open position shown in **FIG. 1**) in which the keyboard **111** is exposed and a closed position in which the keyboard **111** is covered. In the open position, the front of the display unit main body cover the entire top surface of the computer main body **11** and the display screen of the LCD **13** are exposed. In the closed position, the front of the display unit main body covers the entire top surface of the computer main body **11**.

[0033] The support member **15** supports the display unit main body such that the display unit **12** rotates around a second central axis **15***b* that extends to the display unit main body from the support member **15** in a direction perpendicular to the first central axis **15***a*. Thus, the display unit **12** can rotate 360 degrees around the second central axis **15***b* in a horizontal direction with respect to the outer surface of the computer main body **11**, as illustrated in **FIG. 2**. The display unit **12** rotates 180 degrees around the second central axis **15***b* in a horizontal direction (the front and rear surfaces of the display unit main body change places) and then is set in the closed position, with the result that it can be placed in the second open position as shown in **FIG. 5**. In the second open position, the display screen of the LCD **13** is exposed and the rear surface (back) of the display unit main body covers the entire top surface of the computer main body **11**.

[0034] When the display unit **12** is set in the first open position **(FIG. 1)**, a user can use the computer **1** in the same style as that of a normal notebook personal computer (referred to as a PC style). In this PC style, the user can operate the keyboard **111** while seeing the display screen of the LCD **13**. On the other hand, when the display unit **12** is set in the second open position **(FIG. 5)**, the user can use the computer **1** in the same style as that of normal PDA (Personal Digital Associates) with a main body and a display unit built in the main body (hereinafter referred to as a PDA style). In this PDA style, the user can input information with the stylus or operate various key switches provided on the display unit main body.

[0035] As shown in **FIG. 1**, a pair of key switches **112**, another pair of key switches **113** and a key switch **114** are arranged on the right front of the display unit main body. The key switches **112** are, for example, push button switches serving as zoom keys for scaling an image (screen image) such as text and graphics displayed on the display screen of the LCD **13**. The key switches **113** are, for example, push button switches serving as keys for starting a specific application program. The key switch **114** is a cross key switch including four arrow keys indicating four directions of up, down, right and left. The key switch **114** has a touch panel **115** serving as a pointing device in its inside area.

[0036] Further, a pair of key switches **116** and a key switch **117** are arranged on the left front of the display unit main

body. The key switches **116** are, for example, push button switches serving as a right button (cancel key) and a left button (enter key) of the pointing device. The key switch **117** is a push button switch serving as an inhibit switch for inhibiting an automatic image rotating function from being fulfilled to automatically vary the orientation of an image displayed on the display screen of the LCD **13**. The automatic image rotating function is used to align the orientation of the image with a correct one relative to the force of gravity. When the inhibit switch **17** turns on, it outputs an event signal (e.g., signal of logic level "1") indicative of inhibition of the automatic image rotating function. While the inhibit switch **117** is in on state, the orientation of the image displayed on the display screen of the LCD **13** is not varied whichever orientation the display unit main body rotates relative to the force of gravity. On the other hand, when the inhibit switch **117** turns off, it outputs an event signal (e.g., signal of logic level "0") indicative of permission to perform the automatic image rotating function. While the inhibit switch **117** is in off state, when the display unit main body rotates relative to the force of gravity, the orientation of the image displayed on the display screen of the LCD **13** automatically varies, thus the orientation of the image is aligned with a correct orientation relative to the force of gravity.

[**0037**] **FIG. 3** is a top view of the computer **1** whose display unit main body is located in the closed position. **FIG. 4** is a rear view of the computer **1** shown in **FIG. 3**.

[**0038**] Referring to **FIG. 4**, two key switches **118** and **119** are arranged on the back of the computer main body **11**. The key switch **118** is a push button switch provided on the right-end portion of the back of the computer main body **11** when viewed from the front of the body **11**. It is referred to as an R (right) button switch hereinafter. The key switch **119** is a push button switch provided on the left-end portion of the back of the computer main body **11** when viewed from the front of the body **11**. It is referred to as an L (left) button hereinafter.

[**0039**] Any given function can programmably be assigned to each of the R and L button switches **118** and **119**. In the computer **1**, the R and L button switches **118** and **119** serve as key switches for inputting given key data (key code) to the CPU, like the key switches of the keyboard **111**. The R and L button switches **118** and **119** are exposed regardless of whether the computer **1** is used in a PC style or a PDA style. In either case, a user can operate both the R and L button switches **118** and **119**.

[**0040**] The PC style includes a style in which a user puts the computer **1** on a desk or a user's lap and a style in which a user supports the computer **1** with both hands. In the former style, the user can perform a touch-typing operation with both hands. In the latter style as shown in **FIG. 11**, however, the user has to operate the keyboard **111** chiefly with thumbs. In the PC style, therefore, it is desirable to use both the R and L button switches **118** and **119** as key switches for assisting a user in operating the keyboard **111**.

[**0041**] The R and L button switches **118** and **119** are provided on the back of the computer main body **11** as described above. A user can thus operate the keyboard **111** with thumbs while supporting the computer **1** with both hands as shown in **FIG. 11** and simultaneously operate the R button switch **118** with, e.g., the right forefinger or the L button switch **119** with, e.g., the left forefinger.

[**0042**] For example, it is favorable that key data corresponding to an auxiliary key used in combination with other keys be assigned to each of the R and L button switches **118** and **119**. The keyboard **111** includes a plurality of alphabet keys and a plurality of auxiliary keys (e.g., [Shift] key, [Ctrl] key, [Alt] key). The auxiliary keys are used in combination with (depressed simultaneously with) one or more keys such as the alphabet keys. In the present embodiment, for example, the R button switch **118** serves as a switch for inputting key data corresponding to the [Shift] key, and the L button switch **119** serves as a switch for inputting key data corresponding to the [Ctrl] key. Thus, a user can easily input key data corresponding to the alphabet keys and key data corresponding to the [Shift] key or [Ctrl] key at the same time when he or she performs a typing operation while supporting the computer **1** with both hands.

[**0043**] Another example of favorable key data to be assigned to the R and L button switches **118** and **119** corresponds to an arrow key. The keyboard **111** includes four arrow keys ([↑] key, [↓] key, [→] key and [⇆] key) corresponding to four directions of up, down, right and left. The [↑] key is an up arrow key for moving up a pointing position on the display screen of the LCD **13**, and the [↓] key is a down arrow key for moving down a pointing position on the display screen of the LCD **13**. If key data corresponding to the [↓] and [↑] keys are assigned to their respective R and L button switches **118** and **119**, they can serve as switches for inputting the key data corresponding to the [↓] and [↑] keys. Consequently, a user can move a pointing position up and down on the display screen and scroll an image displayed thereon up and down by operating the R button switch **118** with the right forefinger and operating the L button switch **119** with the left forefinger while supporting the computer **1** with both hands.

[**0044**] Using dedicated utility programs, a user can previously designate which of the auxiliary keys and the arrow keys are assigned to the R and L button switches **118** and **119**.

[**0045**] A user can operate both the R and L button switches **118** and **119** in the PDA style as well as in the PC style, as shown in **FIG. 12**. In the PDA style, the user performs an input operation chiefly with a stylus (pen) because he or she cannot operate the keyboard **11** (the keyboard **111** is covered with the rear surface of the display unit **12**). It is therefore favorable that the R and L button switches **118** and **119** be used not for inputting key data to assist a user in operating the keyboard **111** but for assisting a user in performing an input operation with a stylus. In the PDA style, the R button switch **118** serves as a switch for inputting key data corresponding to the left button of the pointing device or key data corresponding to the [Enter] key, and the L button switch **119** serves as a switch for inputting key data corresponding to the right button of the pointing device or key data corresponding to the [Esc] key.

[**0046**] The computer **1** has a key assignment changing function of automatically changing a function assigned to each of the R and L button switches **118** and **119** according to which of the PC style and the PDA style is used for the computer **1**. With this function, a key that conforms to a style to use the computer **1** can be assigned to each of the R and L button switches **118** and **119**.

[**0047**] There now follows an explanation of an automatic image rotating function.

[0048] In the PC style (**FIG. 1**), a screen image such as text and graphics is set to the orientation (first orientation) in which the bottom-end portion of the screen image is located toward the computer main body **11**, more specifically, the top-end portion of the screen image is located toward the top-end portion **121** of the display unit main body and the bottom-end portion of the screen image is located toward the bottom-end portion **122** of the display unit main body. The orientation of the screen image corresponds to that of a default of the image in the PC style.

[0049] When the display unit **12** opens 180 degrees or more from the closed position on the top surface of the computer main body **11** relative to the first central axis **15***a*, the screen image automatically rotates 180 degrees relative to the orientation of a default and its orientation is changed to an orientation (second orientation) in which the top-end portion of the screen image is located toward the computer main body **11** and, more specifically, the top-end portion of the screen image is located toward the bottom-end portion **122** of the display unit main body and the bottom-end portion of the screen image is located toward the top-end portion **121** of the display unit main body. Thus, a user can present the screen image to the partner who faces the user in a correct orientation while maintaining the keyboard **11** in its operable state, with the result that he or she can make a presentation or the like with efficiency.

[0050] In the PDA style (**FIG. 5**), the computer **1** is used in such a manner that the left-end portion **124** of the display unit main body is located above and the right-end portion **123** thereof is located below relative to the force of gravity. Thus, the orientation of the screen image is so controlled that the top-end portion of the screen image is located toward the left-end portion **124** of the display unit main body and the bottom-end portion of the screen image is located toward the right-end portion **123** of the display unit main body. The orientation of the screen image corresponds to that of a default of the image in the PDA style. The aspect ratio of the display screen is changed from the aspect ratio (e.g., length-:wide=3:4) corresponding to a horizontally oriented screen used in the PC style to the aspect ratio (e.g., length:wide=4:3) corresponding to a vertically oriented screen.

[0051] In the PDA style, the computer **1** is able to rotate in different orientations relative to the force of gravity (FIGS. **5** to **8**).

[0052] **FIG. 6** illustrates the computer **1** in which the bottom-end portion **122** of the display unit main body is located above and the top-end portion **121** thereof is located below relative to the force of gravity. A screen image rotates 90 degrees to the left relative to the orientation of a default of the image in the PDA style such that the top-end portion of the screen image is located toward the bottom-end portion **122** of the display unit main body and the bottom-end portion of the screen image is located toward the top-end portion **121** of the display unit main. The screen image is displayed in the aspect ratio (e.g., length:width=3:4) corresponding to the horizontally oriented screen.

[0053] **FIG. 7** illustrates the computer **1** in which the right-end portion **123** of the display unit main body is located above and the left-end portion **124** thereof is located below relative to the force of gravity. A screen image rotates 180 degrees relative to the orientation of a default of the image in the PDA style such that the top-end portion of the screen image is located toward the right-end portion **123** of the display unit main body and the bottom-end portion of the screen image is located toward the left-end portion **124** of the display unit main body.

[0054] **FIG. 8** illustrates the computer **1** in which the top-end portion **121** of the display unit main body is located above and the bottom-end portion **122** thereof is located below relative to the force of gravity. A screen image rotates 90 degrees to the right relative to the orientation of a default of the image in the PDA style such that the top-end portion of the screen image is located toward the top-end portion **121** of the display unit main body and the bottom-end portion of the screen image is located toward the bottom-end portion **122** of the display unit main body. The screen image is displayed in the aspect ratio (e.g., length:width=3:4) corresponding to the horizontally oriented screen.

[0055] While the computer **1** is operating in the PDA style, the automatic image rotating function is performed to sense which of the orientations shown in FIGS. **5** to **8** the computer **1** is located in relative to the force of the gravity and automatically change the orientation of an image such that it can correctly be aligned with that of the force of gravity in accordance with the results of the sensing.

[0056] The way to detect which of the PC style and the PDA style corresponds to the present style of the computer **1** will be described with reference to **FIG. 9**.

[0057] **FIG. 9** illustrates the display unit **12** that opens 180 degrees or more from the top surface of the computer main body **11** with regard to the first central axis **15***a*. The display unit **12** has a PDA style sensing switch **201** on its rear surface. The PDA style sensing switch **201** is a mechanical switch for detecting which of the PC style and the PDA style corresponds to the present style of the computer **1**. When the rear surface of the display unit **12** is placed on the top surface of the computer main body **11**, the PDA style sensing switch **201** contacts a projection **20** formed on the top surface of the computer main body **11** and thus turns on. When the switch **201** turns on, it outputs a sensing signal of logic level "1" indicating that the present style of the computer **1** is a PDA style. When the switch **201** turns off, it outputs a sensing signal of logic level "0" indicating that the present style of the computer **1** is a PC style.

[0058] Referring to **FIG. 10**, the main body of the display unit **12** is supported by the support member **15** such that it can be rotated on the second central axis **15***b* by a shaft **151** protruded from the support member **15**. The display unit main body contains a rotation angle sensor **202** and a gravity sensor **203**. The rotation angle sensor **202** senses whether an angle formed between the front surface of the display unit **12** and the top surface of the computer main body **11** is greater than a specific angle by the rotation angle of the support member **15** that rotates around the first central axis **15***a*. For example, the sensor **202** senses whether or not the angle is 180 degrees or greater. The sensor **202** can be provided in the computer main body **11**. Also, the sensor **202** can be replaced with a mechanical switch that is turned on by a projection formed on the support member **15** when the display unit **12** rotates on the first central axis **15***a* and opens 180 degrees or more from the top surface of the computer main body **11**.

[0059] The gravity sensor **203** is a sensor for sensing which orientation the display unit main body is located in

relative to the orientation of the force of gravity. For example, the sensor **203** is implemented as a gradient sensor for sensing the gradient of the display unit main body in two-dimensional directions X and Y. The gravity sensor **203** senses the gradient in the direction X to output a sensing signal (X) indicative of which of the right-end portion **123** and left-end portion **124** of the display unit **12** is located below relative to the force of gravity. The gravity sensor **203** senses the gradient in the direction Y to output a sensing signal (Y) indicative of which of the top-end portion **121** and bottom-end portion **122** of the display unit **12** is located below relative to the force of gravity. The gravity sensor **203** thus senses which of the orientations shown in FIGS. **5** to **8** the computer **1** is located in relative to the force of gravity.

[**0060**] The gravity sensor **203** can also sense whether or not an angle formed between the front surface of the display unit **12** and the top surface of the computer main body **11** is 180 degrees or greater. When the angle exceeds 180 degrees, the gravity sensor **203** senses that the top-end portion **121** of the display unit **12** is located lower than the bottom-end portion **122** thereof relative to the force of gravity.

[**0061**] However, the orientation of the display unit **12** is unstable relative to the force of gravity when a user holds the computer **1** with hands. It is thus desirable to use the rotation angle sensor **202** made up of mechanical switches and the like in order to sense an angle formed between the front surface of the display unit **12** and the top surface of the computer main body **11**.

[**0062**] A system configuration of the computer **1** will be described with reference to **FIG. 13**.

[**0063**] The computer main body **11** includes a CPU **211**, a system controller **212**, a main memory **213**, an I/O controller **214**, a hard disk drive (HDD) **215**, an audio controller **216**, a BIOS-ROM **217**, an embedded controller/keyboard controller IC (EC/KBC) **218**, and a card controller **219**, as illustrated in **FIG. 13**.

[**0064**] The CPU **211** is a processor for controlling an operation of the computer **1** and executes various application programs and an operating system which are loaded into the main memory **213** from the HDD **215**. The CPU **211** also executes a BIOS (Basic Input Output System) stored in the BIOS-ROM **217**. The BIOS is a program for controlling hardware that makes up the computer **1**. The BIOS has a function of controlling an automatic image rotating function.

[**0065**] The system controller **212** is a bridge device to connect the CPU **211** and I/O controller **214** and includes a memory controller for controlling the main memory **213** and a display controller for controlling the LCD **13**. The I/O controller **214** performs communications with respective devices connected to the I/O controller **214** under the control of the CPU **211**. The I/O controller **214** includes a USB (Universal Serial Bus) host controller. The USB host controller controls a USB device connected to a USB connector provided on the computer main body **11**.

[**0066**] The audio controller **216** carries out a voice input operation for inputting a voice signal through a microphone and an audio playback operation for outputting an audio signal from a speaker under the control of the CPU **211**. The EC/KBC **218** includes a one-chip microcomputer and is connected to the keyboard **111**, touch pad **115** and button group **200** to sense their operations. The button group **200** includes the foregoing key switches **112**, **113**, **114**, **116**, **117**, **118** and **119**. The EC/KBC **218** is electrically connected to the PDA style sensing switch **201**, rotation angle sensor **202** and gravity sensor **203**.

[**0067**] Under the control of the CPU **211**, the card controller **219** controls various cards such as a memory card and a communication card, which are inserted into a card slot provided in the computer main body **11**.

[**0068**] A description of how the BIOS controls the automatic image rotating function will be made with reference to **FIG. 14**.

[**0069**] The BIOS **301** acquires the values of output signals of the PDA style sensing switch **201**, rotation angle sensor **202**, gravity sensor **203** and inhibit switch **117** via the EC/KBC **218**, by polling a register in the EC/KBC **218** or by using of interrupt signal from the EC/KBC **218** to CPU **211**.

[**0070**] When the computer **1** is used in the PC style, the BIOS **301** performs control to change the orientation of a screen image in response to a signal from the rotation angle sensor **202**. When the computer **1** is used in the PDA style, the BIOS **301** performs control to change the orientation of a screen image in response to a signal from the gravity sensor **203**. The BIOS **301** informs a display driver **303** of the orientation of the screen image to be displayed on the LCD **13** and the aspect ratio of the screen image through an operating system (OS) **302**. The display driver **303** performs an operation for rotating a screen image displayed on the LCD **13** and a scaling operation for varying the aspect ratio in response to an instruction from the BIOS **301**.

[**0071**] The display driver **303** sets the orientation of the screen image displayed on the LCD **13** in any one of four orientations (a), (b), (c) and (d) shown in **FIG. 14** in response to an instruction from the BIOS **301**.

[**0072**] An operation of controlling the automatic image rotating function by the BIOS **301** will be described with reference to the flowchart shown in **FIG. 15**.

[**0073**] The BIOS **301** refers to a value of a sensing signal from the PDA style sensing switch **201** through the EC/KBC **218** to determine whether the display unit **12** is located in the first open position or the second open position. In other words, the BIOS **301** determines whether the computer **1** is used in the PC style or the PDA style (step **S111**).

[**0074**] If a value of the sensing signal from the switch **201** is "0," the BIOS **301** determines that the display unit **12** is located in the first open position or the computer **1** is used in the PC style. The BIOS **301** refers to a value of a sensing signal from the rotation angle sensor **202** through the EC/KBC **218** to determine whether an angle formed between the front surface of the display unit **12** on which the display screen of the LCD **13** is placed and the top surface of the computer main body **11** is greater than a specific angle that is predetermined. More specifically, the BIOS **301** determines whether or not the angle is 180 degrees or greater (step **S113**). If the angle is smaller than 180 degrees (NO in step **S113**), the BIOS **301** controls the display driver **303** such that the orientation of the screen image is set in that of a default (corresponding to (a) in **FIG. 14**) in the PC style (step **S114**). If the angle is 180 degrees or greater (YES in step **S113**), the BIOS **301** controls the display driver **303** to display the screen image in the orientation (corresponding to

(b) in **FIG. 14**) in which the screen image rotates 180 degrees relative to the orientation of a default in the PC style (step **S115**).

[**0075**] The BIOS **301** periodically refers to a value of a sensing signal from the rotation angle sensor **202** via the EC/KBC **218**. In the PC style, therefore, when an angle formed between the front surface of the display unit **12** and the top surface of the computer main body **11** changes from smaller than 180 degrees to not smaller than 180 degrees, the orientation of the screen image automatically changes from that of a default in the PC style to the orientation in which the screen image rotates 180 degrees relative to the orientation of the default. After that, when the angle changes from not smaller than 180 degrees to smaller than 180 degrees, the orientation of the screen image returns to that of the default in the PC style.

[**0076**] If a value of the sensing signal from the switch **201** is "1," the BIOS **301** determines that the display unit **12** is located in the second open position or the computer **1** is used in the PDA style. The BIOS **301** controls the display driver **303** to set the orientation of a screen image in that of a default (corresponding to (c) in **FIG. 14**) in the PDA style (step **S116**). Then, the BIOS **301** determines whether the inhibit switch **117** turns on through the EC/KBC **218**. In other words, the BIOS **301** determines whether the inhibit switch **117** outputs an event signal indicative of inhibition of performance of the automatic rotating function (step **S117**).

[**0077**] If the inhibit switch **117** turns off or the automatic image rotating function is permitted to be performed (NO in step **S117**), the BIOS **301** refers to a gradient sensing signal (X, Y) from the gravity sensor **203** via the EC/KBC **218** and senses an orientation of the display unit **12** relative to the force of gravity (step **S118**). In accordance with the sensing result, the BIOS **301** performs an operation to change the orientation of the screen image automatically to be aligned with the force of gravity correctly (step **S119**). In step **S119**, the BIOS **301** determines whether the orientation of the display unit **12** is changed relative to the force of gravity. If the orientation is changed, the BIOS **301** controls the display driver **303** to align the orientation of the screen image with the force of gravity correctly. In the PDA style, therefore, the screen image is automatically set in one of four orientations (a) to (d) shown in **FIG. 14**.

[**0078**] While the inhibit switch **117** turns on or the automatic image rotating function is inhibited from being performed (YES in step **S117**), the BIOS **301** executes neither of steps **S118** and **S119**. Thus, the orientation of the screen image is maintained in the orientation of a default set in step **S116** or that set in step **S119** immediately before the inhibit switch **117** turns on.

[**0079**] Consequently, according to the embodiment of the present invention, a screen image is rotated in conformity with each of the PC style and the PDA style.

[**0080**] Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

What is claimed is:

1. An information processing apparatus comprising:

a housing with a top surface;

a keyboard placed on the top surface of the housing;

a display unit with a front surface and a rear surface, supported by the housing and rotated between a closed position in which the keyboard is covered and an open position in which the keyboard is exposed;

a sensor which senses an angle formed between the front surface of the display unit and the top surface of the housing; and

a display device provided in the display unit to display a screen image in one of a first orientation in which a bottom-end portion of the screen image is located toward the housing and a second orientation in which a top-end portion of the screen image is located toward the housing in accordance with the angle sensed by the sensor.

2. The information processing apparatus according to claim 1, wherein the sensor includes a switch which senses whether the angle is greater than a specific angle.

3. The information processing apparatus according to claim 1, wherein the display device displays the screen image in the first orientation when the angle sensed by the sensor is not greater than the specific angle and displays the screen image in the second orientation when the angle sensed by the sensor is greater than the specific angle.

4. The information processing apparatus according to claim 1, wherein the display unit is supported by the housing rotatably between the closed position and the open position around a central axis parallel to the top surface of the housing.

5. The information processing apparatus according to claim 1, wherein the display unit has a top-end portion and a bottom-end portion supported by the housing, and the sensor is provided in the display unit to sense which of the top-end portion of the display is unit and the bottom-end portion thereof is located below relative to force of gravity.

6. The information processing apparatus according to claim 1, wherein the display unit is supported by the housing rotatably between the closed position and the open position around a central axis parallel to the top surface of the housing, and the apparatus further comprises:

a placement position sensor which senses whether display unit is located in a position where the rear surface of the display unit covers the top surface of the housing and the front surface of the display unit is exposed;

an orientation sensor which senses an orientation of the display unit relative to force of gravity; and

means for changing an orientation of the screen image displayed on the display device in accordance with the orientation of the display unit relative to the force of gravity sensed by the orientation sensor when the placement position sensor senses that the rear surface of the display unit covers the top surface of the housing and the front surface of the display unit is exposed.

7. The information processing apparatus according to claim 6, further comprising a switch which issues an event signal to inhibit the orientation of the screen image from being changed.

8. The information processing apparatus according to claim 7, wherein the switch includes a push button switch.

9. The information processing apparatus according to claim 6, wherein the display unit has a top-end portion, a bottom-end portion supported by the housing, a right-end portion, and a left-end portion, and the orientation sensor outputs a sensing signal indicative of which of the top-end portion of the display unit and the bottom-end portion thereof is located below relative to force of gravity and a sensing signal indicative of which of the right-end portion of the display unit and the left-end portion thereof is located below relative to the force of gravity.

10. The information processing apparatus according to claim 6, wherein the apparatus further comprises a switch which issues an event signal to inhibit the orientation of the screen image from being changed, and an orientation of the screen image formed immediately before the event signal is issued is maintained during issuance of the event signal.

11. An information processing apparatus comprising:

a housing with a top surface;

a keyboard placed on the top surface of the housing;

a display unit with a rear surface and a front surface in which a display screen is exposed, the display unit being supported by the housing and set in one of a first style which allows the display unit to rotate between a closed position in which the keyboard is covered and a first open position in which the display screen and the keyboard are exposed and a second style in which the rear surface covers the keyboard and the display screen is exposed;

an angle sensor which senses an angle formed between the display screen and the top surface of the housing;

an orientation sensor which senses an orientation of the display unit relative to force of gravity;

a placement position sensor which senses which of the first style and the second style the display unit is set in;

means for varying an orientation of a screen image displayed on the display screen between an orientation in which a bottom-end portion of the screen image is located toward the housing and an orientation in which a top-end portion of the screen image is located toward the housing in accordance with the angle sensed by the angle sensor when the placement position sensor senses that the display unit is set in the first style, and for varying the orientation of the screen image to locate the top-end portion of the screen image in a position higher than the bottom-end portion thereof relative to the force of gravity in accordance with the orientation of the display unit sensed by the orientation sensor when the placement position sensor senses that the display unit is set in the second style.

12. The information processing apparatus according to claim 11, wherein the display unit is supported by the housing rotatably around a first central axis that is parallel to the top surface of the housing and a second central axis that is perpendicular to the first central axis.

13. The information processing apparatus according to claim 11, further comprising a switch which issues an event signal to inhibit the screen image from varying in orientation when the display unit is set in the second style.

* * * * *

Exhibit 1012

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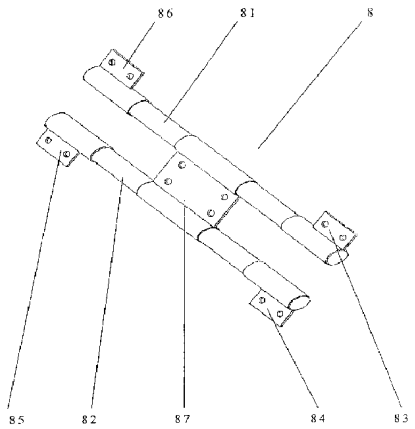
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权利要求书 2 页 说明书 4 页 附图 12 页

[54] 实用新型名称 双铰链装置

[57] 摘要

本实用新型提供一种用于掀盖式的电子产品(如笔记本电脑、便携式影音光盘播放机、手机、个人数字助理或具有掀盖式荧幕的数字相机等等)的双铰链结构，该结构可让掀盖式的电子产品具有360度旋转的功能，而这样的功能却为现今所有具有掀盖式的电子产品(一般设计顶多能180度旋转)，无法达到的优点。而因为具备360度旋转的功能，可让这类具有掀盖式的电子产品具有观看角度更为多变、任一面都可当支架使用、最节省空间的观看方式及当显示屏完全翻转至另一面时(360度旋转)，使用者可依心情随时变换外壳面，而按键操作面依旧可以使用等等优点。



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1. 一种双铰链装置，其特征在于，包括：一用来固定双铰链结构的固定片；多个用来使显示屏与操作面得以连接并旋转的枢转片；以及多个枢轴，其枢接该枢转片及该固定片。

2. 如权利要求 1 所述的双铰链装置，其特征在于，所述固定片的数量也可为多个。

3. 如权利要求 2 所述的双铰链装置，其特征在于，多个固定片为二个。

4. 如权利要求 1 所述的双铰链装置，其特征在于，多个枢轴为二个。

5. 如权利要求 1 所述的双铰链装置，其特征在于，所述多个枢转片为二个。

6. 如权利要求 1 所述的双铰链装置，其特征在于，所述多个枢转片为三个。

7. 如权利要求 1 所述的双铰链装置，其特征在于，所述多个枢转片为四个。

8. 如权利要求 1 所述的双铰链装置，其特征在于，所述固定片还设有数个用来供螺丝锁附的锁定孔。

9. 如权利要求 1 所述的双铰链装置，其特征在于，所述枢转片还设有数个用来供螺丝锁附的锁定孔。

10. 如权利要求 1 所述的双铰链装置，其特征在于，一掀盖式电子产品的显示屏用该双铰链结构可旋转地与该产品本体枢接，该显示屏及操作面具备 360 度旋转的角度，该产品具有多变的观看角度、其任一面都可当支架使用。

11. 一种掀盖式电子产品，其特征在于，包括：一用来观看的显示屏；一用来设定欲得到功能的操作面；以及一种双铰链结构，分别连接于该显示屏和该操作面，其中该显示屏及该操作面具备 360 度旋转角度。

12. 如权利要求 11 所述的掀盖式电子产品，其特征在于，所述双铰链结构包括：一用来固定双铰链结构的固定片；多个用来使显示屏与操作面得以连接并旋转的枢转片，以及多个枢轴，其枢接该枢转片及该固定片。

13. 如权利要求 12 所述的掀盖式电子产品，其特征在于，所述固定片

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的数量也可为多个。

14. 如权利要求 13 所述的掀盖式电子产品，其特征在于，所述多个固定片为二个。

15. 如权利要求 12 所述的掀盖式电子产品，其特征在于，多个枢轴为二个。

16. 如权利要求 12 所述的掀盖式电子产品，其特征在于，所述多个枢转片为二个。

17. 如权利要求 12 所述的掀盖式电子产品，其特征在于，所述多个枢转片为三个。

18. 如权利要求 12 所述的掀盖式电子产品，其特征在于，所述多个枢转片为四个。

19. 如权利要求 12 所述的掀盖式电子产品，其特征在于，所述固定片及枢转片还设有数个用来供螺丝锁附的锁定孔。

20. 如权利要求 11 所述的掀盖式电子产品，其特征在于，所述显示屏用双铰链结构可旋转地与产品本体枢接，该产品具有多变的观看角度、任一面都可当支架使用。

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双铰链装置

技术领域

本实用新型涉及一种用于掀盖式的电子产品(如笔记本电脑、便携式影音光盘播放机、手机、个人数字助理或具掀盖式萤幕的数字相机等等)的双铰链结构。

背景技术

现今一般具有掀盖式的电子产品，如笔记本电脑、便携式影音光盘播放机、手机、个人数字助理、或具有掀盖式萤幕的数字相机等等，是利用铰链来使得产品本体与显示屏得以作出开闭的动作。如图 1 所示为现有掀盖式电子产品所使用的铰链。如图 2 及图 3 所示，当显示屏与产品本体闭合时，可缩小所占空间，让使用者方便携带；如图 4 所示，当显示屏打开时，使用者可经由产品本体上设定的按钮，作适当的操作，而由显示屏得到或确认想要的结果。然而，纵观现今一般具掀盖式的电子产品，其设计顶多能作 180 度旋转，请参阅图 5 及图 6，对使用者来说，仍有某些程度的限制。所以，本实用新型提出一种能 360 度旋转的双铰链结构，其可使用于现今一般具掀盖式的电子产品，使产品功能更多样也更能有效运用空间。

实用新型内容

本实用新型的目的在于提供一种能 360 度旋转的双铰链结构，该结构可让相关掀盖式的电子产品，功能更多样也更能有效运用空间。

本实用新型的目的是这样实现的，即提供一种一种双铰链装置，包括：一用来固定双铰链结构的固定片；多个用来使显示屏与操作面得以连接并旋转的枢转片；以及多个枢轴，其枢接该枢转片及该固定片。

本实用新型还提供一种掀盖式电子产品，包括：一用来观看的显示屏；一用来设定欲得到功能的操作面；以及一种双铰链结构，分别连接于该显示屏和该操作面，其中该显示屏及该操作面具备 360 度旋转角度。

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本实用新型所述的一种用于掀盖式的电子产品的双铰链结构，该实用新型有别于现今一般具掀盖式的电子产品顶多能作 180 度旋转的限制，而可作 360 度的旋转。当掀盖式电子产品的显示屏利用本实用新型的双铰链结构与产品本体枢接时，可使得显示屏具备 360 度旋转的功能，可让产品具有观看角度更为多变、任一面都可当支架使用、最节省空间的观看方式及当完全翻转至另一面时(360 度旋转)，使用者可依心情随时变换外壳面而按键操作面依旧可以使用等等优点。

附图说明

图 1 是现有掀盖式电子产品所使用的铰链立体图；

图 2 是使用现有铰链的掀盖式电子产品闭合时的立体图；

图 3 是使用现有铰链的掀盖式电子产品闭合时的侧视图；

图 4 是使用现有铰链的掀盖式电子产品打开时的立体图；

图 5 是使用现有铰链的掀盖式电子产品打开 180 度时的侧视图；

图 6 是使用现有铰链的掀盖式电子产品打开 180 度时的侧视图；

图 7 是本实用新型提出的双铰链结构之一的立体图；

图 8 是安装部与铰链外壳的平面及侧视示意图；

图 9 是显示屏与操作面折叠的侧视示意图；

图 10 是显示屏翻开 180 度时的侧视示意图；

图 11 是显示屏翻开 180 度时的另一侧视示意图；

图 12 是显示屏翻开 360 度时的侧视示意图；

图 13 是使用图 7 双铰链结构的掀盖式电子产品立体图；

图 14 是本实用新型双铰链结构的另一型态的立体图；

图 15 是使用图 14 双铰链结构的掀盖式电子产品立体图；

图 16 是本实用新型双铰链结构的另一型态的立体图；

图 17 是使用图 16 双铰链结构的掀盖式电子产品立体图；

图 18 是使用本实用新型双铰链结构的掀盖式电子产品其中之一观看角度的立体示意图；

图 19 是使用本实用新型双铰链结构的掀盖式电子产品其中之一观看角度的立体示意图；

图 20 是使用本实用新型双铰链结构的掀盖式电子产品其中之一观看角

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度的立体示意图；以及

图21是使用本实用新型双铰链结构的掀盖式电子产品其中之一观看角度的立体示意图。

具体实施方式

以下描述的本实用新型的实施例是与可携式影音光盘播放机相关。然而，本实用新型可适用于所有掀盖式电子产品，包括笔记本电脑(NOTEBOOK)、手机、个人数字助理(PDA)或具掀盖式萤幕的数字相机等等。

如图4所示，掀盖式电子产品9具有显示屏91及操作面92。使用者经由操作面92作适当的操作，经由显示屏91得到或确认想要的结果。如图7所示为本实用新型提出的双铰链结构之一，双铰链结构8具有枢轴81、82；枢转片83、84、85、86；固定片87。枢转片83、84、85、86及固定片87是枢接至枢轴81、82；而枢转片及固定片的数量可随双铰链结构的不同而不同，视其应用而定。如图8所示，枢转片83、84、85、86利用本身的锁定孔与安装部95、97、96、94的锁定孔对准后以螺丝锁固，使得显示屏91与操作面92得以连接；而固定片87则利用本身的锁定孔与铰链外壳93的锁定孔对准后以螺丝锁固。

如图9所示，当显示屏91与操作面92利用双铰链结构8以上述的方式连接在一起后，由于双铰链结构8的作用，使得显示屏91得以朝下(C方向)与操作面92折叠起来，此时，显示屏91位于操作面92之上；枢转片83、84、85、86朝向左(A方向)互相平行，且枢转片83、86位于枢转片84、85之上。当将显示屏91翻开180度如图10所示的位置时，显示屏91朝上(D方向)位于操作面92的右(B方向)且位于操作面92之上；枢转片83、86朝向右(B方向)，枢转片84、85朝向左(A方向)，且枢转片83、86位于枢转片84、85之上。当将显示屏91翻开如图11所示的位置时，显示屏91朝上(D方向)位于操作面92的右(B方向)且位于操作面92之下；枢转片83、86朝向右(B方向)，枢转片84、85朝向左(A方向)，且枢转片83、86位于枢转片84、85之下。进一步将显示屏91翻开如图12所示的位置时，显示屏91朝下(C方向)与操作面92折叠起来，此时，显示屏91位于操作面92之下；枢转片83、84、85、86朝向左(A方向)互相平行，且枢转片83、86位于枢转片84、85之下。此时，显示屏91便完成了360度的旋转。如图

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13 所示，为使用图 7 双铰链结构的掀盖式电子产品立体图。

如图 14 所示，为图 7 双铰链结构的另一型态；而图 15 为使用图 14 双铰链结构的掀盖式电子产品立体图。如图 16 所示，为图 7 双铰链结构的另一型态；而图 17 为使用图 16 双铰链结构的掀盖式电子产品立体图。

所以，当掀盖式电子产品使用本实用新型提出的双铰链结构，显示屏 91 与操作面 92 便具有 360 度旋转的功能，而这样的功能为现今所有具掀盖式的电子产品(一般设计顶多能 180 度旋转)，无法达到的优点。如图 18、图 19、图 20 及图 21 所示，因为具备 360 度旋转的功能，可让这类具掀盖式的电子产品具有观看角度更为多变、任一面都可当支架使用、当显示屏 91 完全翻转至另一面时(360 度旋转)，依旧可观看，所以也可作为类似相片框的功能，且可依心情随时变换面板图片(如笔记本电脑、便携式影音光盘播放机、手机或个人数字助理)，而此时操作面也依旧可以使用，此外此观看角度为最节省空间的观看方式，甚至于加上适当的装置而可悬挂在墙上。

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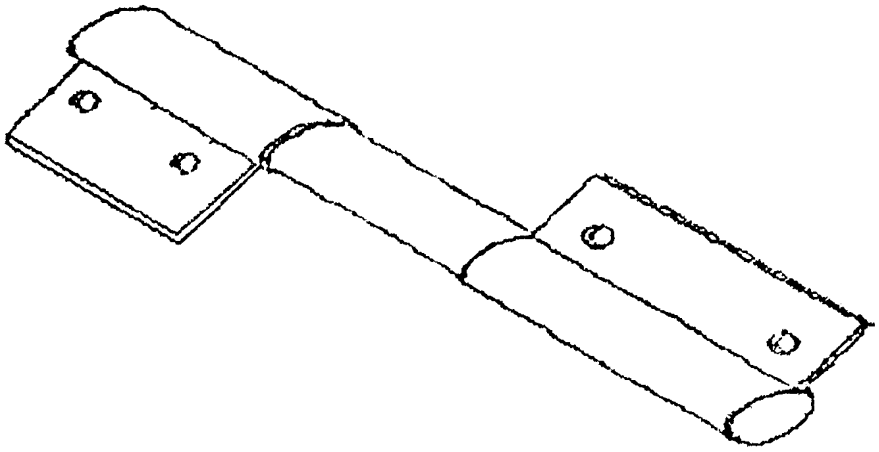


图 1

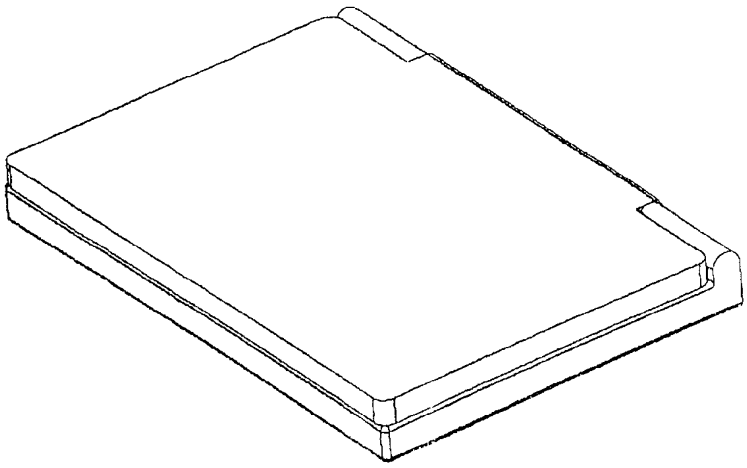


图 2

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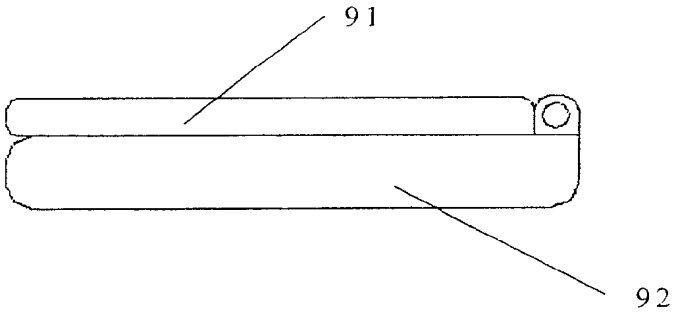


图 3

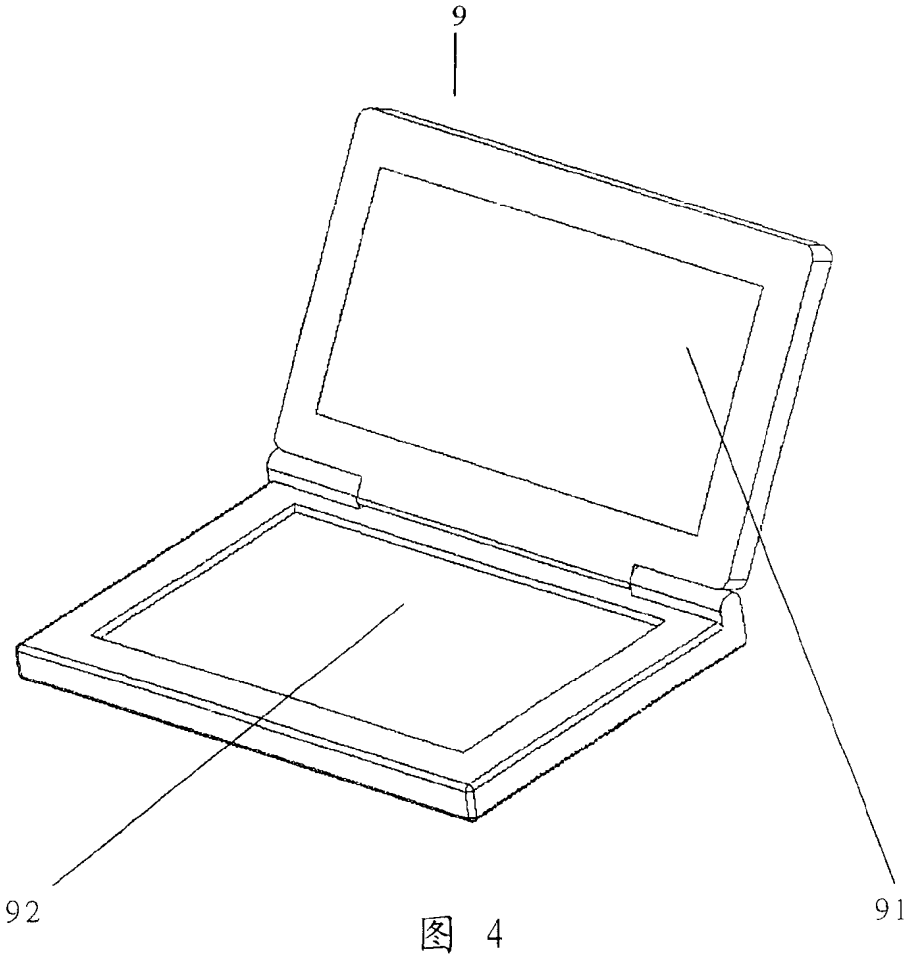


图 4

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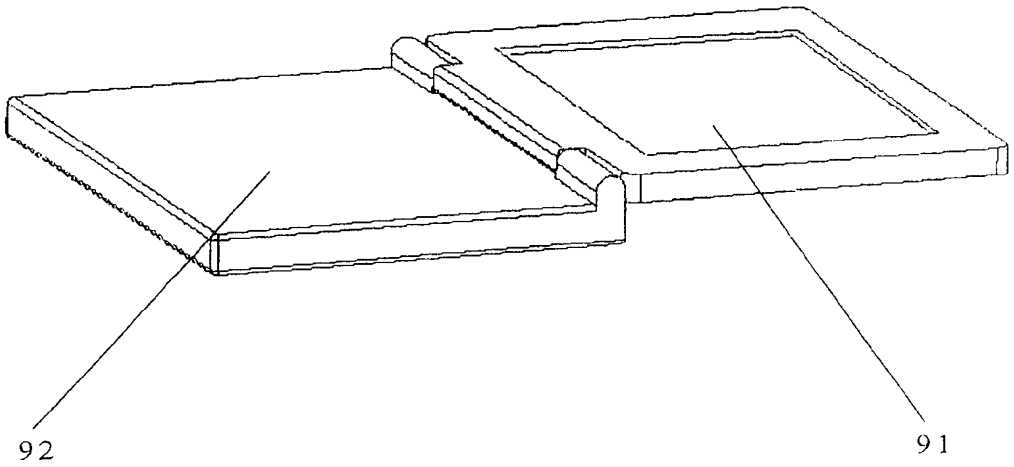


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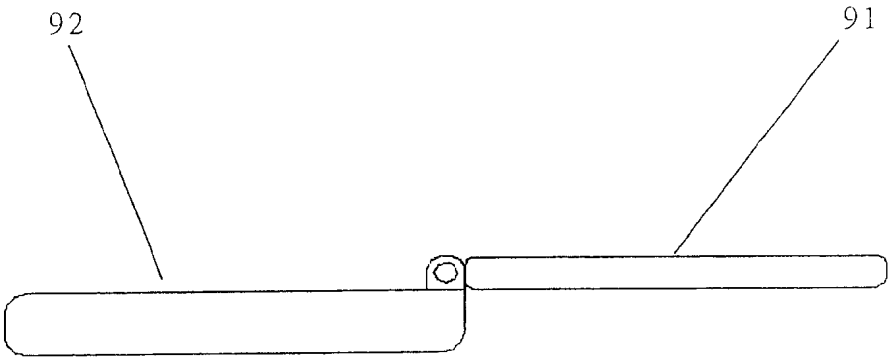


图 6

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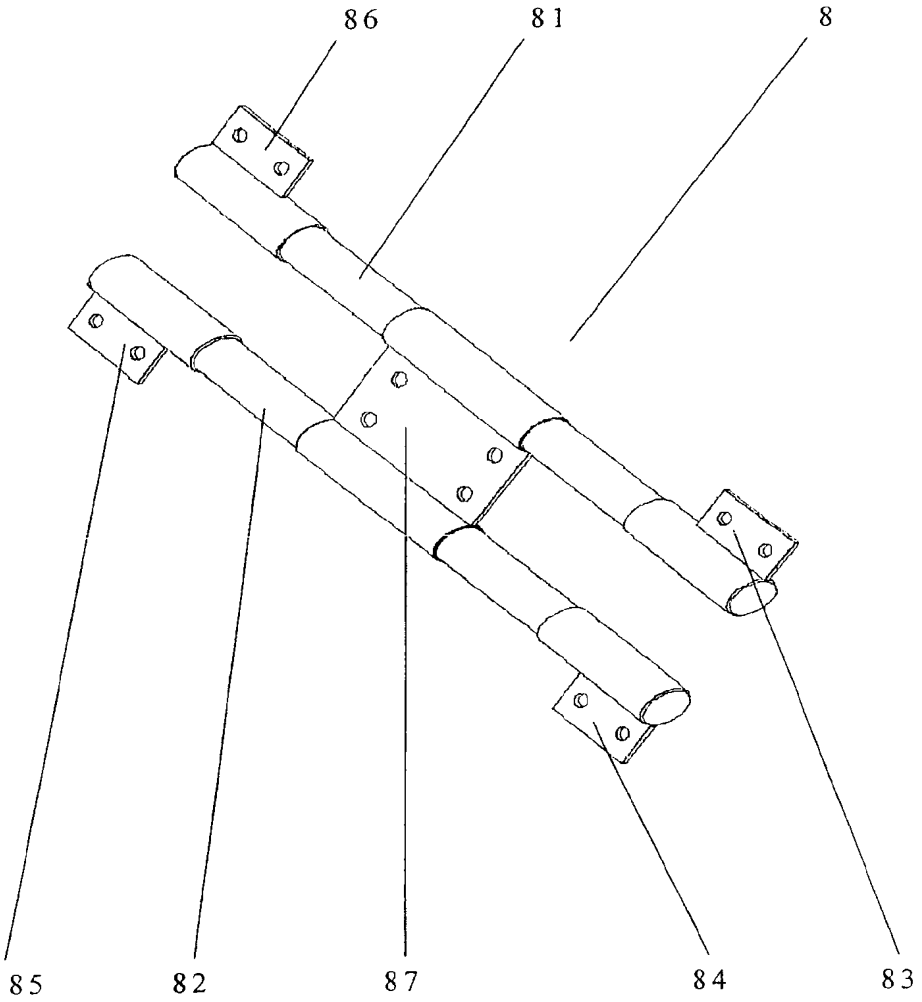


图 7

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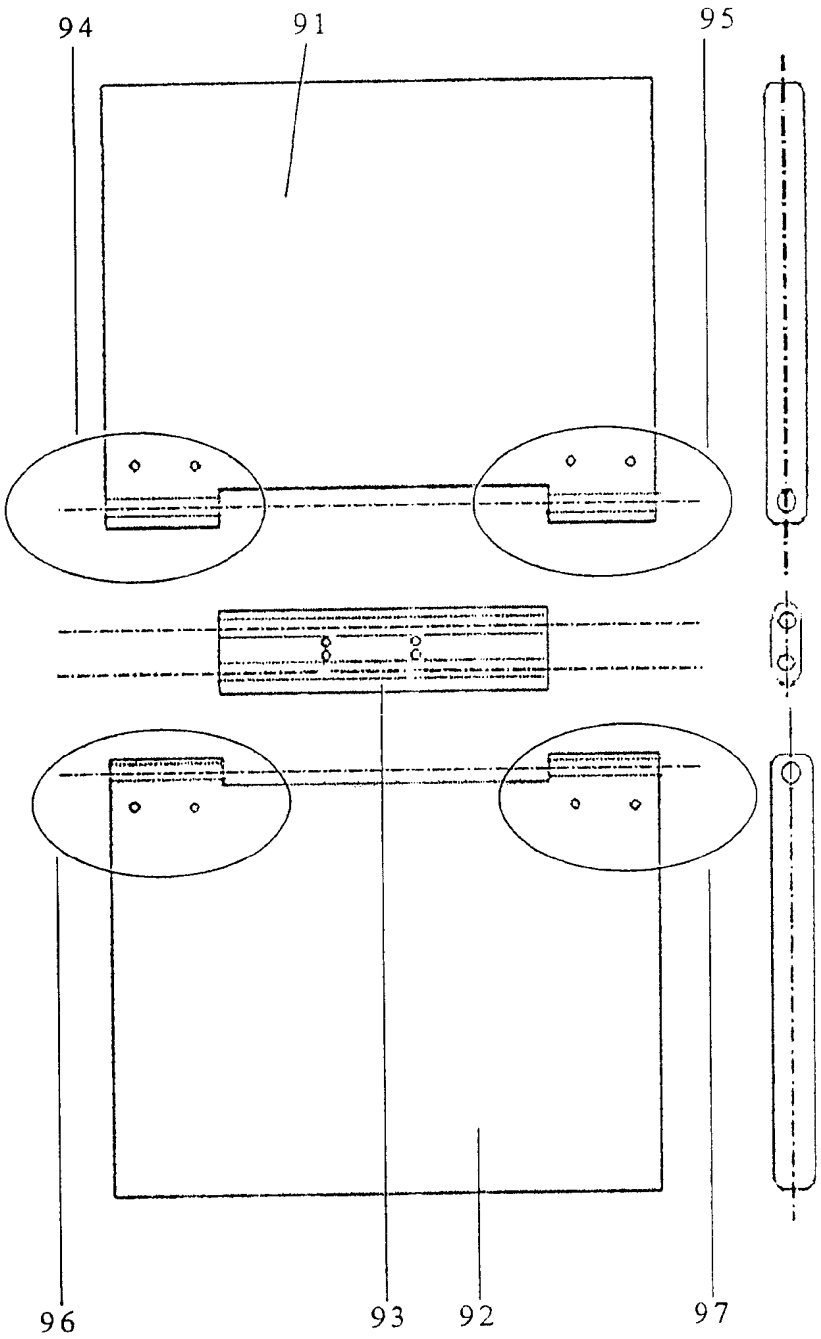


图 8

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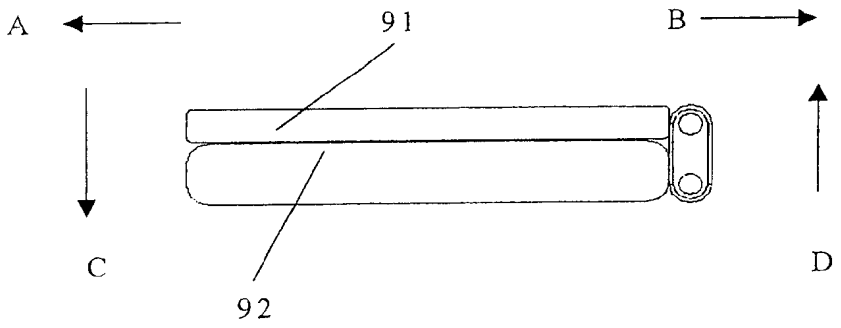


图 9

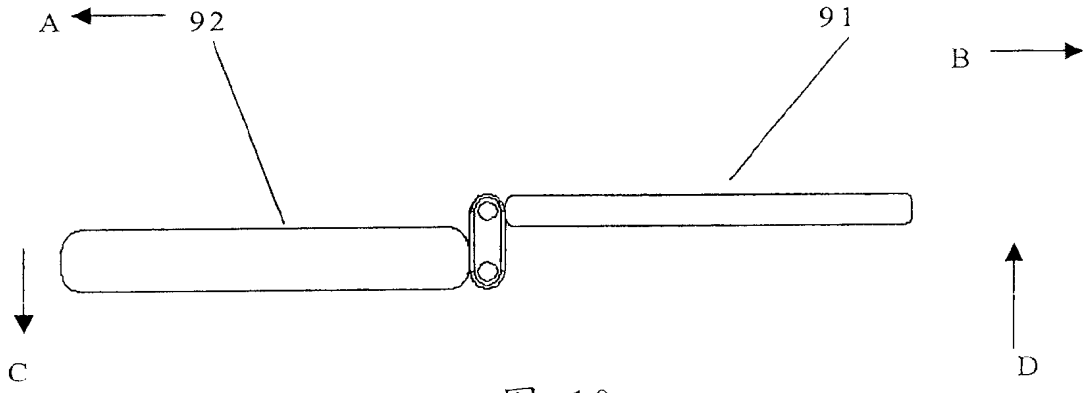


图 10

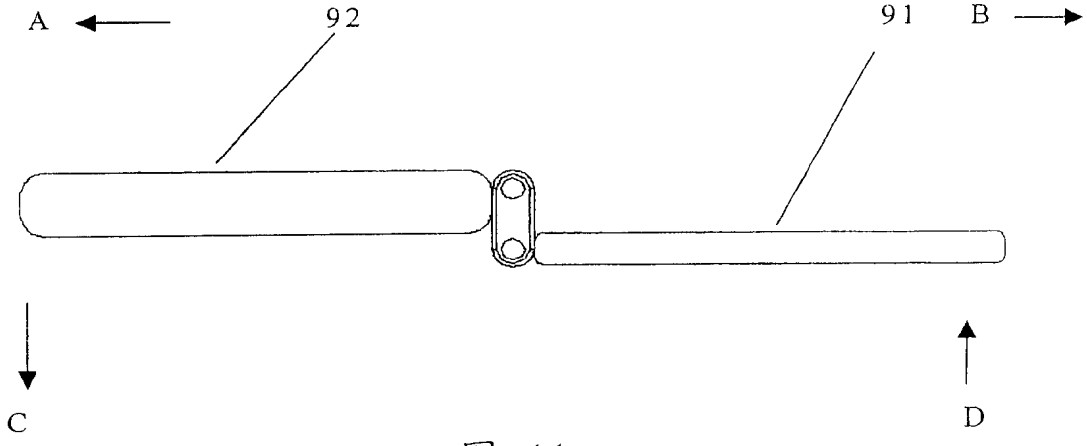


图 11

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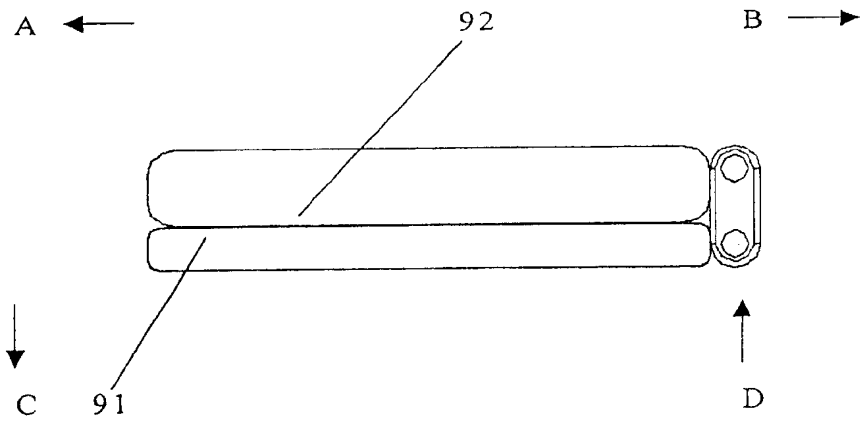


图 12

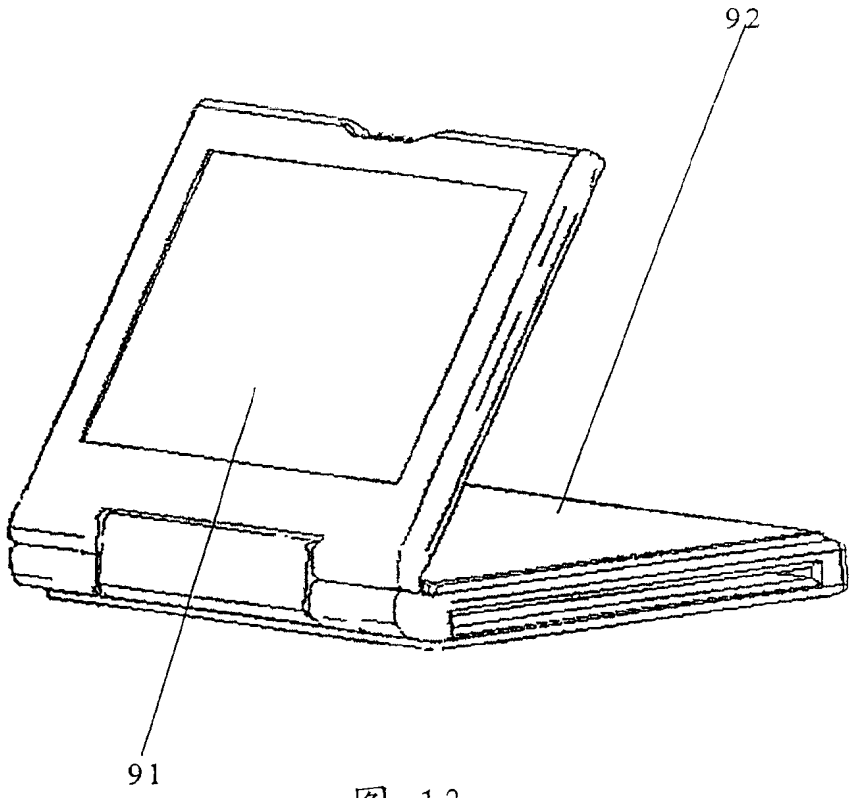


图 13

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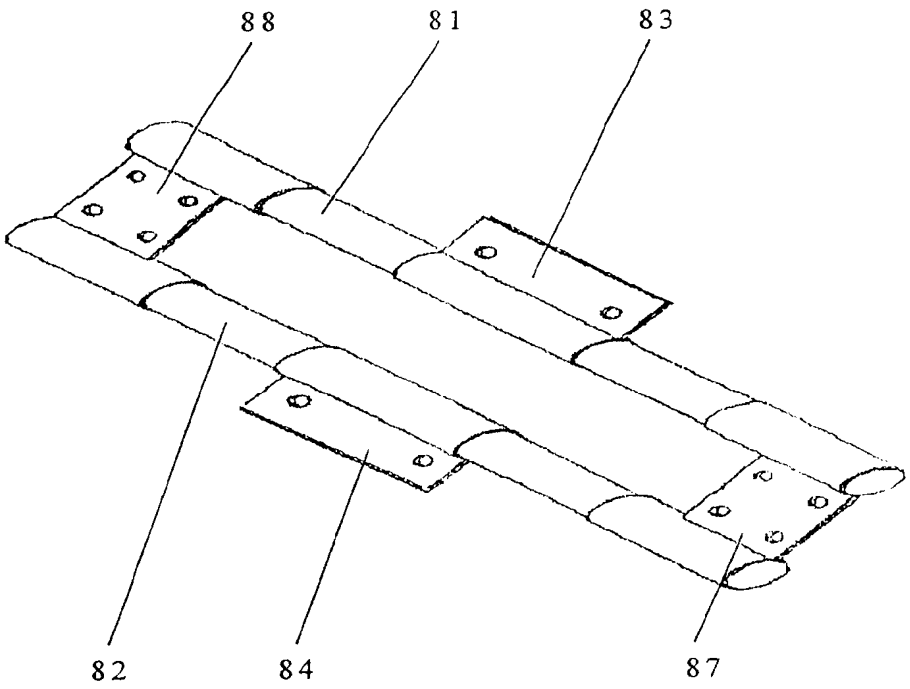


图 14

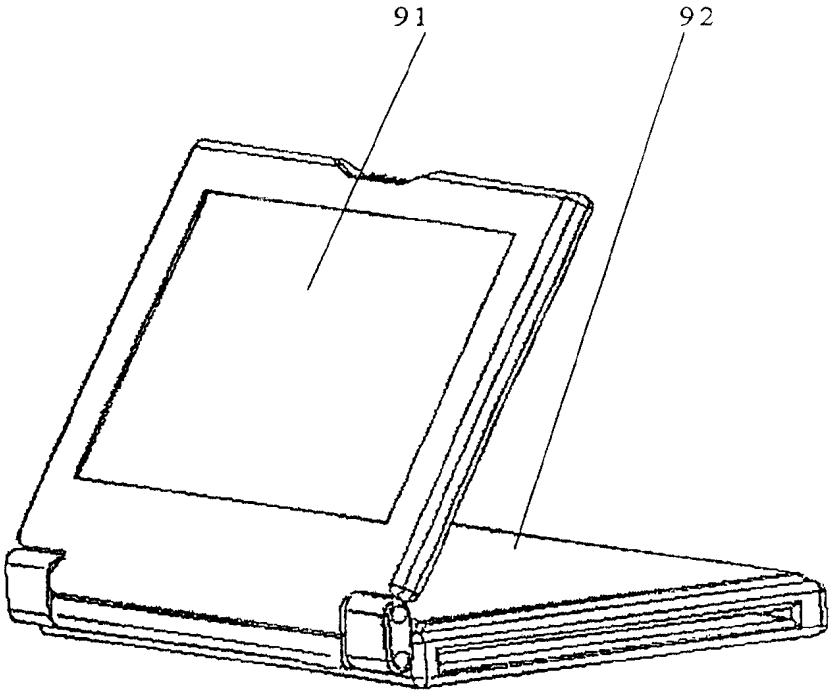


图 15

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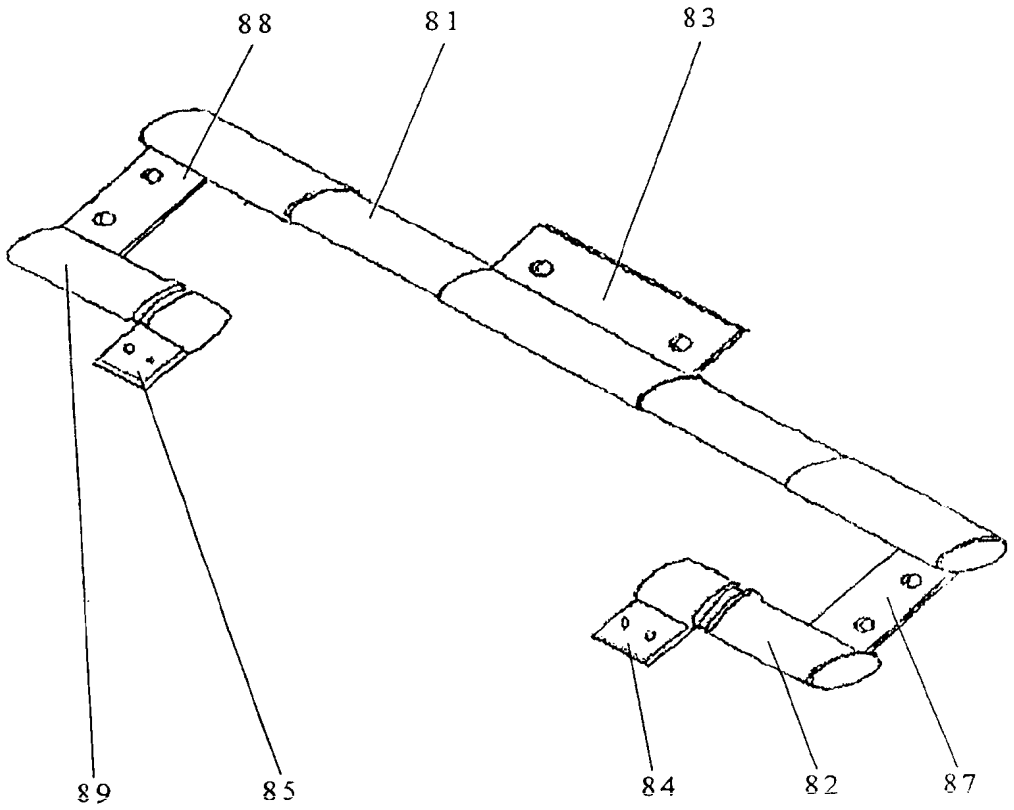


图 16

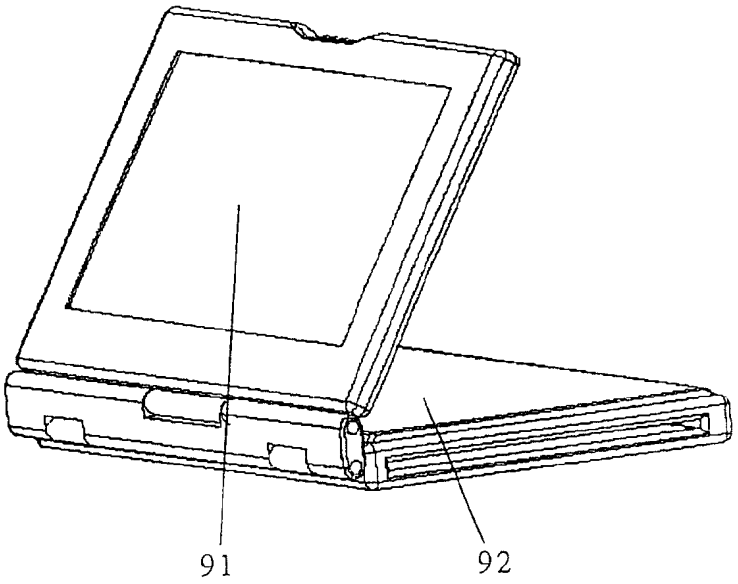


图 17

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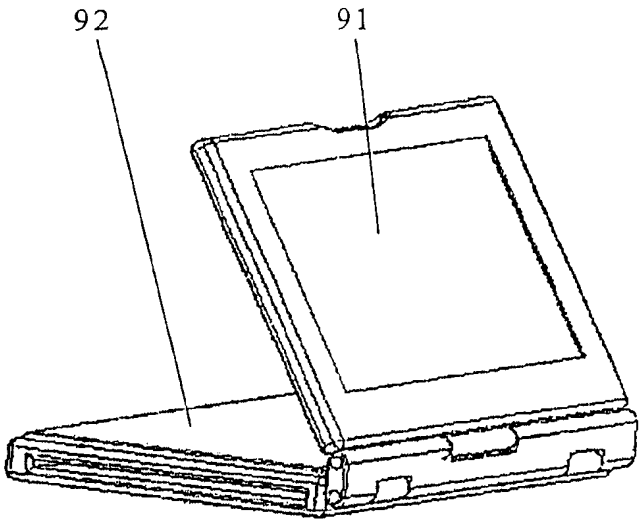


图 18

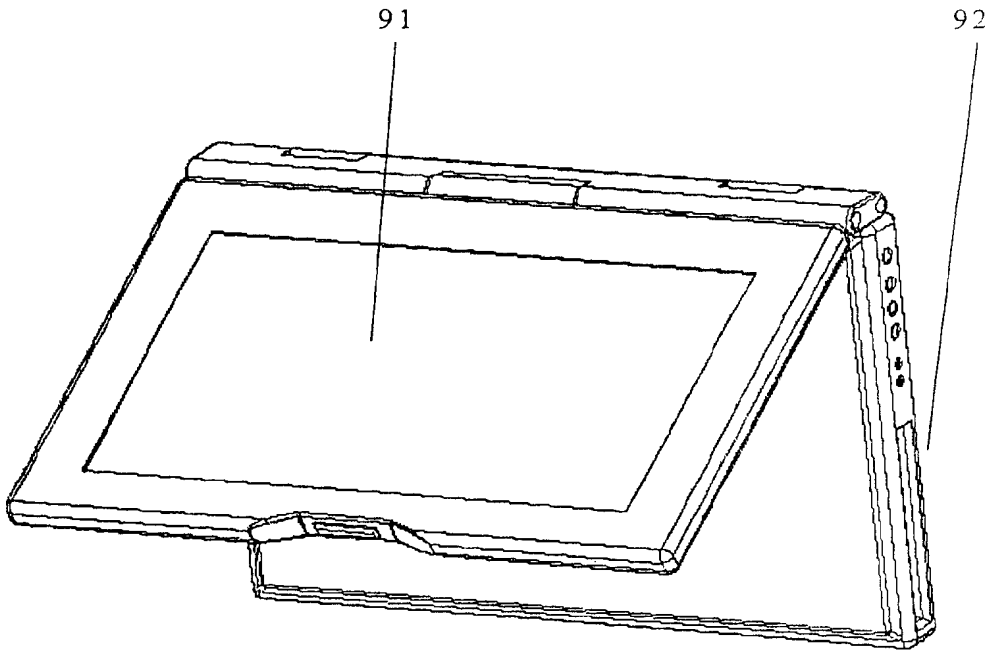


图 19

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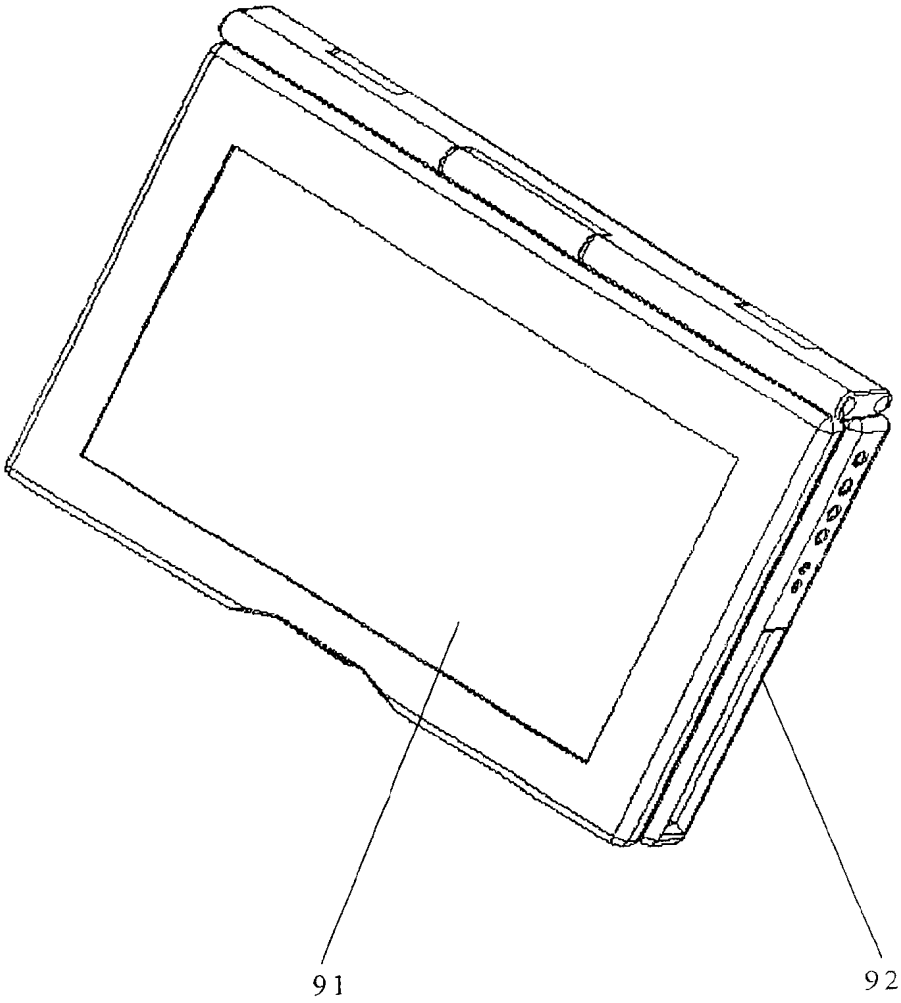


图 20

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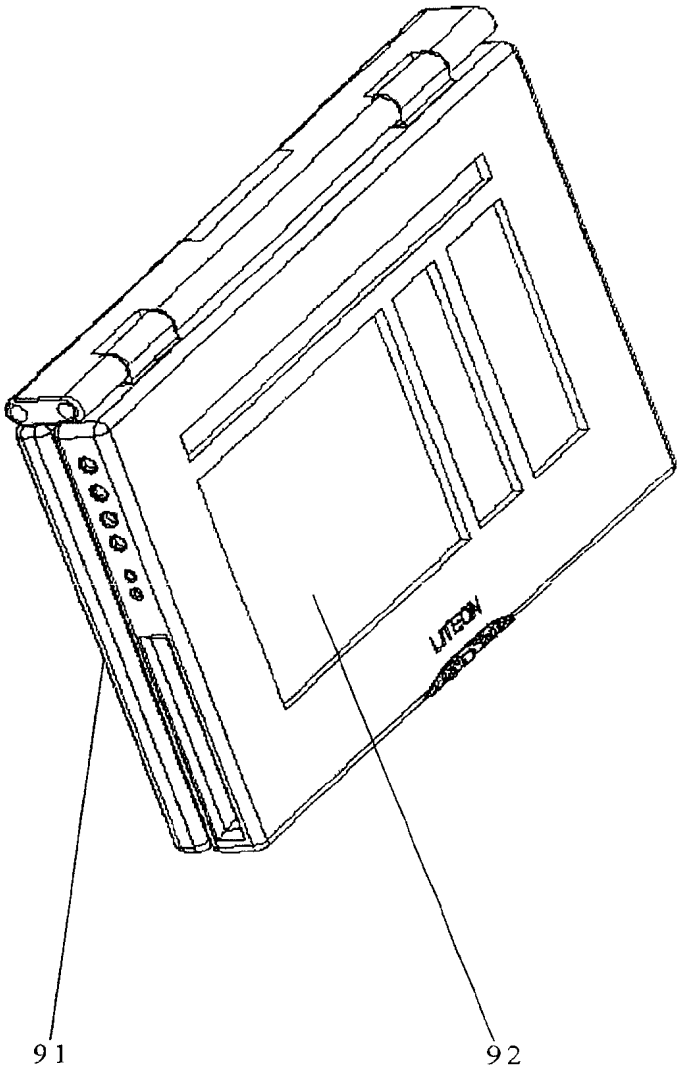


图 21

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Exhibit 1013

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[12] Specification for Utility Model Patent

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[73] Patentee: Jianxing Electronic Technology Co., Ltd.
Address: Taipei City, Taiwan Province

[72] Designer: Lin Ruijiang

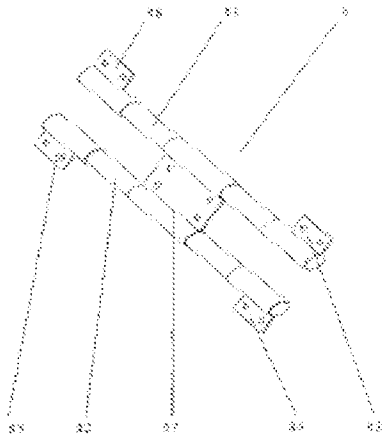
[74] Patent Agency Agent: Beijing Liushen Law Office
Chen Xiaowen; Li Xiaoshu

Claims: 2 Pages. Specification: 4 Pages. Drawings: 12 Pages.

[54] Title of the Utility Model: DOUBLE HINGE DEVICE

[57] Abstract

The present utility model provides a double hinge structure for an electronic product having a liftable cover (such as a notebook computer, a portable video player, a mobile phone, a personal digital assistant, or a digital camera having a liftable screen). The structure enables the electronic product having a liftable cover to be equipped with an advantageous 360-degree rotating function, which is a function that all existing electronic products having liftable covers (the general design enables a rotation by 180 degrees at most) are unable to achieve. Because of the 360-degree rotating function, these electronic products having liftable covers have the following advantages: the viewing angle is more adaptable; any surface may serve as a support, which provides the most space-saving viewing mode; and when a display screen is completely flipped to the other side (rotating by 360 degrees), a user may freely change the cover surface at any time and the key operating surface may still be used.



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1. A double hinge device, comprising: a fixing piece for fixing a double hinge structure; a plurality of pivoting pieces for connecting a display screen and an operating surface and rotating the same; and a plurality of pivots pivotally connected to the pivoting pieces and the fixing piece.

2. The double hinge device according to claim 1, wherein a number of the fixing pieces may be plural.

3. The double hinge device according to claim 2, wherein a number of the plural fixing pieces is two.

4. The double hinge device according to claim 1, wherein a number of the plural pivots is two.

5. The double hinge device according to claim 1, wherein a number of the plural pivoting pieces is two.

6. The dual hinge device according to claim 1, wherein a number of the plural pivoting pieces is three.

7. The double hinge device according to claim 1, wherein a number of the plural pivoting pieces is four.

8.The double hinge device according to claim 1, wherein the fixing piece is further provided with a plurality of locking holes for locking screws.

9.The double hinge device according to claim 1, wherein the pivoting pieces are further provided with a plurality of locking holes for locking screws.

10.The double hinge device according to claim 1, wherein a display screen of an electronic product having a liftable cover uses the double hinge structure to be pivotally connected to a body of the product in a rotatable manner; the display screen and an operating surface are equipped to rotate at a 360-degreeangle; the product is enabled to be viewed at various angles; and any surface of the product may serve as a support.

11. An electronic product having a liftable cove, comprising: a display screen for viewing; an operating surface for setting desired functions; and a double hinge structure respectively connected to the display screen and the operating surface, wherein the display screen and the operating surface are equipped to rotate at a 360-degree angle.

12. The electronic product having a liftable cove according to claim 11, wherein the double hinge structure comprises: a fixing piece for fixing a double hinge structure; a plurality of pivoting pieces for connecting the display screen and the operating surface and for rotating the same; and a plurality of pivots pivotally connected to the pivoting pieces and the fixing piece.

13. The electronic product having a liftable cover according to claim 12, wherein a number of the fixing pieces may be plural.

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14. The electronic product having a liftable cover according to claim 13, wherein a number of the plural fixing pieces is two.

15. The electronic product having a liftable cover according to claim 12, wherein a number of the plural pivots is two.

16. The electronic product having a liftable cover according to claim 12, wherein a number of the plural pivoting pieces is two.

17. The electronic product having a liftable cover according to claim 12, wherein a number of the plural pivoting pieces is three.

18. The electronic product having a liftable cover according to claim 12, wherein a number of the plural pivoting pieces is four.

19. The electronic product having a liftable cover according to claim 12, wherein the fixing piece and the pivoting pieces are further provided with a plurality of locking holes for locking screws.

20. The electronic product having a liftable cover according to claim 11, wherein the display screen is pivotally connected to a body of the product through the double hinge structure in a rotatable manner; the product is enabled to be viewed at various angles; and any surface of the product may serve as a support.

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DOUBLE HINGE DEVICE

TECHNICAL FIELD

The present utility model relates to a double hinge structure for an electronic product having a liftable cover (such as a notebook computer, a portable video player, a mobile phone, a personal digital assistant or a digital camera having a liftable screen).

BACKGROUND

Nowadays, the electronic products having liftable covers, such as laptops, portable video players, mobile phones, personal digital assistants, or digital cameras having liftable screens, use a hinge such that opening and closing positions formed between a product body and a display screen are made possible. As shown in FIG.1, a hinge used by existing electronic products having liftable covers is shown. As shown in FIG. 2 and FIG. 3, when the display screen and the product body form a closing position, the occupied space can be reduced, making it convenient to carry by users. As shown in FIG. 4, when the display screen is in an opened position, a user may make appropriate operations through buttons set on the product body, and desired results may be obtained or confirmed using the display screen. However, looking at existing general electronic products having liftable covers, the design thereof may offer a rotation at 180 degrees at most. Referring to FIG. 5 and FIG. 6, for users, there are still limitations to some degrees . Therefore, the present utility model provides a double hinge structure that enables a rotation at 360 degrees, which can be applied to the existing general electronic products having liftable covers, thereby bringing these products more variable functions with the space more effectively used.

SUMMARY

An objective of the present utility model is to provide a double hinge structure that enables a rotation at 360 degrees, which enables the related electronic products having liftable covers to be equipped with more variable functions with the space more effectively used.

The objective of the present utility model is achieved as follows: a double hinge device is provided, comprising a fixing piece for fixing a double hinge structure; a plurality of pivoting pieces for connecting a display screen and an operating surface and rotating the same ; and a plurality of pivots pivotally connected to the pivoting pieces and the fixing piece.

The present utility model further provides an electronic product having a liftable cover, comprising: a display screen for viewing; an operating surface for setting desired functions; and a double hinge structure respectively connected to the display screen and the operating surface, wherein the display screen and the operating surface are equipped to rotate at a 360-degree angle.

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According to the double hinge structure for the electronic products having liftable covers provided by the present utility model, the present utility model enables a rotation at 360 degrees, thus breaking the limitation of and differs from the current electronic products having liftable covers in which only a 180-degree rotation at most is possible. When a display screen of an electronic product having a liftable cover is pivotally connected to the product body using the double hinge structure provided by the present utility model, the display screen is equipped with the function of rotating by 360 degrees, thus making the product having the following the advantages: the viewing angle is more adaptable; any surface may serve as a support, which provides the most space-saving viewing mode; and when it is completely flipped to the other side (rotating by 360 degrees), a user may freely change the cover surface at any time and the key operating surface may still be used.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a three-dimensional diagram of a hinge used by existing electronic products having liftable covers;

FIG. 2 is a three-dimensional diagram when an electronic product having a liftable cover using the existing hinge is in a closed position;

FIG. 3 is a side view when an electronic product having a liftable cover using the existing hinge is in a closed position;

FIG. 4 is a three-dimensional diagram when an electronic product having a liftable cover using the existing hinge is in an opened position;

FIG. 5 is a side view when an electronic product having a liftable cover using the existing hinge is in an opened position at 180 degrees;

FIG. 6 is a side view when an electronic product having a liftable cover using the existing hinge is in an opened position at 180 degrees;

FIG. 7 is a three-dimensional diagram of one of double hinge structures provided by the present utility model;

FIG. 8 shows a schematic plane view and side view of mounting portions and a hinge shell;

FIG. 9 is a schematic side view of a display screen and an operating surface in a folded position;

FIG. 10 is a schematic side view when a display screen is unfolded by 180 degrees;

FIG. 11 is another schematic side view when a display screen is unfolded by 180 degrees;

FIG. 12 is a schematic side view when a display screen is unfolded by 360 degrees;

FIG. 13 is a three-dimensional diagram of an electronic product having a liftable cover using the double hinge structure in FIG. 7;

FIG. 14 is a three-dimensional diagram showing another mode of the double hinge structure according to the present utility model;

FIG. 15 is a three-dimensional diagram of an electronic product having a liftable cover using the double hinge structure in FIG. 14;

FIG. 16 is a three-dimensional diagram showing another mode of the double hinge structure according to the present utility model;

FIG. 17 is a three-dimensional diagram of an electronic product having a liftable cover using the double hinge structure in FIG. 16;

FIG. 18 is a schematic three-dimensional diagram of one viewing angle of an electronic product having a liftable cover using the double hinge structure according to the present utility model;

FIG. 19 is a schematic three-dimensional diagram of one viewing angle of an electronic product having a liftable cover using the double hinge structure according to the present utility model;

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FIG. 20 is a schematic three-dimensional diagram of one viewing angle of an electronic product having a liftable cover using the double hinge structure according to the present utility model; and

FIG. 21 is a schematic three-dimensional diagram of one viewing angle of an electronic product having a liftable cover using the double hinge structure according to the present utility model.

DETAILED DESCRIPTION OF EMBODIMENTS

Embodiments of the present utility model described below are related to a portable video player. However, the present utility model is applicable to all electronic products having liftable covers, including notebook computers (NOTEBOOK), mobile phones, personal digital assistants (PDA) or digital cameras having liftable screens.

As shown in FIG. 4, an electronic product having a liftable cover 9 is provided with a display screen 91 and an operating surface 92. A user makes appropriate operations through the operating surface 92, and the desired results are obtained or confirmed using the display screen 91. As shown in FIG. 7, one of double hinge structures is provided by the present utility model. A double hinge structure 8 is provided with pivots 81 and 82; pivoting pieces 83, 84, 85, and 86; and a fixing piece 87. The pivoting pieces 83, 84, 85, and 86 and the fixing piece 87 are pivotally connected to the pivots 81 and 82. The number of the pivoting pieces and the fixing piece may vary with different double hinge structures, depending on applications thereof. As shown in FIG. 8, after the locking holes of the pivoting pieces 83, 84, 85, and 86 are aligned with the locking holes of the mounting portions 95, 97, 96, and 94 and then locked with screws, the display screen 91 and the operating surface 92 are then connected. After the locking holes of the fixing piece 87 are aligned with the locking holes of the hinge shell 93, screws are used to lock the same.

As shown in FIG. 9, when the display screen 91 and the operating surface 92 are connected together in the above-mentioned manner by using the double hinge structure 8, under the effect of the double hinge structure 8, the display screen 91 can be turned downwards (C direction) toward the operating surface 92 and the two are interposed; at this time, the display screen 91 is positioned on the operating surface 92. The pivoting pieces 83, 84, 85, and 86 are parallel to each other towards the left (A direction), and the pivoting pieces 83 and 86 are positioned on the pivoting pieces 84 and 85. When the display screen 91 is turned by 180 degrees to the position shown in FIG. 10, the display screen 91 faces upwards (D direction) and is positioned to the right (B direction) of the operating surface 92 and on the operating surface 92. The pivoting pieces 83 and 86 face rightwards (B direction); the pivoting pieces 84 and 85 face leftwards (A direction), and the pivoting pieces 83 and 86 are positioned on the pivoting pieces 84 and 85. When the display screen 91 is turned to, for example, the position shown in FIG. 11, the display screen 91 faces upwards (D direction) and is positioned to the right (B direction) of the operating surface 92 and below the operating surface 92. The pivoting pieces 83 and 86 face rightwards (B direction); the pivoting pieces 84 and 85 face leftwards (A direction), and the pivoting pieces 83 and 86 are positioned below the pivoting pieces 84 and 85. When the display screen 91 is further turned to, for example, the position shown in FIG. 12, the display screen 91 faces downwards (C direction) and is interposed with the operating surface 92; at this time, the display screen 91 is positioned below the operating surface 92. The pivoting pieces 83, 84, 85, and 86 face leftwards (A direction) and are parallel with each other. The pivoting pieces 83 and 86 are positioned below the pivoting pieces 84 and 85. At this time, the display screen 91 has completed a 360-degree rotation. As shown in FIG. 13, it is a three-dimensional view of an electronic product having a liftable cover

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using the double hinge structure in FIG. 7.

FIG. 14 shows another mode of the double hinge structure of FIG. 7; and FIG. 15 is a three-dimensional diagram of an electronic product having a liftable cover using the double hinge structure of FIG. 14. FIG. 16 is another mode of the double hinge structure of FIG. 7; and FIG. 17 is a three-dimensional diagram of an electronic product having a liftable cover using the double hinge structure of FIG. 16.

Therefore, when an electronic product having a liftable cover uses the double hinge structure provided by the present utility model, the display screen 91 and the operating surface 92 are equipped with a 360-degree rotating function, which is an advantage that all existing electronic products having liftable covers cannot achieve (the general design enables a rotation by 180 degrees at most). As shown in FIG. 18, FIG. 19, FIG. 20, and FIG. 21, these electronic products having liftable covers have the following advantages because of the 360-degree rotating function: various viewing angles; any surface can serve as a support; when the display screen 91 is completely turned to the other side (rotating by 360 degrees), the display screen can still be viewed, the display screen can thus be turned into a photo frame; panel pictures (such as a notebook computer, a portable video player, a mobile phone or a personal digital assistant) can be changed at any time based on users' mood; and at this time, the operating surface may still be used. In addition, a viewing mode using this viewing angle saves the most space. An appropriate device may also be added, such that the product can be hung on the wall.

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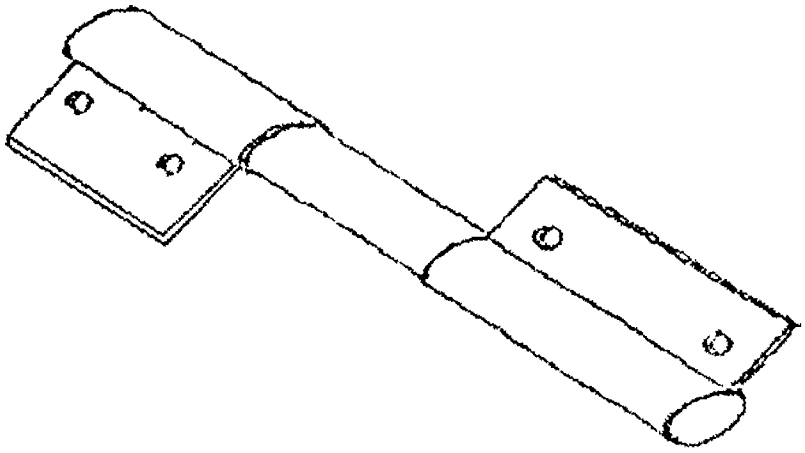


FIG. 1

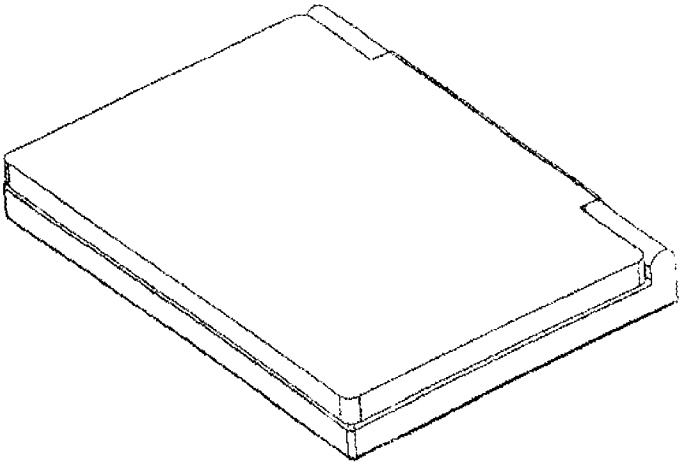


FIG. 2

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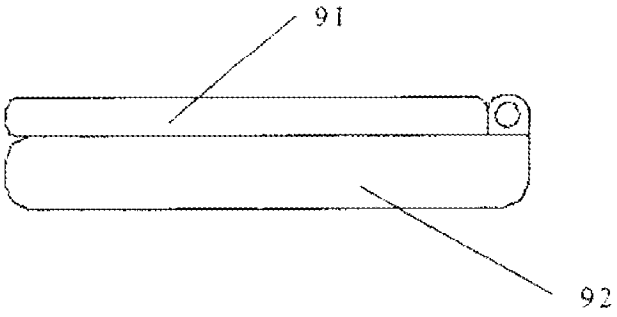


FIG. 3

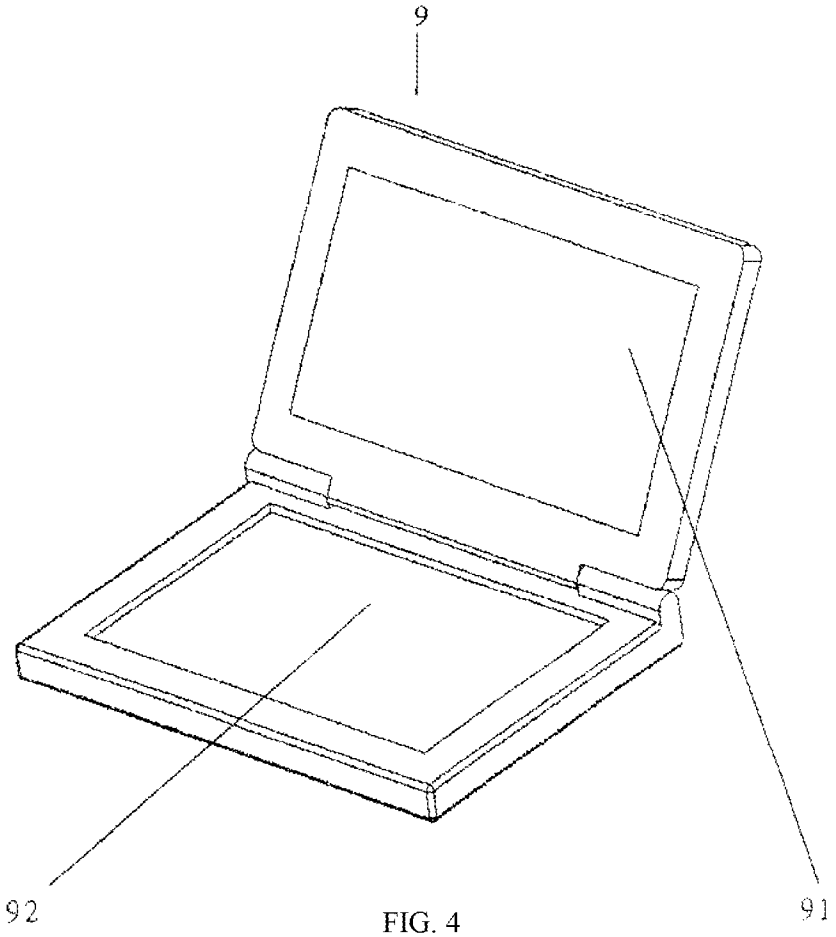


FIG. 4

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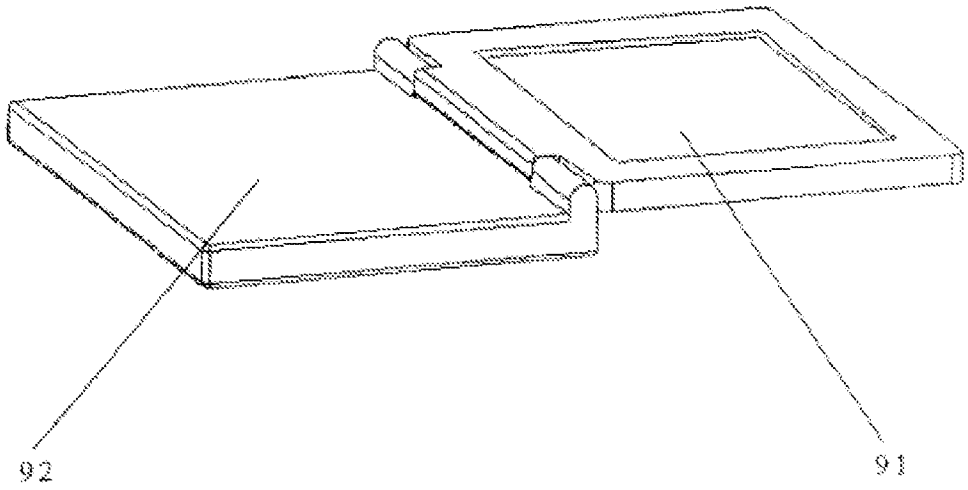


FIG. 5

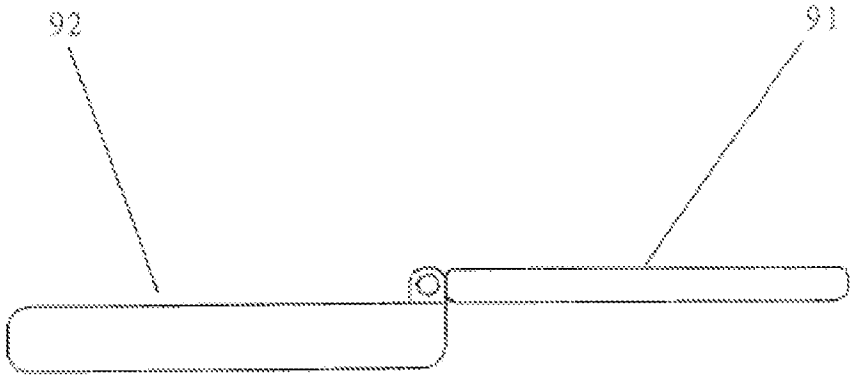


FIG. 6

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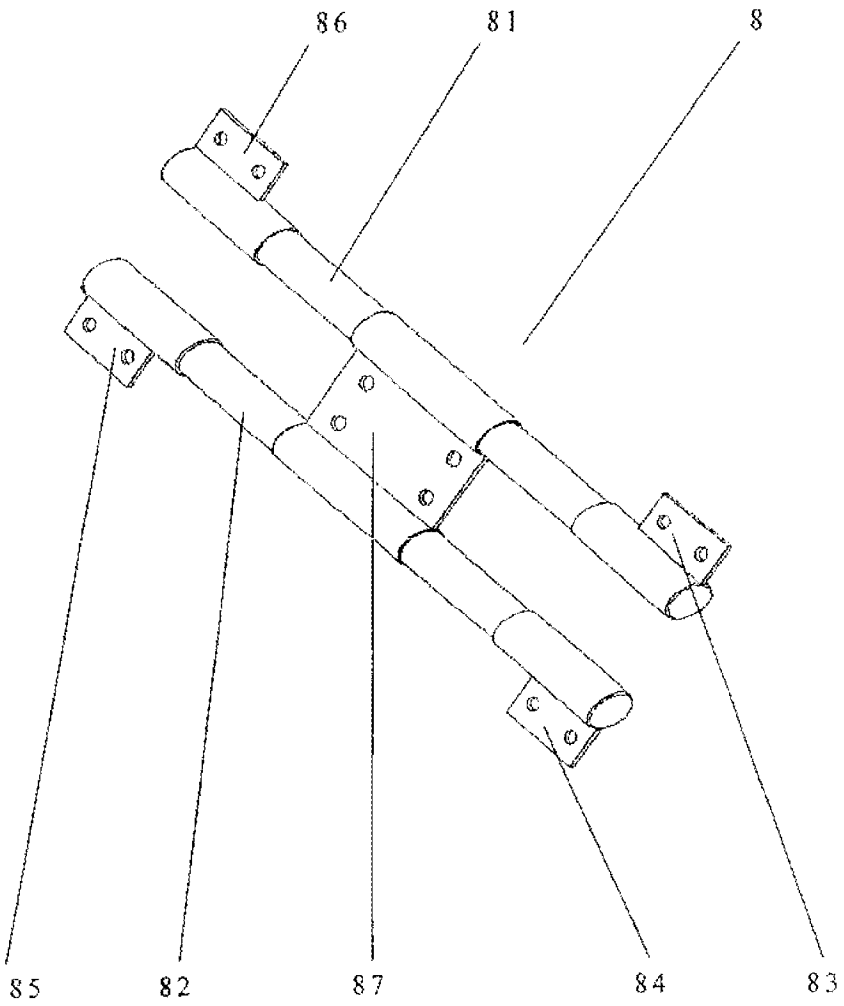


FIG. 7

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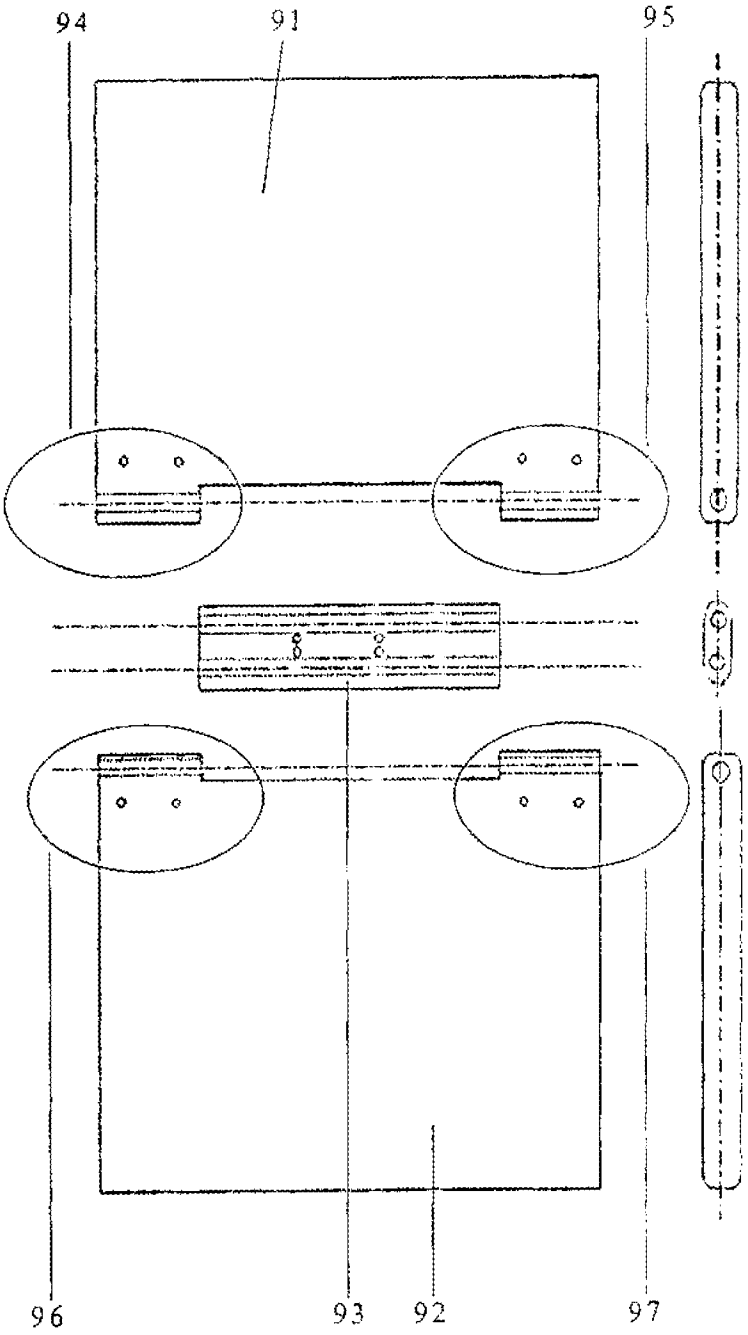


FIG. 8

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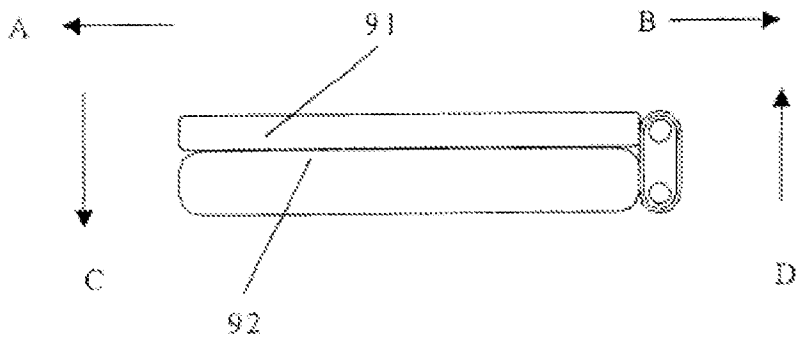


FIG. 9

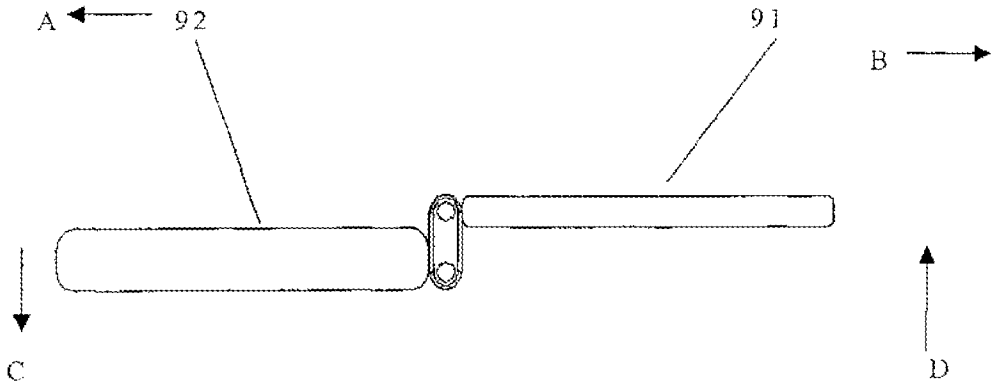


FIG. 10

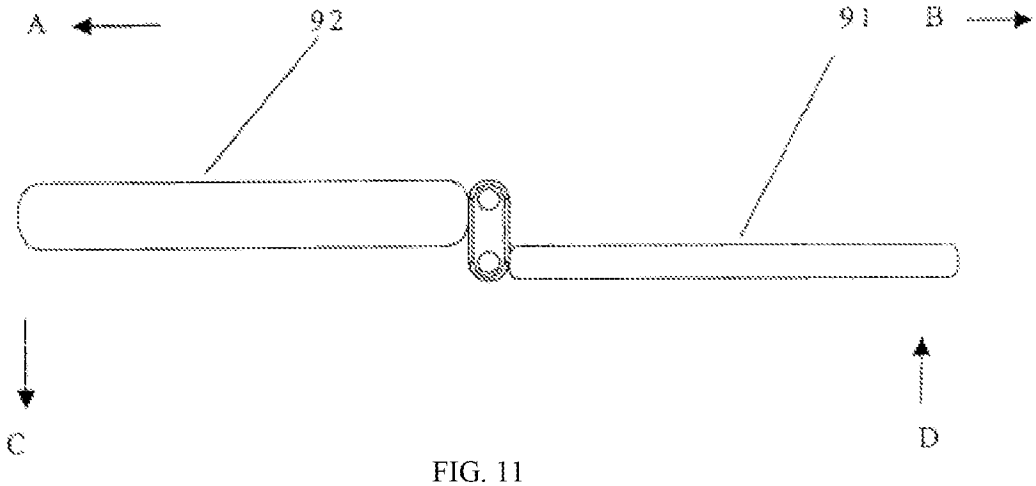


FIG. 11

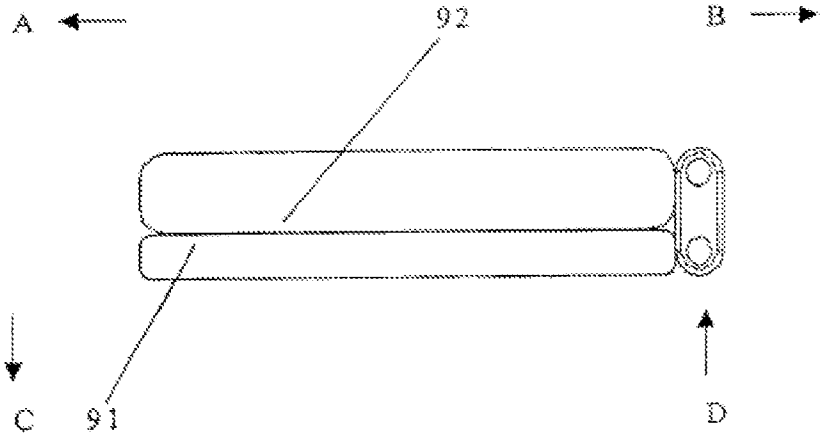


FIG. 12

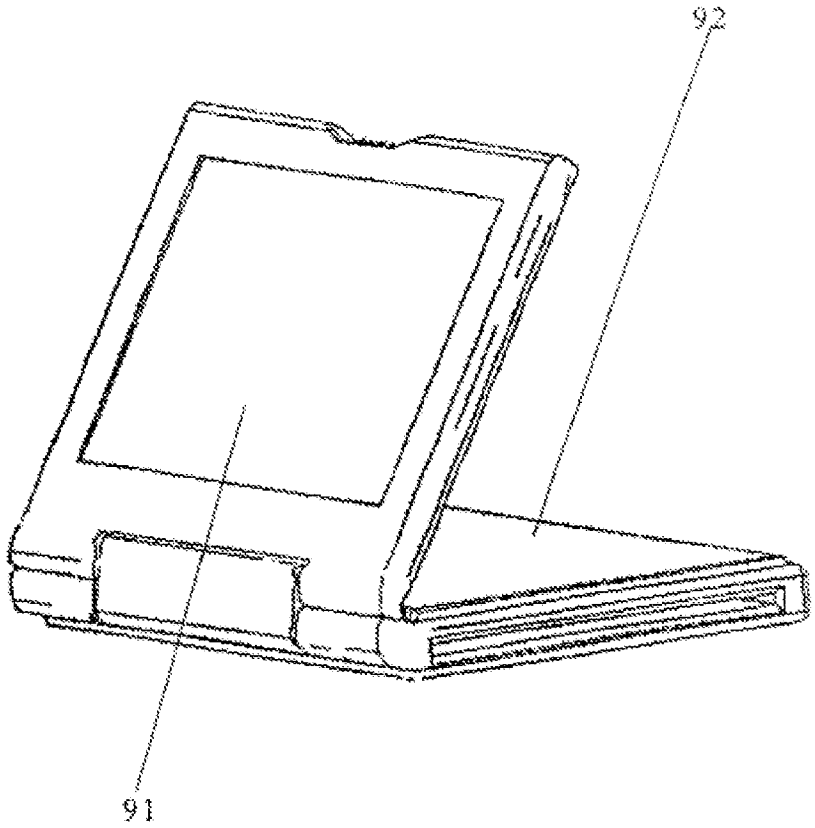


FIG. 13

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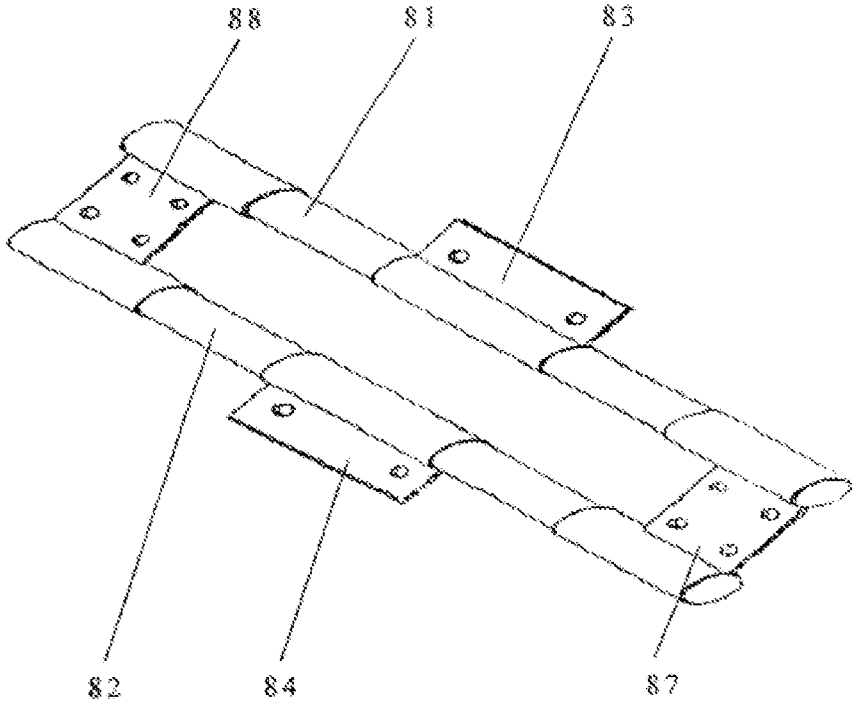


FIG. 14

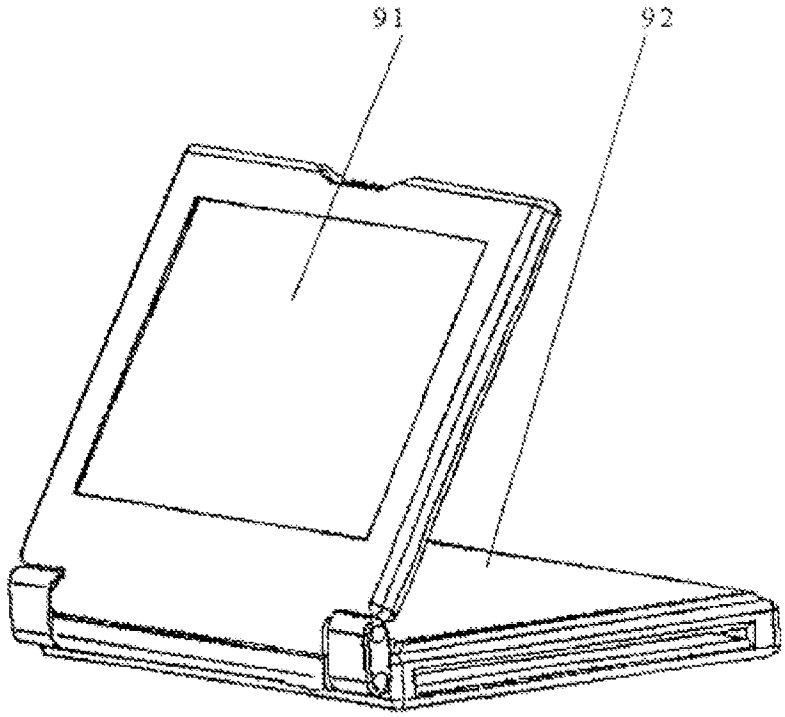


FIG. 15

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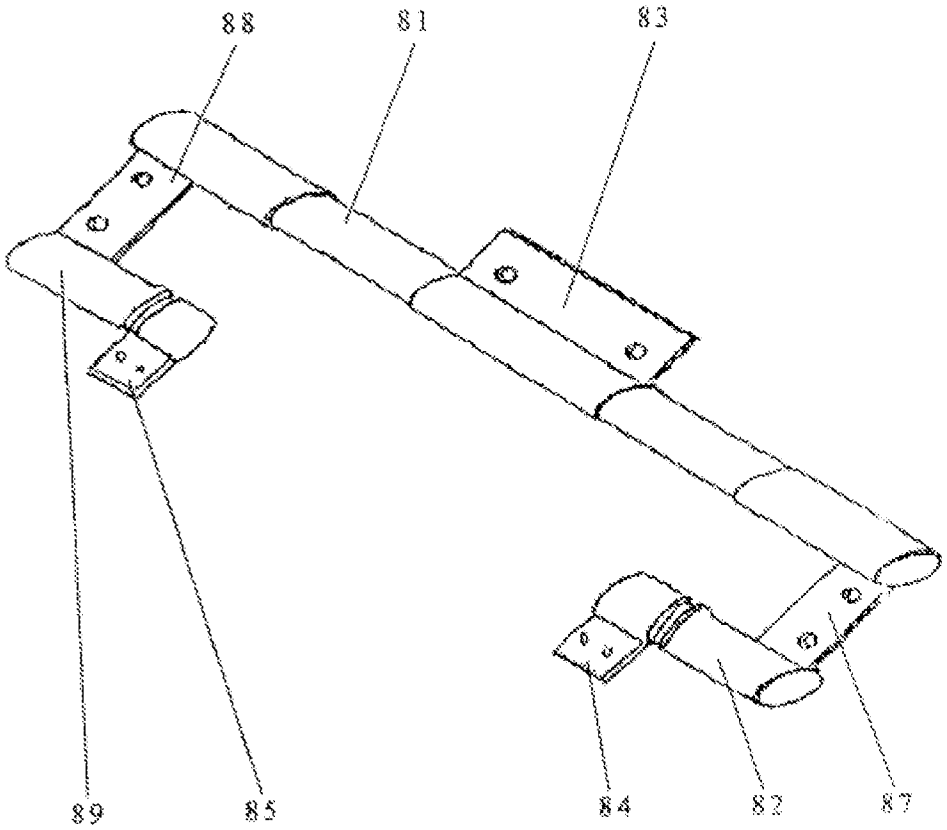


FIG. 16

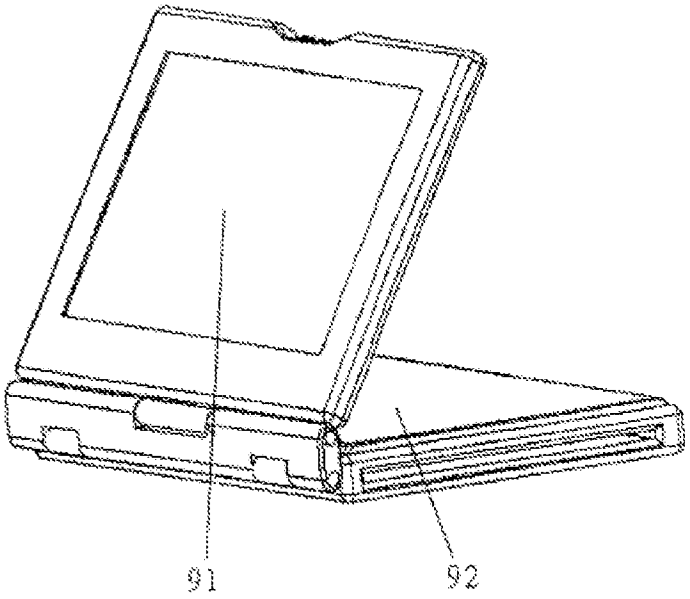


FIG. 17

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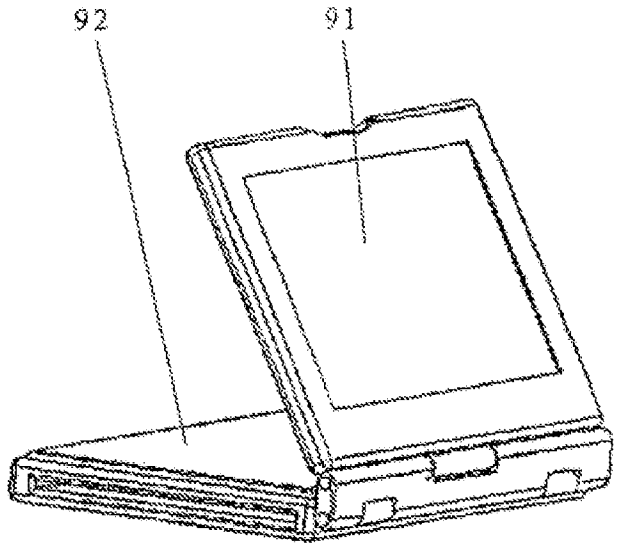


FIG. 18

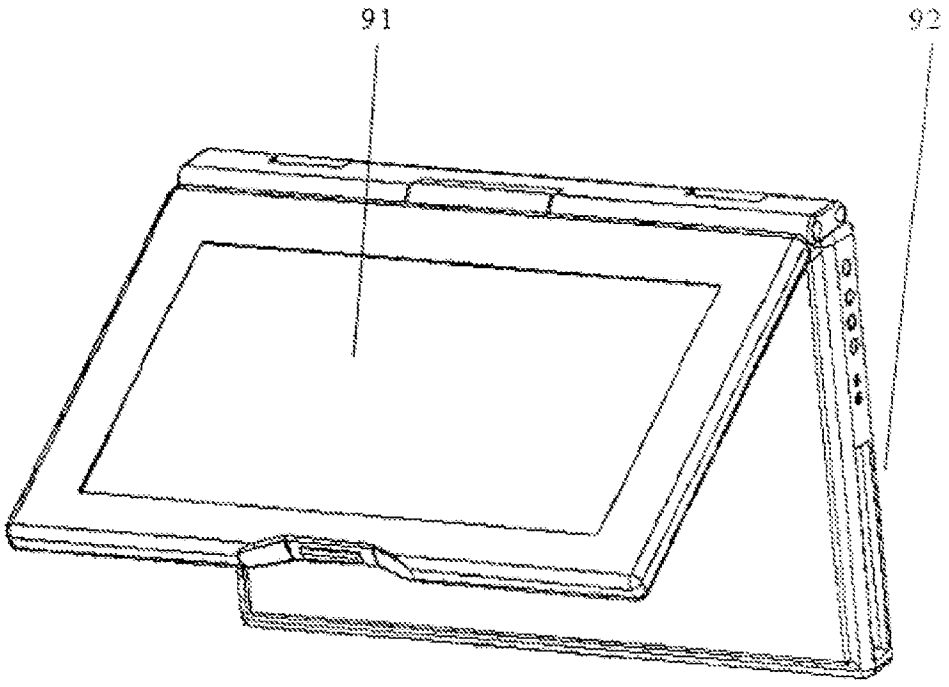


FIG. 19

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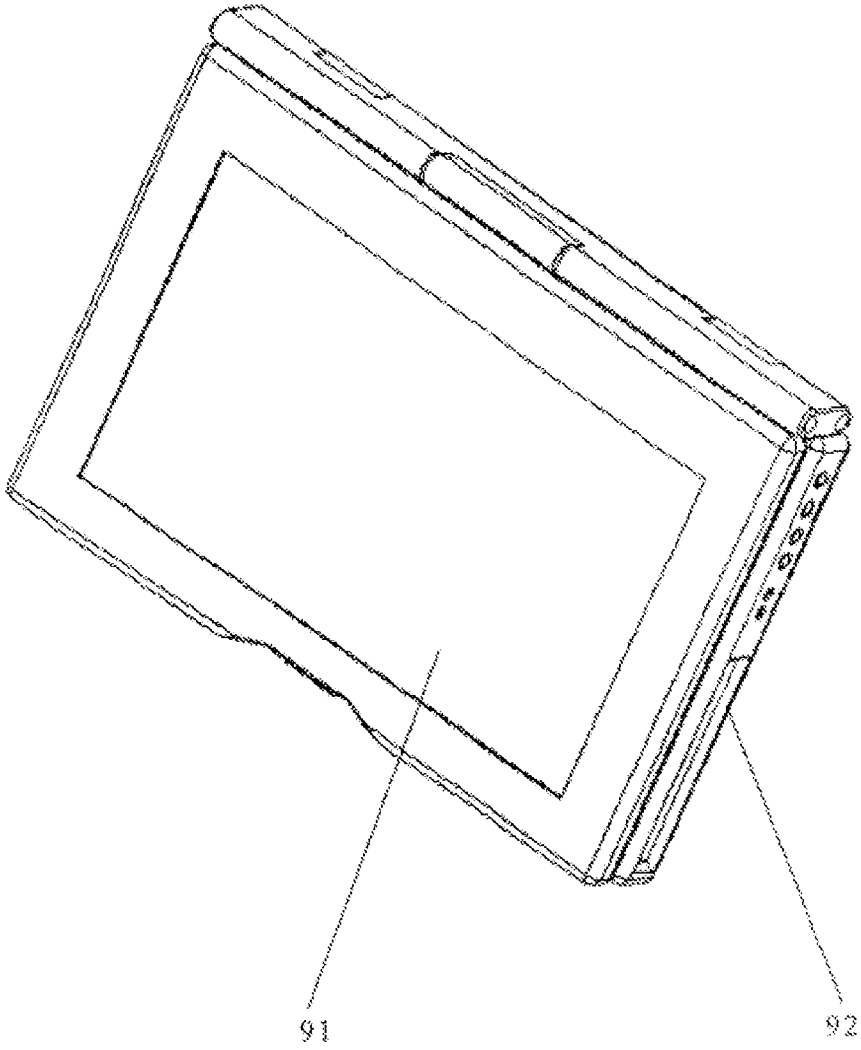


FIG. 20

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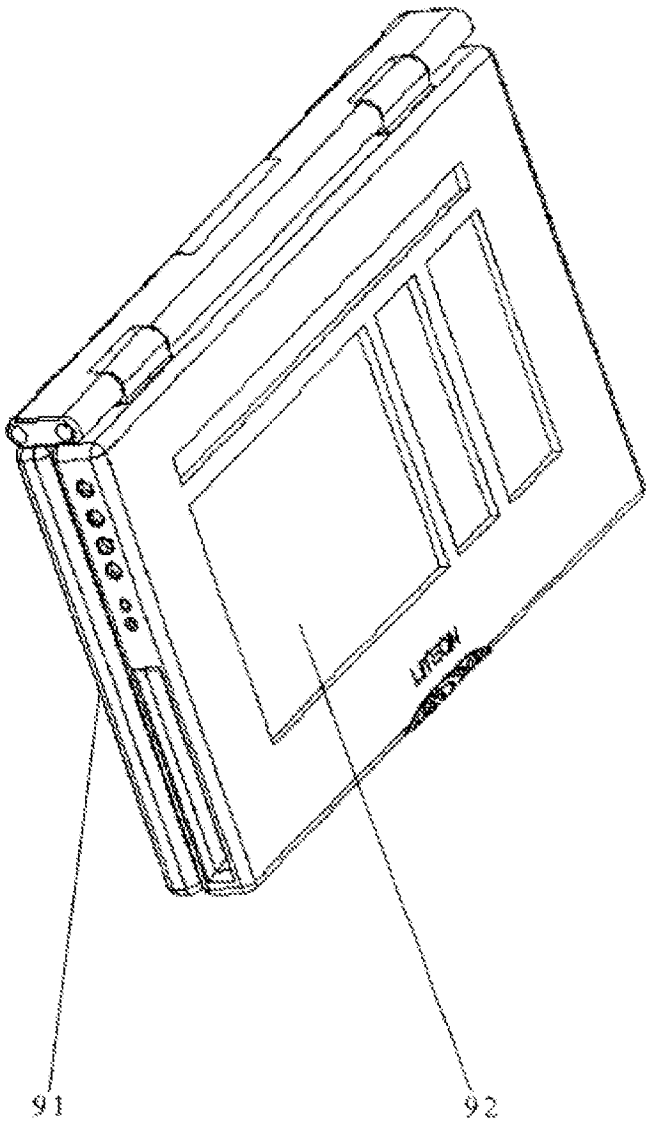


FIG. 21

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TARGEM TRANSLATIONS

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I, Xu hui, declare as follows:

1. I am over eighteen years of age and fully competent to make this affidavit. I have personal knowledge of the information contained in this affidavit, and it is true and accurate to the best of my knowledge.

2. I am a translator fluent in the Chinese and English languages.

3. I translated the Chinese patent file CN2627170Y into English and the English translation is a true and accurate translation of the Chinese patent file CN2627170Y .

I declare under penalty of perjury of the laws of the United States of America that the foregoing information is true and accurate to the best of my knowledge. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. § 1001) and may jeopardize the validity of the application or any patent issuing thereon.

Executed on: 2021.12.6 at Rm 402, Shuibing B, Dawei Vnit Dr, Yuelu District, Changsha, Hunan, China

Signed by Xu hui

Exhibit 1022

(19)日本国特許庁（ＪＰ）　(12)**公開特許公報**（Ａ）　(11)特許出願公開番号

特開平8－179851

(43)公開日　平成８年(1996)７月12日

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Ｇ０６Ｆ　1/16				
			Ｇ０６Ｆ　1/ 00　３１２　Ｆ	

審査請求　未請求　請求項の数１　ＯＬ　（全　４　頁）

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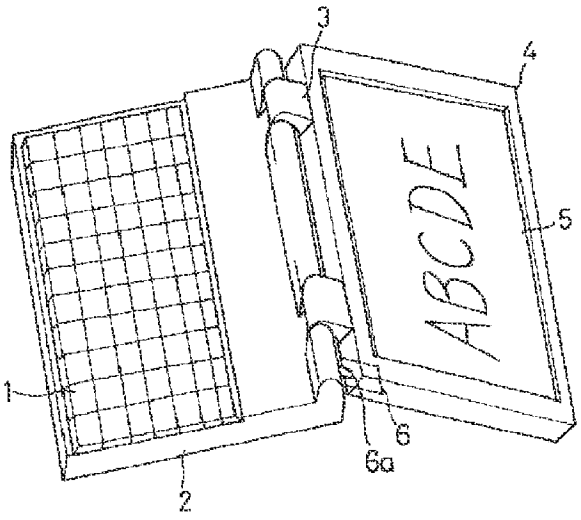
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(54)【発明の名称】　携帯型コンピュータ

(57)【要約】

【目的】　ディスプレイを大きく開くとその表示内容が１８０°回転して表示され、対面の相手側から正常な立像として見えるようにし、プレゼンテーションをしやすくした携帯型コンピュータを実現する。

【構成】　ディスプレイが蓋側に取り付けられ、キーボードが本体側に取り付けられ、開閉自在となった携帯型コンピュータであって、ディスプレイの開き角度が所定値以上になったことを検出する開き角度センサと、開き角度センサがディスプレイの開き角度が所定値以上となったのを検出したときに、ディスプレイの表示を１８０°回転させる表示処理部とを備えている。



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【特許請求の範囲】
【請求項１】　ディスプレイが蓋側に取り付けられ、キーボードが本体側に取り付けられ、開閉自在となった携帯型コンピュータにおいて、
前記ディスプレイの開き角度が所定値以上になったことを検出する開き角度センサと、
前記開き角度センサがディスプレイの開き角度が所定値以上となったのを検出したときに、前記ディスプレイの表示を１８０°回転させる表示処理部とを備えて成る携帯型コンピュータ。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】この発明はラップトップコンピュータ、ノートブック型コンピュータ、サブノート型コンピュータなどの携帯型コンピュータに関する。
【０００２】
【従来の技術】従来から、ラップトップコンピュータ、ノートブック型コンピュータ、サブノート型コンピュータなどの携帯型コンピュータが広く普及しており、客先に商談に行くときに携帯して行き、商談相手に携帯型コンピュータのディスプレイでプレゼンテーションを行ない、商談を進める形態で利用される機会も多い。
【０００３】
【発明が解決しようとする課題】ところが、従来の携帯型コンピュータでは、応接室などで対面して商談するような場合、対面の席に座っている相手にディスプレイの表示を見てもらうためにはコンピュータ本体を相手側に向くように回転させたり、相手に使用者側に来てもらっていっしょに見たりする必要があり、コンピュータを回転させて相手に見てもらっている場合には使用者がキーボードを操作してディスプレイの表示を変化させる必要があればもう一度コンピュータを使用者側に向け直す手間が掛かり、またいっしょに同じ向きに座り直してもらうのも客人相手では面倒であり、対面しながら円滑に商談を進める点で不自由があった。
【０００４】この発明はこのような従来の問題点に鑑みてなされたもので、ディスプレイを大きく開いて対面している相手に見えるようにすれば、ディスプレイの表示内容が自動的に１８０°回転して相手から見て正常な立像で見えるようにできる携帯型コンピュータを提供することを目的とする。
【０００５】
【課題を解決するための手段】この発明は、ディスプレイが蓋側に取り付けられ、キーボードが本体側に取り付けられ、開閉自在となった携帯型コンピュータにおいて、ディスプレイの開き角度が所定値以上になったことを検出する開き角度センサと、開き角度センサがディスプレイの開き角度が所定値以上となったのを検出したときに、ディスプレイの表示を１８０°回転させる表示処理部とを備えたものである。
【０００６】
【作用】この発明の携帯型コンピュータでは、対面に座わって話しているときに相手方にディスプレイの表示を見せる必要が生じたような場合、ディスプレイの取り付けられた蓋側を大きく開いて相手に見せるようにすれば、開き角度センサがそれを検出し、これによって表示処理部がそれまでのディスプレイの表示を１８０°回転させて表示するようになる。
【０００７】したがって、対面の相手にディスプレイを大きく開いて正常な表示を見せながら、使用者は反対側から本体のキーボードを通常の姿勢で操作するという使い方が可能となる。
【０００８】
【実施例】以下、この発明の実施例を図に基づいて詳説する。図１及び図２はこの発明の一実施例の携帯型コンピュータの外観を示しており、キーボード１の備えられた本体２と、この本体２に対してヒンジ３によって開閉自在に連結された蓋体４と、蓋体４に取り付けられたディスプレ５から構成されている。そして蓋体４のヒンジ側端面には蓋体４を１８０°以上に大きく開いたときにその突起部６ａが本体２の背面に当接してスイッチ動作する開き角度センサ６が設けられている。
【０００９】図３はこの実施例の携帯型コンピュータの回路構成を示しており、通常のコンピュータの構成と同じように中央演算処理装置（ＣＰＵ）７と、主メモリ８と、キーボード１からの入力操作信号をＣＰＵに対して入力処理する入力処理部９と、ＣＰＵ７からの表示データをディスプレイ５に表示させる制御を行なう表示処理部１０と、ハードディスク、フロッピーディスクなどの外部記憶装置１１を備えている。
【００１０】入力処理部９に対しては、キーボード１を接続すると共に、開き角度センサ６のセンシング信号も入力するようになっている。この開き角度センサ６は蓋体４を１８０°以上に大きく開いたときに突起部６ａが没入してスイッチ６ｂを閉じ、これによって開き角度センシング信号を入力処理部９に与える構成である。
【００１１】なお、開き角度センサ６はこの構成のものに限定されず、広く開き角度を検出する機械的手段や電気的手段を利用することができる。
【００１２】ＣＰＵ７は開き角度センサ６から開き角度センシング信号が入力されると、表示データを表示処理部１０に出力している場合に、表示データと共に１８０°回転表示指令信号も出力し、これを受けて表示処理部１０はディスプレイ５の表示をそれまでの表示状態から１８０°回転させた状態、つまり天地を逆転させた表示状態に変化させるようになっている。
【００１３】次に、上記構成の携帯型コンピュータの動作について説明する。通常の使用状態は図１に示すように蓋体４を９０°～１２０°程度に開き、ディスプレイ５の表示を見ながら、同じ向きで本体２上のキーボード

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１を操作する。

【００１４】しかしながら、客先に持ち込んでプレゼンテーションを行なうような場合には、通常、図４（ａ）に示すように使用者Ａと相手Ｂとは対面座して商談を進めるので、使用者Ａは図１に示す状態、つまりコンピュータＣの蓋体４をその中のディスプレイ５が自分の方から見える角度に開いた状態で操作し、所望の内容が表示できれば図４（ｂ）に示すように蓋体４を１８０°以上に大きく開いて相手Ｂにディスプレイの表示を見せるようにする。

【００１５】この状態では、図２に示すように、開き角度センサ６が所定角度以上に大きく開いたことを示すセンシング信号を入力処理部９に入力し、入力処理部９はＣＰＵ７にその信号を与える。

【００１６】そこで、ＣＰＵ７はそれまでの表示状態から１８０°回転させて表示させる指令を表示データと共に表示処理部１０に出力し、表示処理部１０はディスプレイ５に表示データを１８０°回転させた状態で表示させる。したがって、対面に座っている相手Ｂはディスプレイ５の表示を通常の立像となった状態で見ることができるようになる。しかもこの場合、使用者Ａはそれまでと同じ向きに座ったまま、キーボード１を操作して入力を行ない、ディスプレイ５の表示内容を変化させることができることになる。

【００１７】

【発明の効果】以上のようにこの発明によれば、通常、対面して相手方と商談を行なうが、その対面座のままコンピュータのディスプレイを相手に見える角度まで大きく開くだけで相手に正常な立像状態で表示内容を見せることができ、コンピュータを客先に持ち込み、対面に座りながら話し合い、その後、コンピュータを開いてプレゼンテーションを始めるような場合、従来のように相手に席を変わってもらったり、使用者が相手と同じ向きの席に変わったりして同じ向きからディスプレイを見、あるいはコンピュータ自体を相手側に回転させてディスプレイを見てもらうような面倒な作業をする必要がなくなり、しかも相手にディスプレイの表示を見せながら対面座からキーボードを通常と同じ姿勢で操作して表示内容を変化させることもでき、使い勝手が大幅に向上する。

【図面の簡単な説明】

【図１】この発明の一実施例の通常の使用状態の斜視図。

【図２】上記実施例のディスプレイを大きく開いた状態での表示状態を示す斜視図。

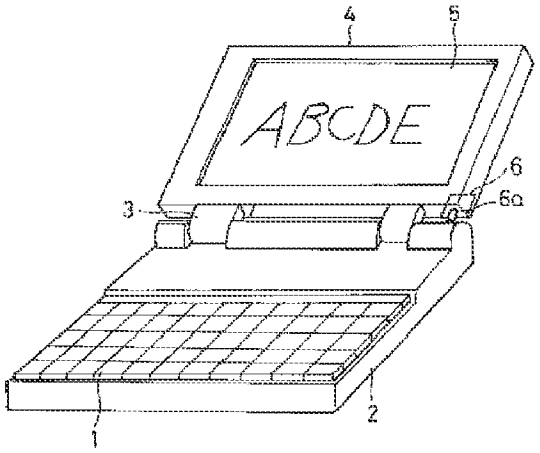
【図３】上記実施例の回路ブロック図。

【図４】上記実施例の使用説明図。

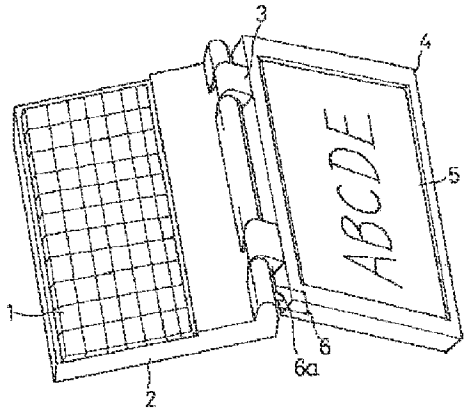
【符号の説明】

１　キーボード
２　本体
３　ヒンジ
４　蓋体
５　ディスプレイ
６　開き角度センサ
６ａ　突起部
６ｂ　スイッチ
７　ＣＰＵ
８　主メモリ
９　入力処理部
１０　表示処理部
１１　外部記憶装置
Ａ　使用者
Ｂ　相手
Ｃ　コンピュータ

【図１】

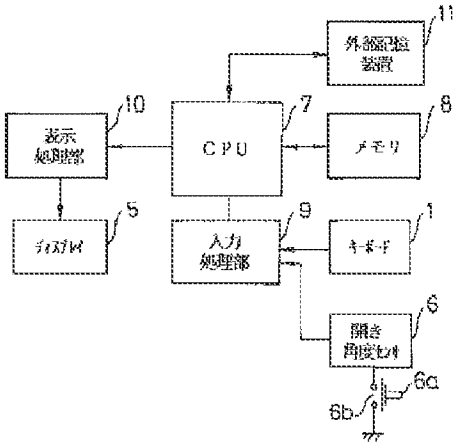


【図２】

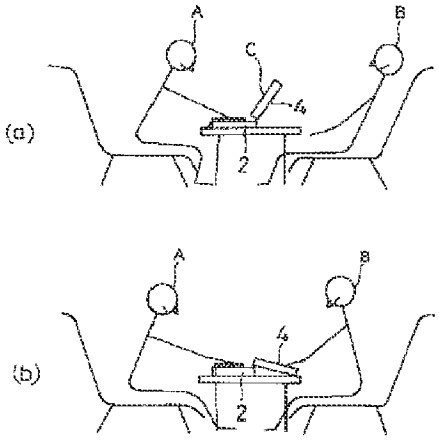


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【図３】



【図４】



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Exhibit 1023

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(54) TITLE OF THE INVENTION: Portable Computer

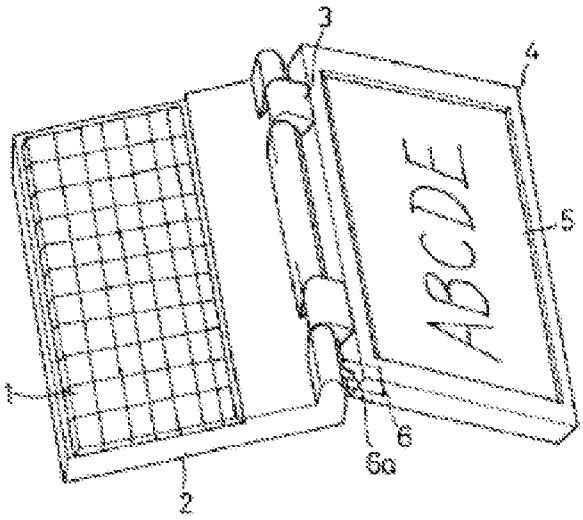
(57) ABSTRACT

PURPOSE: To achieve a portable computer, whereby the content presented on the display is rotated by 180 degrees when the user opens the display wide so that the other party who is seated face-to-face with the user can view the displayed image at the properly erected angle, thereby making it easier to provide presentations.

CONSTITUENT ELEMENTS: A freely openable/closable portable computer that comprises a display attached to the lid side and a keyboard attached to the main-body side, said portable computer being provided with:

An opening-angle sensor that detects when the opening angle of the display reaches a predetermined value or goes beyond the predetermined value; and

A display processing part that rotates the contents presented on the display by 180 degrees when said opening-angle sensor detects that the opening angle of the display has reached the predetermined value or goes beyond the predetermined value.



WHAT IS CLAIMED IS:

CLAIM 1

A freely openable/closable portable computer that comprises a display attached to the lid side and a keyboard attached to the main-body side, said portable computer being provided with:

An opening-angle sensor that detects when the opening angle of the display reaches a predetermined value or goes beyond the predetermined value; and

A display processing part that rotates the contents presented on the display by 180 degrees when said opening-angle sensor detects that the opening angle of the display has reached the predetermined value or goes beyond the predetermined value.

DETAILED DESCRIPTION OF THE INVENTION

[0001]

FIELD OF INDUSTRIAL APPLICATION

The present invention pertains to portable computers, such as laptop computers, notebook computers, subnotebook computers, and the like.

[0002]

PRIOR ART

Conventionally, portable computers, such as laptop computers, notebook computers, subnotebook computers, and the like, have been popular in a wide range of applications. In many occasions, the users carry such portable computers with them to business negotiations with their customers and use the displays of the portable computers to provide presentations to the customers as a part of the business negotiations.

[0003]

PROBLEMS TO BE RESOLVED BY THE INVENTION

However, conventional portable computers do not provide enough flexibility and convenience to facilitate smooth business negotiations when such negotiations are carried out by parties sitting across a table from each other. For instance, when a user negotiates a business deal with another party sitting face-to-face across a table in a conference room, or the like, the user needs to turn the main body of the computer around toward the other party, or have the other party move to the user's side of the table. In the former case, in which the user turns the computer around to the other side of the table so that the other party can see the display, it is time-consuming because the user has to change the display setting of the screen through the operation of the keyboard, and then turn the computer back toward him- or herself after he or she finished showing the screen to the other party. Or, in the latter case, in which the user and the other party view the screen together on the same side of the table, it is cumbersome to ask the other party to move to the user's side and sit next to him or her – especially when the other party is a customer.

[0004] This invention was arrived at in view of such conventional problems, and therefore is intended to provide a portable computer that automatically rotates the contents presented on the display by 180 degrees when the user opens the display wide so that the other party across the table can see the displayed images at the properly erected angle.

[0005]

MEANS FOR ACHIEVING THE OBJECTIVE

This invention claims a freely openable/closable portable computer that comprises a display attached to the lid side, and a keyboard attached to the main-body side, said portable computer being provided with:

> An opening-angle sensor that detects when the opening angle of the display reaches a predetermined value or goes beyond the predetermined value; and
>
> A display processing part that rotates the contents presented on the display by 180 degrees when said opening-angle sensor detects that the opening angle of the display has reached the predetermined value or goes beyond the predetermined value.

[0006]

OPERATION OF THE INVENTION

With the portable computer according to the present invention, when it becomes necessary to show a content on the display to the other party who is sitting face-to-face across the table during a conversation, the user only needs to open the lid side (to which the display is attached) wide enough for the other party to be able to see the display because

the opening-angle sensor will detect such an action, whereupon the display processor is caused to rotate the contents, which have been presented on the display, by 180 degrees.

[0007] This makes it possible for the user to open the display wide so as to show a normal display to the other party across the table while operating the keyboard on the main body in a normal posture from the other side of the table.

[0008]

WORKING EXAMPLE

The following is a detailed explanation of a working example of the present invention with reference to drawings: The Figures 1 and 2 show exterior appearances of the portable computer according to a working example of the present invention, which comprises:

A main body 2 that is provided with a keyboard 1;

A lid 4 that is coupled to said main body 2 with hinges 3 in such a way that the lid 4 can be freely opened and closed; and

A display 5 that is attached to the lid 4.

Furthermore, an opening-angle sensor 6 is provided on the hinge-side end surface of the lid 4 in such a way that the protrusion 6a comes into contact with the back side of the main body 2 and thereby actuates a switch operation when the lid 4 is opened to an angle equal to or greater than 180 degrees.

[0009] Figure 3 shows a circuit configuration of the portable computer according to the present working example. Similar to the configuration in a regular computer, it is provided with the following elements:

A central processing unit (CPU) 7;

A main memory 8;

An input processing part 9 that performs the input processing of input-operation signals (which are obtained from the keyboard 1) into the CPU;

A display processing part 10 that performs the control operation so as to cause the display data from the CPU 7 to be displayed on the display 5; and

An external storage 11, such as a hard disk, a floppy disk, or the like.

[0010] The keyboard 1 is connected to the input processing unit 9; and sensing signals from the opening-angle sensor 6 are input into the input processing unit 9 as well. The opening-angle sensor 6 is configured so that, when the lid 4 is opened to an angle equal to or greater

than 180 degrees, the projection 6a is retracted so as to close the switch 6b, thereby providing an opening-angle sensing signal to the input processing unit 9.

[0011] It should be noted that the opening-angle sensor 6 is not limited to this configuration, but may be configured with the use of a mechanical or electric means that detects a wide opening-angle.

[0012] Upon the input of the opening-angle sensing signal from the opening-angle sensor 6, the CPU 7 will output a 180°-rotation display command signal together with the display data if the display data is currently output to the display processing unit 10. In response thereto, the display processing unit 10 changes the view on the display 5 to a state in which the view is rotated by 180 degrees from the previous display state, i. e., a state in which the display is inverted upside down.

[0013] Next is an explanation of an operation of the portable computer having the above-described configuration. In the state for regular use, the user opens the lid 4 to an angle of approximately 90 to 120 degrees as shown in Figure 1, and operates the keyboard 1 on the main body 2, doing so while looking at the display 5 in the same direction.

[0014] However, in cases the portable computer is used for a presentation at a customer's location, the user A and the other party B typically sit face-to-face across a table as they negotiate a business deal as shown in Figure 4(a). Accordingly, the user A operates the portable computer in the state shown in Figure 1, i.e., in the state in which the lid 4 of the computer C is opened to an angle that allows the user A to see the display 5 in the lid 4, so as to display desired contents on the screen. And, once the desired contents are displayed on the display 5, the user A opens the lid 4 wider to an angle equal to or greater than 180 degrees as shown in Figure 4(b) so that the other party B can see the contents presented on the display.

[0015] In this state, the opening-angle sensor 6 inputs a sensing signal, which indicates that the angle has opened to an angle equal to or greater than a predetermined angle as shown in Figure 2, into the input processing unit 9; and the input processing unit 9 provides said signal to the CPU 7.

[0016] Then, the CPU 7 outputs a command for rotating the display view by 180 degrees from the previous display state, to the display processing unit 10 together with the display data, whereupon the display processing unit 10 displays the display data on the display 5 in a state in which the display data is rotated by 180 degrees. Thus, the other party B sitting across the table can view the image on the display 5 at the normally erected angle. Moreover, in this case, the user A can make changes to the contents on the display 5 by operating the keyboard 1 while he or she remains seated on the same chair facing the same direction as before.

[0017]

EFFECT OF THE INVENTION

As described above, business negotiations are typically performed by two parties sitting face-to-face across a table. However, according to the present invention, it becomes possible to allow the other party to view the displayed images at the properly erected angle, doing so simply by opening the computer display wide enough that the other party can see the screen — while both parties remain seated across the table. Accordingly, for example, in the case that the user brings a computer with him or her to a customer's location and opens the computer to start a presentation after having some discussions with the customer while both parties are seated face-to-face across a table, it is no longer necessary for the user to perform troublesome work as required by the prior art, such as asking the other party to change his or her seat, moving to a different seat on the same side as the other party, or turning the whole computer around toward the other party's side so that the other party can see the display. Moreover, with the portable computer according to the present invention, the user can make changes to the displayed contents through the operation of the keyboard in the same posture as usual, doing so while showing the content presented on the display to the other party as both parties remain seated on their own seats across the table. As such, the usability is greatly improved.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a perspective view of a working example of the present invention in its regular usage state.

Figure 2 shows a perspective view of the display state of the aforementioned working example in the state in which the display is opened wide.

Figure 3 shows a circuit block diagram of the aforementioned working example.

Figure 4 shows a schematic diagram that illustrates the use of the aforementioned working example.

DESCRIPTION OF REFERENCE CODING

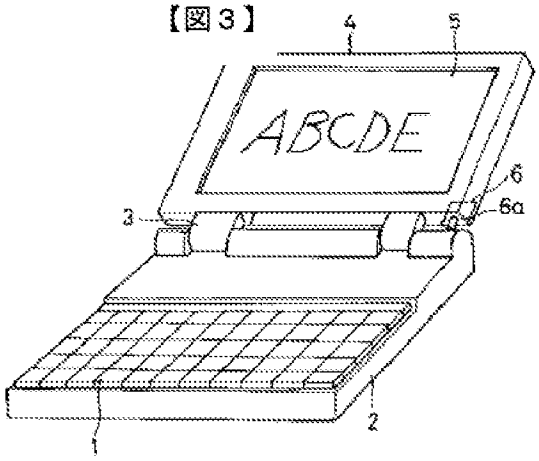
1 Keyboard
2 Main Part
3 Hinge
4 Lid Body
5 Display
6 Opening-angle Sensor
6a Projection
6b Switch

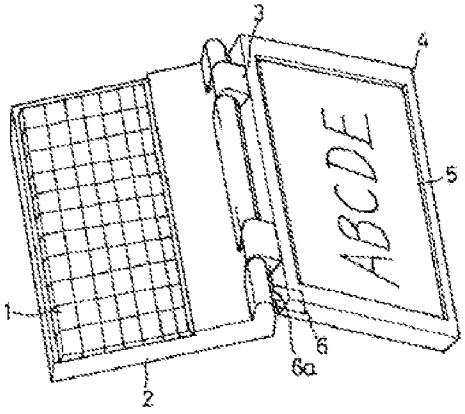
7 CPU
8 Main Memory
9 Input Processing Part
10 Display Processing Part
11 External Storage
A User
B Other party
C Computer

【図１】 1]

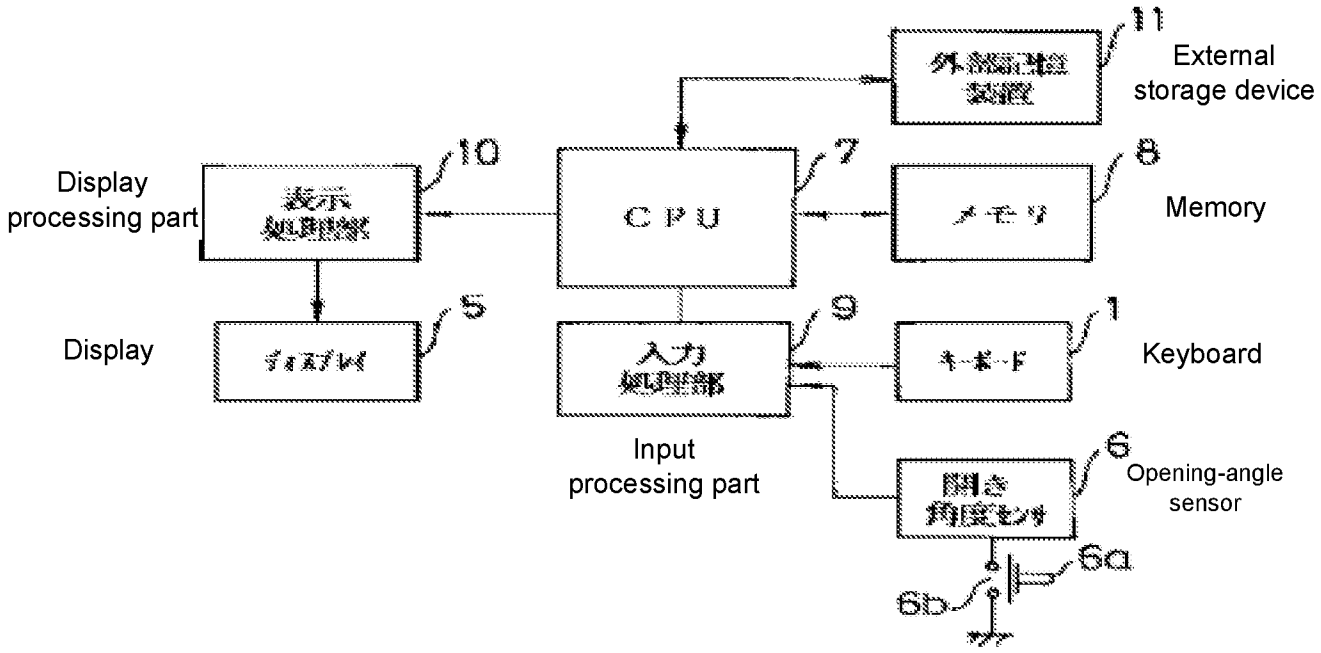
【図２ 2]

【図３】



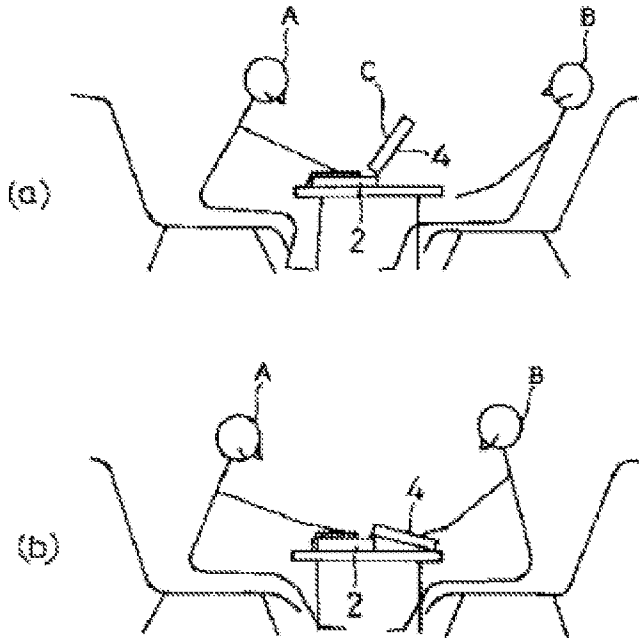


[Figure 3]


11
External storage device
10
Display processing part
7
CPU
8
Memory
5
Display
9
1
Keyboard
Input processing part
6
Opening-angle sensor
6a
6b

【図４】

[Figure 4]


A
B
C
4
2
(a)
A
B
4
2
(b)

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1. I, Yukie Hirose, hereby certify that I am a professional translator with over 20 years of experience, am fluent in both Japanese and English, and am competent to translate from Japanese into English.

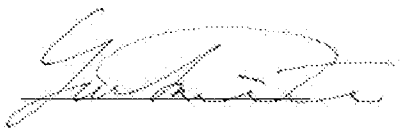
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Executed on: 1/31/2021

Signed: 

Ms. Yukie Hirose

Exhibit 1010

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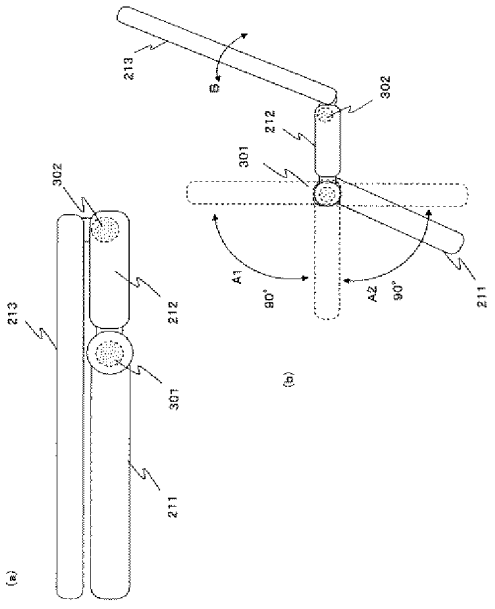
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(54)【発明の名称】情報処理装置

(57)【要約】
【課題】　ノート型ＰＣ等の情報処理装置をユーザの使用スタイルに応じた様々な形状へ変更可能とするとともに、操作性、ディスプレイの視認性を向上させた情報処理装置を提供する。
【解決手段】　ノート型ＰＣ等の情報処理装置を、ディスプレイユニットと、データ入力部を備えた本体ユニットと、連結ユニットとの３ユニット構成とし、連結ユニットを本体ユニットおよびディスプレイユニット各々に対して枢軸部を介して連結し、各接続ユニットが相互に回動可能な構成とした。連結ユニットは、本体ユニットに対して少なくとも一方向に９０度以上回転可能な構成を有する。本構成により、ユーザによるキーボード入力の操作性や、ディスプレイの視認性を損なうことのない快適な利用が可能となる情報処理装置が実現される。
【選択図】　図２



【特許請求の範囲】
【請求項1】
ディスプレイを備えたディスプレイユニットと、
データ入力部を備えた本体ユニットと、
前記本体ユニットおよび前記ディスプレイユニット間に位置し、前記本体ユニットおよび前記ディスプレイユニット各々に対して枢軸部を介して連結され、前記本体ユニットおよび前記ディスプレイユニット各々に対して回動可能な連結ユニットとを有し、
前記本体ユニットは、前記連結ユニットに対して少なくとも一方向に９０度以上回転可能な構成を有することを特徴とする情報処理装置。
【請求項2】
前記本体ユニットは、
前記連結ユニットに対して少なくとも一方向に１８０度回転可能な構成を有することを特徴とする請求項１に記載の情報処理装置。
【請求項3】
前記本体ユニットは、
前記連結ユニットに対して双方向に各々９０度以上回転可能な構成を有することを特徴とする請求項１に記載の情報処理装置。
【請求項4】
前記情報処理装置は、
前記本体ユニットのデータ入力部形成面を下面とし、前記連結ユニットおよび前記ディスプレイユニットを前記本体ユニットから上方に伸びる方向に設定した状態において安定して載置可能な構成を有することを特徴とする請求項１に記載の情報処理装置。
【請求項5】
前記情報処理装置は、
前記連結ユニットの一面を下面とし、前記本体ユニットおよび前記ディスプレイユニットを前記連結ユニットから上方に伸びる方向に設定した状態において安定して載置可能な構成を有することを特徴とする請求項１に記載の情報処理装置。
【請求項6】
前記連結ユニットと、前記本体ユニットとを相互に回動可能とした枢軸部は、
前記連結ユニットまたは前記本体ユニットのいずれかに一体化して構成されたユニット延長部に回動軸中心を持つ構成であり、前記ユニット延長部は、ユニット延長部の構成されたユニットのユニット面に対して平行に伸びる構成を有することを特徴とする請求項１に記載の情報処理装置。
【請求項7】
前記連結ユニットと、前記本体ユニットとを相互に回動可能とした枢軸部は、
前記連結ユニットまたは前記本体ユニットのいずれかに一体化して構成されたユニット延長部に回動軸中心を持つ構成であり、前記ユニット延長部は、ユニット延長部の構成されたユニットのユニット面から離間する方向に伸びる構成を有することを特徴とする請求項１に記載の情報処理装置。
【請求項8】
前記連結ユニットと、前記本体ユニットとを相互に回動可能とした枢軸部は、
前記連結ユニット、および前記本体ユニット双方のユニット面上またはユニット面から離間した位置に回動軸中心を設定した構成であることを特徴とする請求項１に記載の情報処理装置。
【請求項9】
前記ディスプレイユニット、および前記本体ユニット、および前記連結ユニットを相互に回動可能に連結する枢軸部は、
任意の角度に設定された各ユニットを設定角度において維持可能な保持強度を持つ構成であることを特徴とする請求項１に記載の情報処理装置。

【請求項10】
前記連結ユニットは、
電子部品を搭載した構成であることを特徴とする請求項１に記載の情報処理装置。
【請求項11】
前記連結ユニットは、
前記本体ユニットまたは前記ディスプレイユニットとのデータ転送に適用する着脱可能なコネクタ部を有することを特徴とする請求項１０に記載の情報処理装置。
【請求項12】
前記電子部品は、
キーボード、ディスプレイ、スピーカ、メモリ、メモリ装着部、バッテリー、タッチパッド、ポインティングデバイス、方向入力キー、テンキーの少なくともいずれかを含む構成であることを特徴とする請求項１０または１１に記載の情報処理装置。
【発明の詳細な説明】
【技術分野】
【0001】
本発明は、情報処理装置に関する。特に、ディスプレイおよびキーボード等の入力部を有する例えばノート型ＰＣ等の情報処理装置をユーザの使用スタイルに応じた様々な形状へ変更可能とし、ユーザによる操作性の向上、ディスプレイの視認性の向上、さらに収納のし易い構成を実現した情報処理装置に関する。
【背景技術】
【0002】
昨今、パーソナルコンピュータ（ＰＣ）等、情報処理装置の小型化が進み、特に、ノートブック型ＰＣにおいては、多くの薄型化、軽量化された製品が開発されている。一般的に、ノートブック型のＰＣは、例えば液晶ディスプレイからなるディスプレイユニットと、キーボードを備えた本体ユニットとが折り曲げ可能な構成を有し、携帯時には折り曲げた状態とし、使用時にはディスプレイユニットをキーボード部を持つ本体ユニットに対してほぼ直立、あるいは９０～１２０度の角度に設定した状態において使用する。
【0003】
このように、従来の一般的なノート型ＰＣは、キーボード部を持つ本体ユニットとディスプレイユニットの相対的角度を調整することが可能な構成を持つのみである。このような構成の場合、机の上にノートＰＣを置いて利用する場合には問題がないが、例えば膝の上にＰＣを載せて操作する場合や、ソファーや床に寝転んで操作する場合、あるいは片手で持ちながら操作するといった場合には、キーボード入力等の操作が困難になり、またディスプレイが見えにくくなるなどという問題がある。
【0004】
ノート型ＰＣの操作性、視認性を向上させることを目的として提案された構成として例えば特許文献１に記載の構成がある。特許文献１に記載の構成は、図１に示すように、ディスプレイ１０１と本体ケース１１０を有し、本体ケース１１０を前方本体ケース１１１と後方本体ケース１１２に分割し、両者をヒンジ１２０によって結合し、前方本体ケース１１１と後方本体ケース１１２の突合せ部、すなわちヒンジ部１２０を持ち上げて、前方本体ケース１１１を水平面から１０～１５度、傾けた態で保持可能とした構成が示されている。
【0005】
このように、特許文献１に記載の構成は、ヒンジ部１２０を持ち上げた状態で保持することで、キーボード部が構成された前方本体ケース１１１を１０～１５度前方に傾けて固定させ、ユーザのキーボード入力の操作性を向上させたものである。
【0006】
特許文献１に記載の構成により、ある程度、ユーザの操作性を向上させることはできる。しかし、この構成は、キーボードの角度を水平面に対して０～１５度程度の範囲で設定することを可能としているのみであり、一般的なＰＣの利用形態、すなわち机上にＰＣを置いて利用するという利用形態の範囲の中での操作性向上を図っているに過ぎないもので

ある。
【0007】
特許文献１の構成は、例えば、ＰＣを片手で持ちながらもう一方の手でキーボード入力する場合や、ＰＣをＴＶとして使用する場合、ソファーや床に寝転んで操作する場合、狭い棚にＰＣを操作可能な状態で置く場合や、ＰＣを立てたまま収納する場合など、様々な利用形態に対応してなされたものではなく、このような利用形態とした場合には、特許文献１の構成によっても、キーボート入力の操作困難性や、ディスプレイが見えにくくなるという問題、収納不可能となるといった問題は解決されない。
【特許文献1】特開平５－１０８２２８号公報
【発明の開示】
【発明が解決しようとする課題】
【0008】
本発明は、このような状況に鑑みてなされたものであり、ディスプレイおよびキーボード等の入力部を有する例えばノート型ＰＣ等の情報処理装置をユーザの使用スタイルに応じた様々な形状へ変更可能とし、ユーザによる操作性を向上させ、またディスプレイの視認性を向上させ、収納のし易い情報処理装置を提供することを目的とする。
【0009】
例えば、ＰＣをＴＶとして使用したり、ソファーや床に寝転んで操作する場合、狭い棚にＰＣを操作可能な状態で置くといった、様々な利用形態において、操作性、ディスプレイの視認性を損なうことなく利用可能な構成とするとともに、ＰＣを立てたまま収納可能とするなど、様々な利用形態に対応した構成を持つ情報処理装置を提供することを目的とする。
【課題を解決するための手段】
【0010】
本発明の第１の側面は、
ディスプレイを備えたディスプレイユニットと、
データ入力部を備えた本体ユニットと、
前記本体ユニットおよび前記ディスプレイユニット間に位置し、前記本体ユニットおよび前記ディスプレイユニット各々に対して枢軸部を介して連結され、前記本体ユニットおよび前記ディスプレイユニット各々に対して回動可能な連結ユニットとを有し、
前記本体ユニットは、前記連結ユニットに対して少なくとも一方向に９０度以上回転可能な構成を有することを特徴とする情報処理装置にある。
【0011】
さらに、本発明の情報処理装置の一実施態様において、前記本体ユニットは、前記連結ユニットに対して少なくとも一方向に１８０度回転可能な構成を有することを特徴とする。
【0012】
さらに、本発明の情報処理装置の一実施態様において、前記本体ユニットは、前記連結ユニットに対して双方向に各々９０度以上回転可能な構成を有することを特徴とする。
【0013】
さらに、本発明の情報処理装置の一実施態様において、前記情報処理装置は、前記本体ユニットのデータ入力部形成面を下面とし、前記連結ユニットおよび前記ディスプレイユニットを前記本体ユニットから上方に伸びる方向に設定した状態において安定して載置可能な構成を有することを特徴とする。
【0014】
さらに、本発明の情報処理装置の一実施態様において、前記情報処理装置は、前記連結ユニットの一面を下面とし、前記本体ユニットおよび前記ディスプレイユニットを前記連結ユニットから上方に伸びる方向に設定した状態において安定して載置可能な構成を有することを特徴とする。
【0015】

さらに、本発明の情報処理装置の一実施態様において、前記連結ユニットと、前記本体ユニットとを相互に回動可能とした枢軸部は、前記連結ユニットまたは前記本体ユニットのいずれかに一体化して構成されたユニット延長部に回動軸中心を持つ構成であり、前記ユニット延長部は、ユニット延長部の構成されたユニットのユニット面に対して平行に伸びる構成を有することを特徴とする。

【0016】

さらに、本発明の情報処理装置の一実施態様において、前記連結ユニットと、前記本体ユニットとを相互に回動可能とした枢軸部は、前記連結ユニットまたは前記本体ユニットのいずれかに一体化して構成されたユニット延長部に回動軸中心を持つ構成であり、前記ユニット延長部は、ユニット延長部の構成されたユニットのユニット面から離間する方向に伸びる構成を有することを特徴とする。

【0017】

さらに、本発明の情報処理装置の一実施態様において、前記連結ユニットと、前記本体ユニットとを相互に回動可能とした枢軸部は、前記連結ユニット、および前記本体ユニット双方のユニット面上またはユニット面から離間した位置に回動軸中心を設定した構成であることを特徴とする。

【0018】

さらに、本発明の情報処理装置の一実施態様において、前記ディスプレイユニット、および前記本体ユニット、および前記連結ユニットを相互に回動可能に連結する枢軸部は、任意の角度に設定された各ユニットを設定角度において維持可能な保持強度を持つ構成であることを特徴とする。

【0019】

さらに、本発明の情報処理装置の一実施態様において、前記連結ユニットは、電子部品を搭載した構成であることを特徴とする。

【0020】

さらに、本発明の情報処理装置の一実施態様において、前記連結ユニットは、前記本体ユニットまたは前記ディスプレイユニットとのデータ転送に適用する着脱可能なコネクタ部を有することを特徴とする。

【0021】

さらに、本発明の情報処理装置の一実施態様において、前記電子部品は、キーボード、ディスプレイ、スピーカ、メモリ、メモリ装着部、バッテリー、タッチパッド、ポインティングデバイス、方向入力キー、テンキーの少なくともいずれかを含む構成であることを特徴とする。

【発明の効果】

【0022】

本発明の構成によれば、ディスプレイおよびキーボード等の入力部を有する例えばノート型ＰＣ等の情報処理装置において、ユーザの使用スタイルに応じた様々な形状へ変更することが可能となる。また、設定できる形状のバリエーションが多く、ユーザによるキーボード入力の操作性や、ディスプレイの視認性を損なうことのない快適な利用が可能となる情報処理装置が実現される。

【0023】

本発明の構成によれば、本体ユニットと、連結ユニットは一方向に少なくとも９０度回転可能な構成であり、設定可能な形状のバリエーションが豊富となり、片手で把持してもう一方の手でキーボート入力を行うといった利用形態や、ソファーや床に寝転んで操作する場合、狭い棚にＰＣを操作可能な状態で置くといった、様々な利用形態において、操作性、ディスプレイの視認性を損なうことなく快適な利用を実現する構成が提供される。さらに、立てたまま収納可能となるなど、様々な利用形態、収納形態に対応した構成を持つ情報処理装置が実現される。

【発明を実施するための最良の形態】

【0024】

以下、図面を参照しながら本発明の情報処理装置の詳細について説明する。

【実施例】

【0025】

図２は、本発明の実施例１に係る情報処理装置の断面図を示している。（ａ）が情報処理装置を閉じたクローズ状態の構成、（ｂ）がオープン状態の構成および動きを説明する図である。

【0026】

情報処理装置は、例えばノート型ＰＣ（Personal Computer）、ＰＤＡ（Personal Digital Assistants）等の携帯型の情報処理装置であり、データ出力部としてのディスプレイとキーボード等のデータ入力部を備えた構成である。

【0027】

図２（ａ）に示すように本発明の情報処理装置において、ディスプレイユニット２１３は、連結ユニット２１２に対して回動可能に枢軸部３０２によって連結されている。さらに、連結ユニット２１２は、枢軸部３０１により、キーボード等のデータ入力部を備えた本体ユニット２１１に連結されている。

【0028】

図２（ｂ）を参照して本発明の情報処理装置の各ユニットの相対的な動きについて説明する。ディスプレイユニット２１３は、連結ユニット２１２との連結部である枢軸部３０２を中心として、矢印Ｂに示すように回動する。

【0029】

また、キーボード等のデータ入力部を備えた本体ユニット２１１は、連結ユニット２１２との連結部である枢軸部３０１を回動軸中心として、矢印Ａ１，Ａ２に示すように回動する。本体ユニット２１１は、連結ユニット２１２に対して、少なくとも一方向（Ａ２方向）に９０度以上回動可能な構成である。なお、図に示す構成例は、連結ユニット２１２に対して、上方向（Ａ１）にも９０度以上回動可能な構成例を示している。すなわち、本体ユニット２１１が連結ユニット２１２に対して双方向に９０度以上回動可能な構成例を示している。

【0030】

図３に、本発明の情報処理装置の平面図を示す。図３に示すように本発明の情報処理装置は、キーボード等のデータ入力部を備えた本体ユニット２１１、連結ユニット２１２、ディスプレイユニット２１３の３つのユニットを持つ。本体ユニット２１１と連結ユニット２１２は枢軸部３０１を介して相互に回動可能に連結され、連結ユニット２１２とディスプレイユニット２１３も枢軸部３０２を介して相互に回動可能に連結された構成である。

【0031】

図４を参照して本体ユニット２１１と連結ユニット２１２とを連結する枢軸部３０１の具体的な構成例について説明する。

【0032】

本体ユニット２１１と連結ユニット２１２とを連結する枢軸部３０１は、図４（Ａ）に示すように本体ユニット２１１が連結ユニット２１２に対して少なくとも一方向に９０度以上回動可能な構成とされる。本体ユニット２１１と連結ユニット２１２とが同一平面に設定された状態が（ａ）であり、本体ユニット２１１が連結ユニット２１２に対して９０度、上側に折り曲げられた状態が（ｂ）本体ユニット２１１が連結ユニット２１２に対して９０度、下側に折り曲げられた状態が（ｃ）である。

【0033】

図４（Ｂ）に枢軸部３０１近傍の拡大図を示す。図４（Ｂ）に示すように、連結ユニット２１２には、連結ユニット２１２と一体となったユニット面に対して平行に伸びるユニット延長部２３１が構成されている。このユニット延長部２３１に回動軸中心を持つ枢軸部３０１が形成されている。

【0034】

このような枢軸部構成とすることで、（ｂ）に示す状態、すなわち、本体ユニット２１１が連結ユニット２１２に対して９０度、上側に折り曲げられた状態において、本体ユニットの上面が、連結ユニットの側面の接触することなく、回転を阻害せずに９０度の折り曲げが可能となる。同様に、（ｃ）に示す状態、すなわち、本体ユニット２１１が連結ユニット２１２に対して９０度、下側に折り曲げられた状態において、本体ユニットの下面が、連結ユニットの側面の接触することなく、回転を阻害せずに９０度の折り曲げが可能となる。

【0035】

なお、図４に示す構成では、連結ユニット２１２と一体となったユニット面に対して平行に伸びるユニット延長部２３１を構成した例を示してあるが、本体ユニット側に本体ユニット面に対して平行に伸びるユニット延長部を構成してもよく、この構成でも本体ユニットと連結ユニットは、同一方向に９０度回転可能となる。

【0036】

なお、ディスプレイユニット２１３、および本体ユニット２１１、および連結ユニット２１２を相互に回動可能に連結する枢軸部は、任意の角度に設定された各ユニットを設定角度において維持可能な保持強度を持つ。すなわち、所定の角度に折り曲げた状態で、ユーザがキーボード操作を行っても角度が容易に変更しない保持強度を持つ。

【0037】

なお、図４に示す枢軸部の構成は一例であり、本体ユニット２１１が連結ユニット２１２に対して同一方向に９０度以上回動可能な構成であれば、この他の構成を適用してもよい。

【0038】

このような構成を持つ本発明の情報処理装置の利用構成例について、図５以下を参照して説明する。

【0039】

図５（１）は、一般的な利用例であり、キーボード等のデータ入力部を備えた本体ユニット２１１と、連結ユニット２１２を同一平面状に設定し、ディスプレイユニットのみを垂直よりやや上向きに設定した構成であり、机上に置いて操作する場合の一般的な利用例である。

【0040】

図５（２）は、例えば電車のテーブルなど、十分なスペースのない狭い棚において、本発明の情報処理装置を利用する構成例を示している。連結ユニット２１２の下面を棚に載せ、キーボード等のデータ入力部を備えた本体ユニット２１１をユーザの操作のし易い角度に設定した利用例である。

【0041】

図６（３）は、キーボード等のデータ入力部を備えた本体ユニット２１１と、連結ユニット２１２を山型になるように設定した例であり、図に示すように、床に腰をおろし、膝を曲げて座った状態で、膝の上に情報処理装置（ＰＣ）を載せて利用する場合に操作性、ディスプレイの見やすい状態を設定することが可能である。また、各ユニットの角度調整により、床やソファーに寝転んで情報処理装置（ＰＣ）を載せて利用する場合の操作性、ディスプレイの見やすい状態の設定も可能となる。

【0042】

図６（４）は、キーボード等のデータ入力部を備えた本体ユニット２１１を、連結ユニット２１２の後ろ側に曲げて設定した例であり、例えばキーボード入力を必要としない利用態様、例えば、ディスプレイに映画やテレビなどのコンテンツを表示し、ユーザが視聴する場合の利用例であり、床、あるいはテーブル面に本体ユニット２１１の上面（キーボード面）を接触させて安定的に置くことが可能であり、キーボードをユーザに対して隠すとともにディスプレイを高い位置に保持した状態で任意の角度にディスプレイを調整することができる。本体ユニット２１１は、連結ユニット２１１に対して９０度以上折り曲げ可能であるので、図６（４）のような形状に設定した場合、ディスプレイユニット２１３

および本体ユニット２１１の重心（Ｇ）は、連結ユニット２１２側に設定されることになり、キーボードをユーザに対して隠すとともにディスプレイを高い位置に保持した状態で安定して置くことが可能となる。

【0043】

このように、本発明の情報処理装置は、本体ユニット２１１のデータ入力部形成面を下面とし、連結ユニット２１２およびディスプレイユニット２１３を本体ユニット２１１から上方に伸びる方向に設定した形態とした場合においても安定して載置可能な構成を有する。

【0044】

図７（５）は、ディスプレイユニット２１３と連結ユニット２１２が平行になるように設定するとともに、キーボード等のデータ入力部を備えた本体ユニット２１１を、連結ユニット２１２の前方に９０度、曲げて設定した例であり、ディスプレイユニット２１３と連結ユニット２１２の折り曲げ部をユーザの手で把持可能とし、ユーザの一方の手でキーボード入力を可能とした例である。

【0045】

ディスプレイユニット２１３のディスプレイの下側は、連結ユニット２１２によって覆い隠されるが、従来からある表示プログラムにおける表示領域調整処理により、データ表示をディスプレイユニット２１３のディスプレイの下側を除く上側の領域に設定することが可能であり、ユーザは、すべての表示データをディスプレイの上側に表示させることが可能である。

【0046】

図７（５）に示す構成では、情報処理装置（ＰＣ）を置く場所がない場合であっても、ユーザはキーボードからのデータ入力操作が可能であり、ディスプレイによるデータ表示も可能となる。

【0047】

本実施例における情報処理装置の変形例を図８に示す。

（ａ）は、完全なクローズ状態である。

（ｂ）は、本体ユニット２１１と、連結ユニット２１２とを同一平面状に設定し、ディスプレイユニット２１３のみを立てた状態であり通常のテーブル上での使用などに最適な形状である。

【0048】

（ｃ）は、図６（３）を参照して説明した構成に対応し、本体ユニット２１１と、連結ユニット２１２とを山型に設定し、ディスプレイユニット２１３を立てた状態であり、膝の上での利用や、寝転んだ状態での利用などに最適な形状である。本体ユニット２１１と、連結ユニット２１２との設定角度は、少なくとも９０度までの角度に任意に設定可能であり、ユーザの利用形態に併せて自在に設定できる。

【0049】

（ｄ）は、連結ユニット２１２を下側に置き本体ユニット２１１とディスプレイユニット２１３を立てた状態であり、狭いスペースにおける収納に最適な形状である。なお、（ａ）に示す形状の方がより薄型となるが、立てかける壁などがない場合は、（ａ）の形状では縦に置くことができない。（ｄ）の形状とすれば、立てかける壁などがなくても安定して収納可能となる。ディスプレイユニット２１３および本体ユニット２１１は、連結ユニット２１１に対して９０度以上折り曲げ可能であり、（ｄ）の形状とした場合、ディスプレイユニット２１３および本体ユニット２１１の重心は、内側、すなわち連結ユニット２１２側に設定されることになり、安定して置くことが可能となる。

【0050】

このように、本発明の情報処理装置は、連結ユニット２１２の一面を下面とし、本体ユニット２１１およびディスプレイユニット２１３を連結ユニット２１２から上方に伸びる方向に設定した状態において安定して載置可能な構成を有する。

【0051】

（ｅ）は、先に図７を参照して説明したように、ディスプレイユニット２１３と連結ユニット２１２が平行になるように設定し、キーボード等のデータ入力部を備えた本体ユニット２１１を、連結ユニット２１２の前方に９０度、曲げて設定した例であり、ディスプレイユニット２１３と連結ユニット２１２の折り曲げ部を片手で把持し、もう一方の手でキーボード入力を行う場合などに最適な形状である。

【0052】

（ｆ）は、図５（２）を参照して説明した構成に対応し、連結ユニット２１２に対して、上側に略９０度折り曲げたディスプレイユニット２１３と、連結ユニット２１２に対して、下側に略９０度折り曲げた本体ユニット２１１を有する構成である。例えば電車のテーブルなど、十分なスペースのない狭い棚において、本発明の情報処理装置を利用する場合などに最適な形状である。

【0053】

（ｇ）は、図６（４）を参照して説明した構成に対応する構成である。キーボード等のデータ入力部を備えた本体ユニット２１１を、連結ユニット２１２の後ろ側に曲げて設定した形状とした例であり、例えばキーボード入力を必要としない利用態様、例えば、ディスプレイに映画やテレビなどのコンテンツを表示し、ユーザが視聴する場合などに最適な形状である。本体ユニット２１１は、連結ユニット２１１に対して９０度以上折り曲げ可能であるので、（ｇ）のような形状とした場合、ディスプレイユニット２１３および本体ユニット２１１の重心は、連結ユニット２１２側に設定されることになり、キーボードをユーザに対して隠すとともにディスプレイを高い位置に保持した状態で安定して置くことが可能となる。

【実施例】

【0054】

上述した実施例では、キーボード等のデータ入力部を備えた本体ユニット２１１を、連結ユニット２１２に対して９０度回転可能にした構成例を説明した。以下、実施例２として、本体ユニット２１１を、連結ユニット２１２に対して一方向に１８０度回転可能にした構成例について説明する。

【0055】

図９を参照して、本実施例における本体ユニット２１１と連結ユニット２１２とを連結する枢軸部３５１の具体的な構成例について説明する。

【0056】

本体ユニット２１１と連結ユニット２１２とを連結する枢軸部３５１は、図９（Ａ）に示すように本体ユニット２１１が連結ユニット２１２に対して１８０度以上回動可能な構成とされる。本体ユニット２１１と連結ユニット２１２とが同一平面に設定された状態が（ａ）であり、本体ユニット２１１が連結ユニット２１２に対して約４５度、下側に折り曲げられた状態が（ｂ）であり、本体ユニット２１１が連結ユニット２１２に対して１８０度、下側に折り曲げられた状態が（ｃ）である。

【0057】

図９（Ｂ）に枢軸部３５１近傍の拡大図を示す。図９（Ｂ）に示すように、本体ユニット２１１と連結ユニット２１２とを相対的に回動可能とする枢軸部３５１は、本体ユニット２１１と、連結ユニット２１２の下面以下に回動中心軸３５２を設定した構成となっている。すなわち、連結ユニット２１２、および本体ユニット２１１双方のユニット面（下面）またはユニット面から離間した位置に回動軸中心を設定した構成である。

【0058】

図に示すように、回動軸中心交差面は、本体ユニット２１１と、連結ユニット２１２を同一面として設定した図９（Ｂ）（ａ）の状態において、本体ユニット２１１と、連結ユニット２１２の下側の面以下の位置に設定される。この構成により、本体ユニット２１１は、連結ユニット２１２に対して図９（Ｂ）（ｂ）～（ｃ）のように回転可能となり、本体ユニット２１１が連結ユニット２１２に対して一方向に１８０度回転可能となる。

【0059】

なお、ディスプレイユニット２１３、および本体ユニット２１１、および連結ユニット２１２を相互に回動可能に連結する枢軸部は、任意の角度に設定された各ユニットを設定角度において維持可能な保持強度を持つ。

【0060】

なお、図９に示す枢軸部の構成は一例であり、本体ユニット２１１が連結ユニット２１２に対して１８０度以上回動可能な構成であれば、この他の構成を適用してもよい。例えば図１０に示す構成が適用可能である。

【0061】

図１０（ａ）は、本体ユニット２１１の下面にユニット面から離間する方向に、例えばユニット面に対して垂直方向に伸びるユニット延長部３８１を設け、連結ユニット２１２の厚み方向の略中心部を通る面に回動軸中心３６２を設けた枢軸部３６１を設定した構成である。

【0062】

図１０（ｂ）は、連結ユニット２１２の下面にユニット面離間する方向に、例えばユニット面に対して垂直方向に伸びるユニット延長部３８２を設け、本体ユニット２１１の厚み方向の略中心部を通る面に回動軸中心３７２を設けた枢軸部３７１を設定した構成である。

【0063】

図１０（ａ），（ｂ）のような枢軸部構成とした場合にも、本体ユニット２１１と連結ユニット２１２とは、同一方向に１８０度回転可能となる。

【0064】

このように、本体ユニット２１１を連結ユニット２１２に対して、同一方向に１８０度回転可能とした構成を持つ本実施例の情報処理装置の利用構成例について、図１１を参照して説明する。

【0065】

（ａ）は、完全なクローズ状態

（ｂ）は、本体ユニット２１１と、連結ユニット２１２とを同一平面状に設定し、ディスプレイユニット２１３のみを立てた状態であり通常のテーブル上での使用などに最適な形状である。

【0066】

（ｃ）は、本体ユニット２１１下面と、連結ユニット２１２の下面を相対するように１８０度折り曲げ、連結ユニット２１２とディスプレイユニット２１３が同一面を形成するように設定した構成であり、狭い場所での収納構成、あるいはディスプレイの視聴者と、キーボード入力者が情報処理装置を介して相対した状態として、ディスプレイ視聴者に対して、キーボード入力情報を秘匿したキーボード入力操作を行いたい場合などに最適な形状である。

【0067】

（ｄ）は、キーボード等のデータ入力部を備えた本体ユニット２１１、連結ユニット２１２、ディスプレイユニット２１３を略Ｎ字状に配列した形態であり、狭い場所での操作が必要な場合の利用構成、あるいは収納構成などに最適な形状である。（ａ）に示す通常のクローズ状態から本体ユニット２１１を連結ユニット２１２に対して１８０度回転した形状である。

【0068】

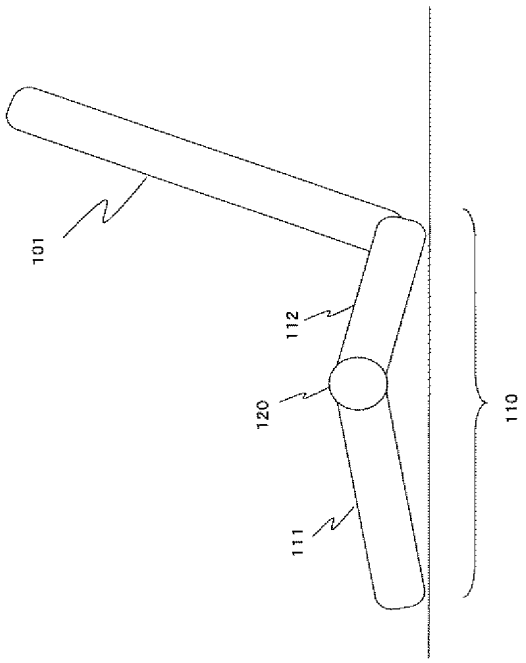
（ｅ）は、キーボード等のデータ入力部を備えた本体ユニット２１１、連結ユニット２１２、ディスプレイユニット２１３を略Ｎ字状に配列した形状とした例である。キーボードを前面に傾斜させて配置した形態であり、狭い場所での操作が必要な場合の利用構成などに最適な形状である。なお、この形状での使用の際には、ディスプレイユニット２１３のディスプレイの下側は、連結ユニット２１２によって覆い隠されるが、従来からある表示プログラムにおける表示領域調整処理により、データ表示をディスプレイユニット２１３のディスプレイの下側を除く上側の領域に設定することが可能であり、ユーザは、すべ

ての表示データをディスプレイの上側に表示させることが可能である。
【0069】
（ｆ）は、キーボード等のデータ入力部を備えた本体ユニット２１１を、連結ユニット２１２の後ろ側に曲げて設定した例であり、例えばキーボード入力を必要としない利用態様、例えば、ディスプレイに映画やテレビなどのコンテンツを表示し、ユーザが視聴する場合などに最適な形状である。
【0070】
なお、図４、あるいは図９、図１０を参照して枢軸部の構成例について説明したが、上述した枢軸部の構成は一例であり、本体ユニットと連結ユニットが９０度以上回動可能な構成、あるいは１８０度回動可能な構成としては、上述した構成以外の枢軸部構成として様々な構成が適用可能である。図１２に適用可能な１つの枢軸部の構成例を示す。図１２に示す構成は、連結ユニット３９１の本体ユニット３９２に対する突合せ部に凹部３９３を形成し、一方、本体ユニット３９２に凸部（延長部）を形成して、連結ユニット３９１と本体ユニット３９２とを勘合する構成として、勘合部の中心を回転軸として相互に回動可能とした枢軸部３９５を持つ構成である。このように、本体ユニットと連結ユニットが９０度以上回動可能な構成、あるいは１８０度回動可能な構成としては、様々な構成が適用できる。
【実施例】
【0071】
上述した実施例においては、連結ユニットは、キーボード等のデータ入力部を備えた本体ユニットと、ディスプレイユニットを連結する部材として説明したが、連結ユニットには、操作部、または出力部、あるいはその他の電子機器を搭載した構成とすることが可能である。
【0072】
図１３、図１４、図１５を参照して、連結ユニットに操作部、または出力部、あるいはその他の電子機器を搭載した構成例について説明する。
【0073】
図１３（Ａ）は、キーボード４１１を構成した連結ユニットの構成例である。例えばテンキー、ファンクションキーなど、本体ユニット側のキーボードの補完的なキーボードを構成する。
【0074】
図１３（Ｂ）は、ディスプレイ４１２を構成した連結ユニットの構成例である。ディスプレイユニット側のディスプレイと異なる情報を連結ユニット側のディスプレイ４１２に表示することが可能となる。例えばディスプレイユニット側のディスプレイには作業中の文書データを表示し、連結ユニット側のディスプレイには、映画、テレビなどのストリーミングコンテンツを表示するなどの利用形態が可能である。
【0075】
図１３（Ｃ）は、スピーカ４１３を構成した連結ユニットの構成例である。連結ユニット４１３の面積を利用することで、サイズの大きなスピーカの設定が可能となり、音楽コンテンツの再生などに最適である。
【0076】
図１４（Ｄ）は、フラッシュメモリ等のメモリカード用のメモリカードスロット４１４を設定した連結ユニットの構成例である。図１４（Ｅ）は、ハードディスク４１５を格納した連結ユニットの構成例である。
【0077】
図１５（Ｆ）は、タッチパッド４１６を設定した連結ユニットの構成例である。図１５（Ｇ）は、方向入力キー４１７を配置した連結ユニットの構成例である。
【0078】
その他、バッテリー、メモリカード、メモリ装着部、記録媒体ドライブ、タッチパッド、トラッキングポインタ、テンキー、方向入力部などの各種の電子部品、入力部、出力部

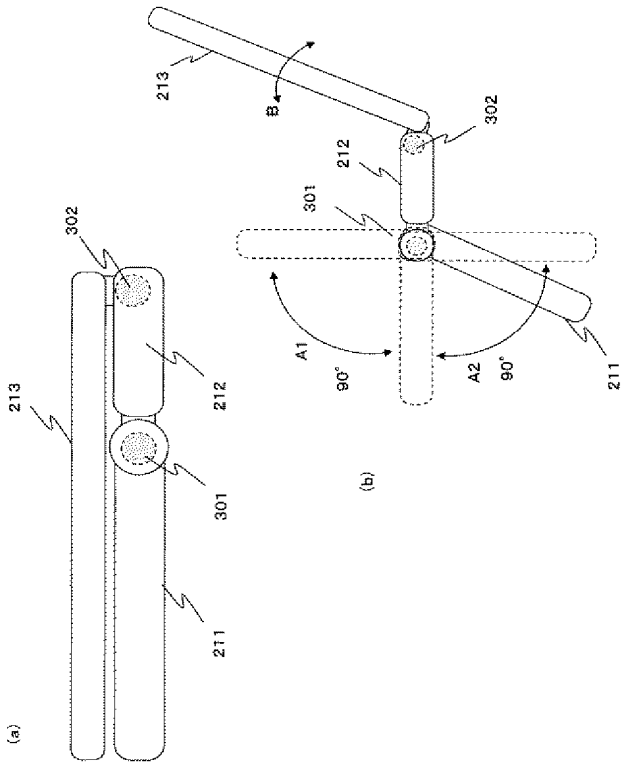
を搭載した連結ユニットを構成可能である。
【0079】
なお、図１３、図１４、図１５に示す電子部品、あるいはその他の各電子部品を搭載した連結ユニット構成とする場合、連結ユニットと本体ユニットまたはディスプレイユニット間は制御信号、電力あるいはデータの転送可能な構成とすることが必要である。
【0080】
例えばこれらの制御信号、電力あるいはデータの転送用の信号線を接続するコネクタを連結ユニットと本体ユニットまたはディスプレイユニットそれぞれに設け、各ユニットの相互接続、切り離しを可能とした構成としてもよい。
【0081】
このようなコネクタ接続を可能とした構成とすることで、ユーザは、利用形態に応じて、図１３、図１４、図１５に示す（Ａ）～（Ｇ）の異なる連結ユニットを適宜選択し、選択した連結ユニットを本体ユニットまたはディスプレイユニットと接続して利用することが可能となる。
【0082】
以上、特定の実施例を参照しながら、本発明について詳解してきた。しかしながら、本発明の要旨を逸脱しない範囲で当業者が該実施例の修正や代用を成し得ることは自明である。すなわち、例示という形態で本発明を開示してきたのであり、限定的に解釈されるべきではない。本発明の要旨を判断するためには、冒頭に記載した特許請求の範囲の欄を参酌すべきである。
【産業上の利用可能性】
【0083】
以上、説明したように、本発明の構成によれば、ディスプレイおよびキーボード等の入力部を有する例えばノート型ＰＣ等の情報処理装置において、ユーザの使用スタイルに応じた様々な形状へ変更することが可能となる。また、設定できる形状のバリエーションが多く、ユーザによるキーボード入力の操作性や、ディスプレイの視認性を損なうことのない快適な利用が可能となる情報処理装置が実現されるので、様々な利用形態が想定されるノート型ＰＣなどの情報処理装置において適用可能である。
【0084】
本発明の構成によれば、本体ユニットと、連結ユニットは一方向に少なくとも９０度回転可能な構成であり、設定可能な形状のバリエーションが豊富となり、片手で把持してもう一方の手でキーボート入力を行うといった利用形態や、ソファーや床に寝転んで操作する場合、狭い棚にＰＣを操作可能な状態で置くといった、様々な利用形態において、操作性、ディスプレイの視認性を損なうことなく快適な利用を実現する構成が提供される。さらに、立てたまま収納可能となるなど、様々な利用形態、収納形態に対応した構成を持つ情報処理装置が実現されるので、様々な利用形態が想定されるノート型ＰＣなどの情報処理装置において適用可能である。
【図面の簡単な説明】
【0085】
【図1】従来の折り曲げ可能なノート型ＰＣの構成例を示す図である。
【図2】本発明の情報処理装置のクローズ状態およびオープン状態における構成について説明する図である。
【図3】本発明の情報処理装置の平面図である。
【図4】本発明の情報処理装置の枢軸部の詳細構成であり、一方向に９０度以上回動可能な枢軸部構成を説明する図である。
【図5】本発明の情報処理装置の利用例を説明する図である。
【図6】本発明の情報処理装置の利用例を説明する図である。
【図7】本発明の情報処理装置の利用例を説明する図である。
【図8】本発明の情報処理装置の利用例を説明する図である。
【図9】本発明の第２実施例に係る情報処理装置の枢軸部の詳細構成であり、一方向に１

８０度回動可能な枢軸部構成を説明する図である。
【図10】本発明の第２実施例に係る情報処理装置の枢軸部の詳細構成であり、一方向に１８０度回動可能な枢軸部構成を説明する図である。
【図11】本発明の第２実施例に係る情報処理装置の利用例を説明する図である。
【図12】本発明の情報処理装置に適用可能な枢軸部の構成例を説明する図である。
【図13】本発明の第３実施例に係る情報処理装置の連結ユニットの構成例であり、電子部品を搭載した連結ユニットの構成例を説明する図である。
【図14】本発明の第３実施例に係る情報処理装置の連結ユニットの構成例であり、電子部品を搭載した連結ユニットの構成例を説明する図である。
【図15】本発明の第３実施例に係る情報処理装置の連結ユニットの構成例であり、電子部品を搭載した連結ユニットの構成例を説明する図である。
【符号の説明】
【0086】
１０１　ディスプレイ
１１０　本体ケース
１１１　前方本体ケース
１１２　後方本体ケース
１２０　ヒンジ
２１１　本体ユニット
２１２　連結ユニット
２１３　ディスプレイユニット
３０１，３０２　枢軸部
２３１　ユニット延長部
３５１，３６１，３７１　枢軸部
３５２，３６２，３７２　回動中心軸
３８１，３８２　ユニット延長部
３９１　連結ユニット
３９２　本体ユニット
３９３　凹部
３９４　凸部
３９５　枢軸部
４１１　キーボード
４１２　ディスプレイ
４１３　スピーカ
４１４　メモリカードスロット
４１５　ハードディスク
４１６　タッチパッド
４１７　方向入力キー

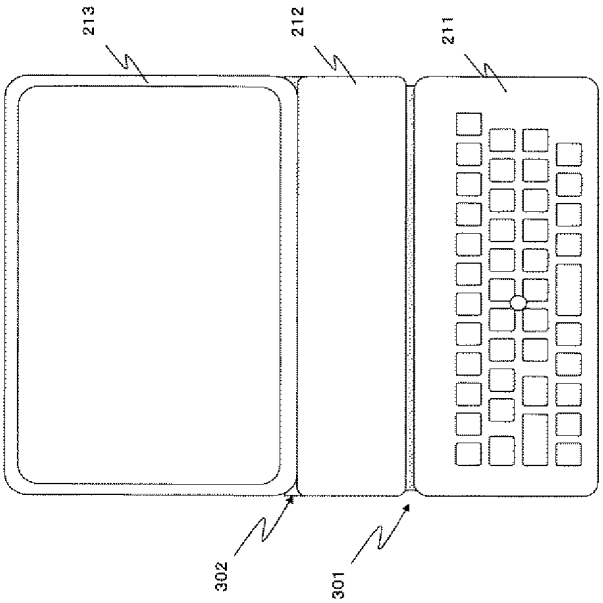
【図1】


101
112
120
111
110

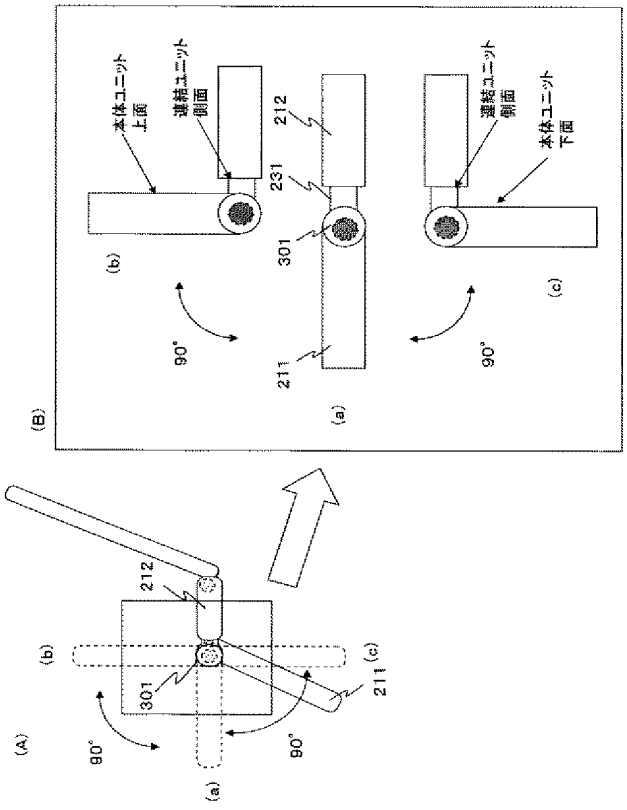
【図2】


213
B
302
212
301
A1
90°
A2
90°
211
(b)
302
213
212
301
211
(a)

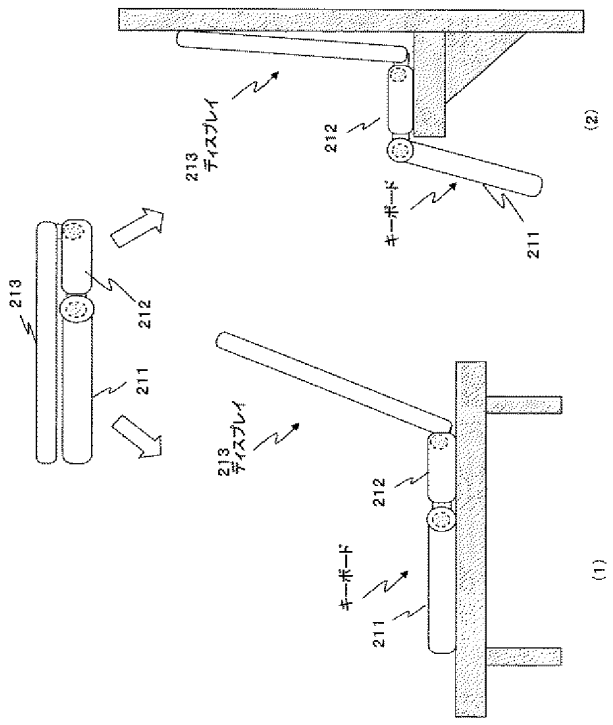
【図3】


213
212
211
302
301

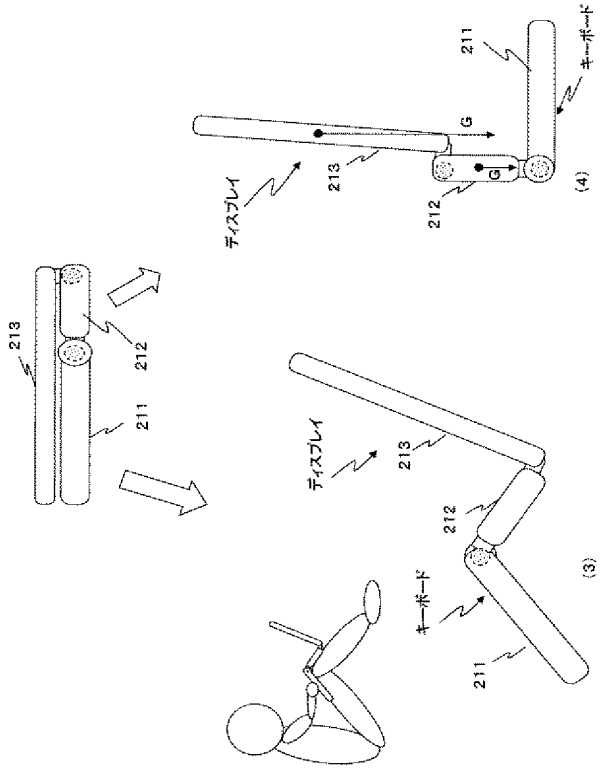
【図4】


本体ユニット
上面
連結ユニット
側面
212
231
301
211
(b)
(a)
(c)
90°
90°
(B)
(A)
90°
90°

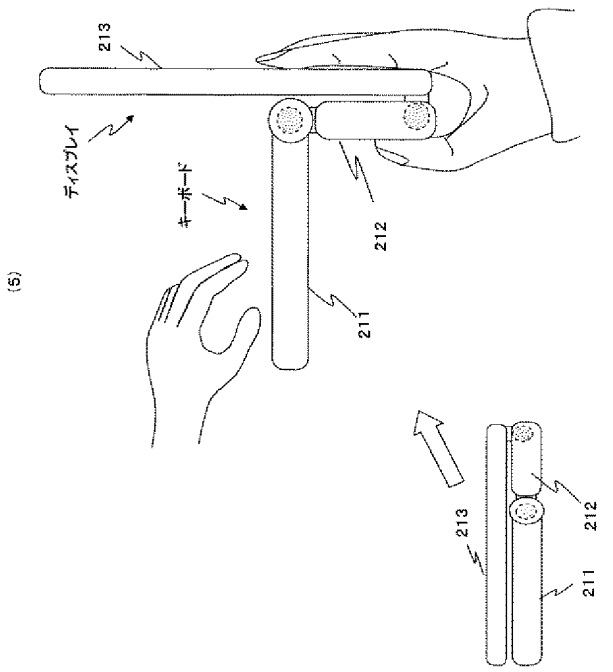
【図5】


213
ディスプレイ
212
キーボード
211
(1)
(2)

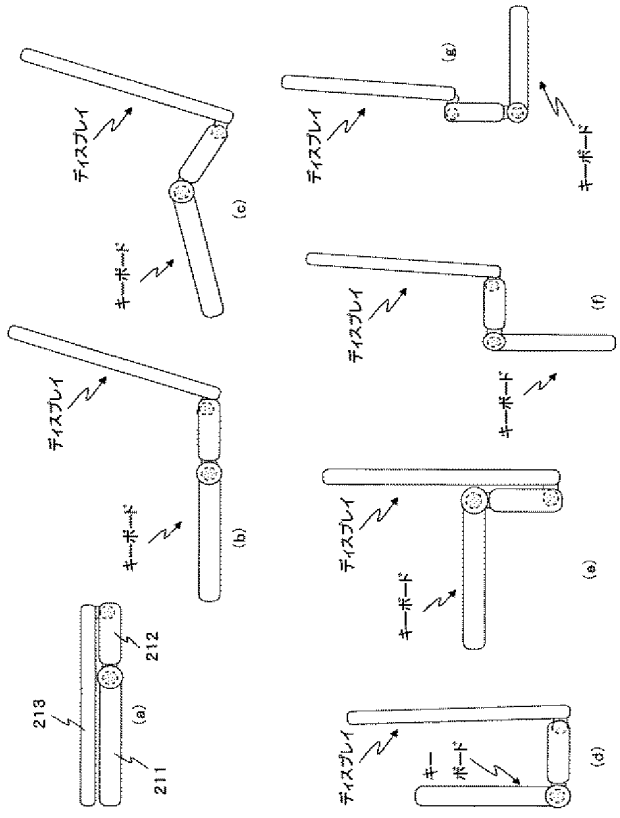
【図6】


213
212
211
ディスプレイ
キーボード
G
(3)
(4)

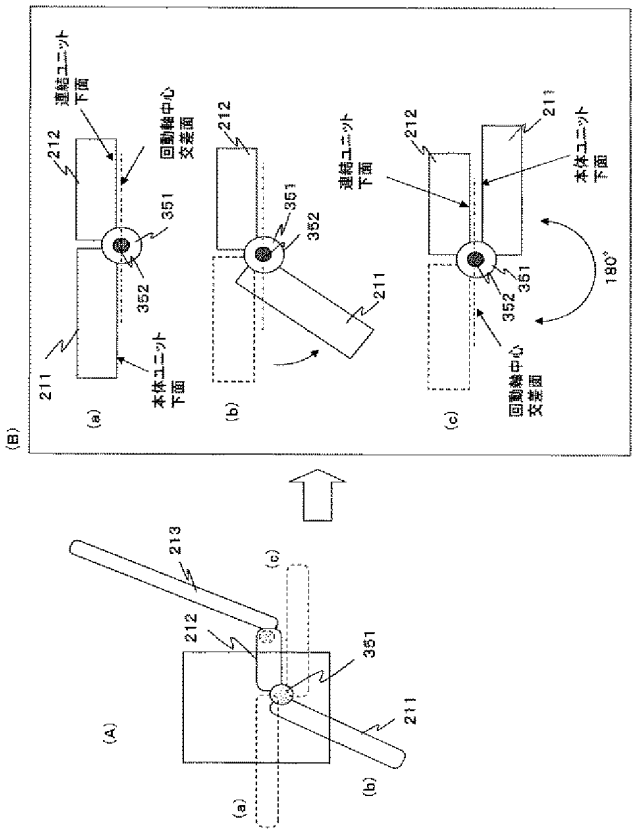
【図7】


213
ディスプレイ
キーボード
212
211
(5)

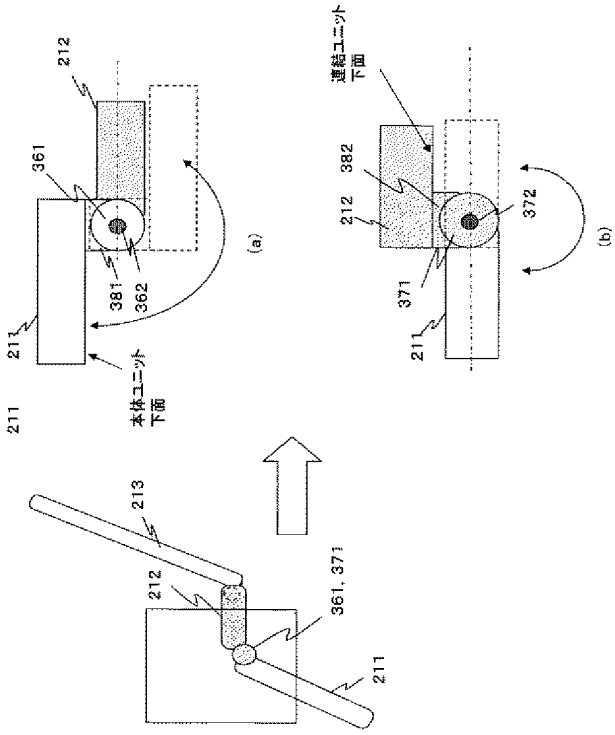
【図8】


ディスプレイ
キーボード
213
212
211
(a)
(b)
(c)
(d)
(e)
(f)
(g)

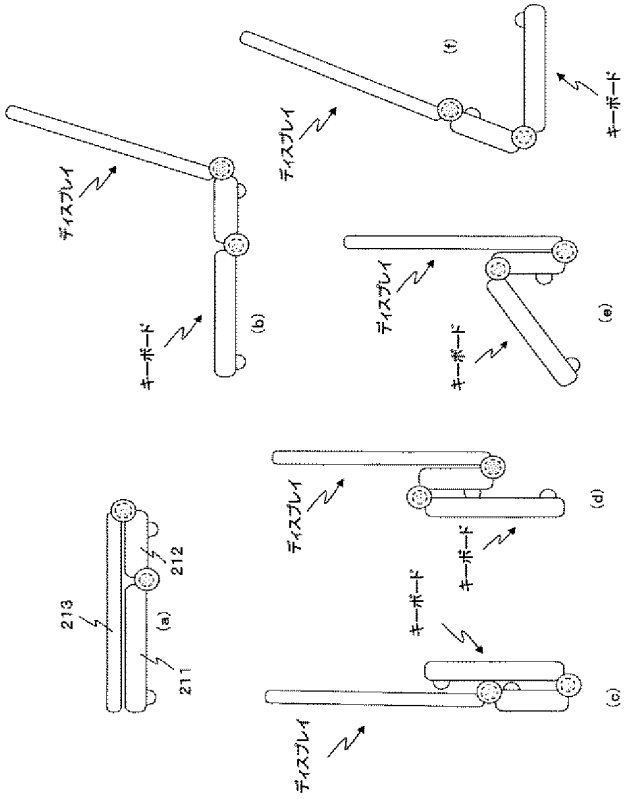
【図9】



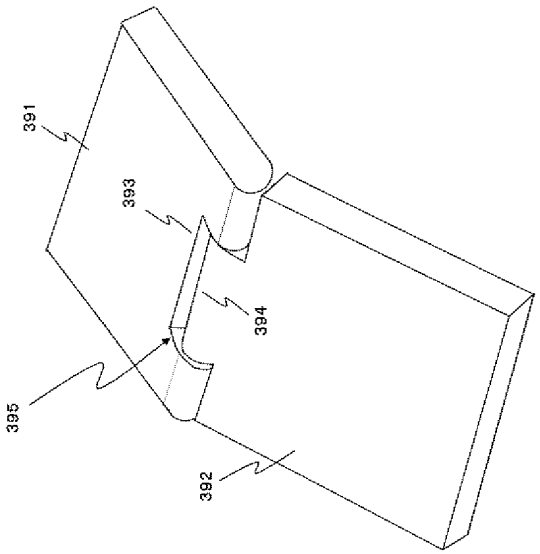
【図10】



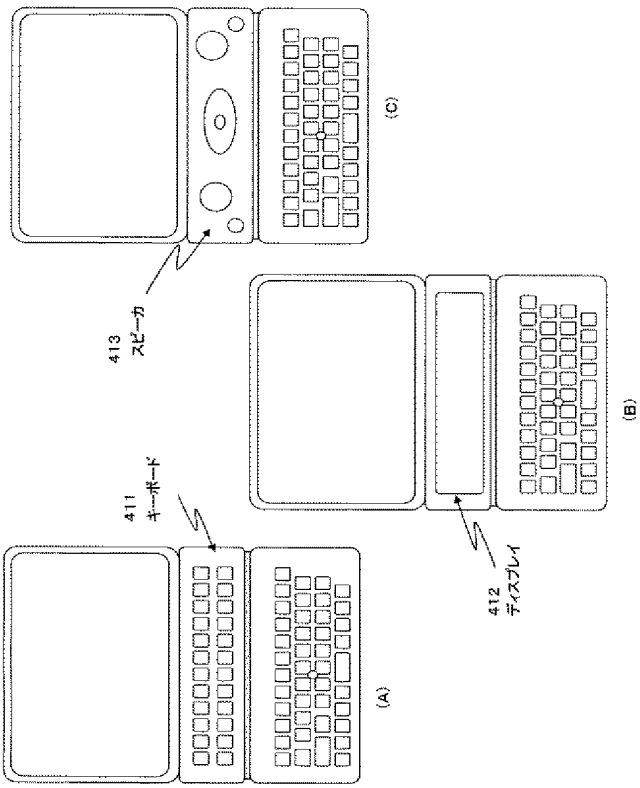
【図11】



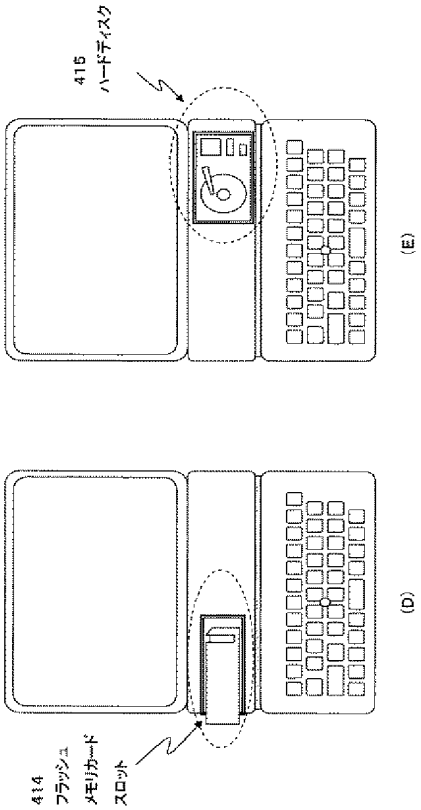
【図12】



【図13】


413
スピーカ
411
キーボード
412
ディスプレイ
(A)
(B)
(C)

【図14】


415
ハードディスク
414
フラッシュ
メモリカード
スロット
(D)
(E)

【図15】

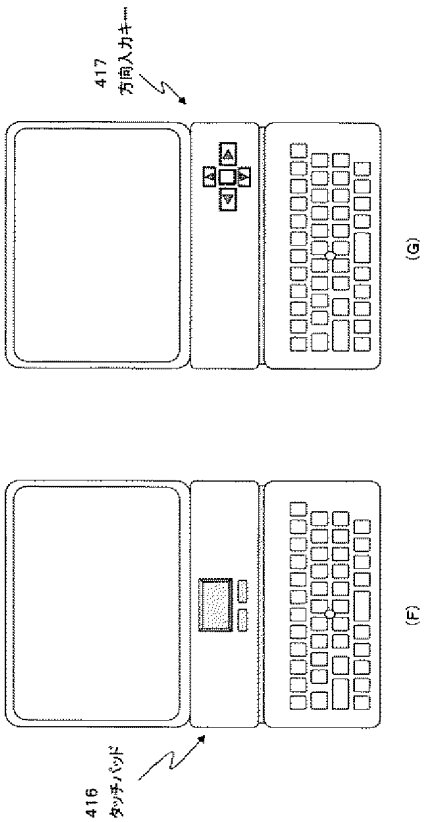

417
方向入力キー
416
タッチパッド
(F)
(G)

Exhibit 1011

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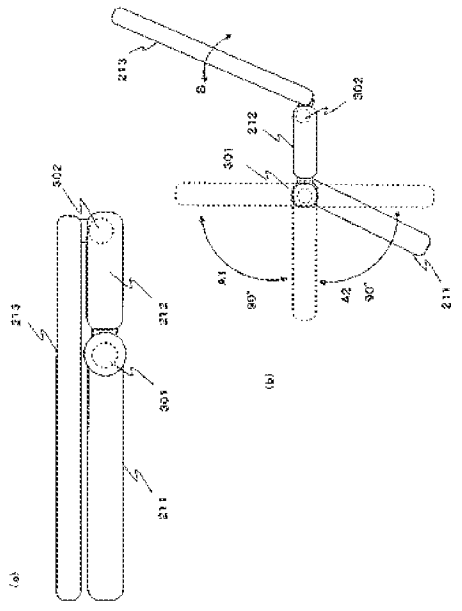
(54) [Title of the Invention] Information Processing Apparatus

(57) [Abstract]

[Problem] To provide an information processing apparatus such as a laptop-type PC that can be changed into various shapes according to styles of use by a user, and that affords improved operability and improved display visibility.

[Solution] An information processing apparatus such as a laptop-type PC is configured to have a three-unit configuration comprising a display unit, a main unit equipped with a data input unit, and a connecting unit, wherein the connecting unit is connected to each of the main unit and the display unit via a pivot portion, and each of the connected units is configured to be able to pivot with respect to the others. The connecting unit has a configuration capable of rotating 90 degrees or more in at least one direction with respect to the main unit. According to the present configuration, an information processing apparatus is achieved that allows comfortable use without compromising the operability of the keyboard input by the user or the visibility of the display.

[Selected Drawing] FIG. 2



[Claims]
[Claim 1]
An information processing apparatus comprising,
a display unit equipped with a display, a main unit equipped with a data input section, and
a connection unit that is located between the main unit and the display unit, that is connected to each of the main unit and the display unit respectively through a pivot portion, and that can rotate with respect to each of the main unit and the display unit,
characterized in that the main unit has a configuration capable of rotating with respect to the connecting unit by 90 degrees or more in at least one direction.
[Claim 2]
The information processing apparatus according to claim 1, characterized by the main unit having a configuration such that the main unit is capable of rotating by 180 degrees in at least one direction with respect to the connecting unit.
[Claim 3]
The information processing apparatus according to claim 1, characterized by the main unit having a configuration such that the main unit is capable of rotating at least 90 degrees in both directions with respect to the connecting unit.
[Claim 4]
The information processing apparatus according to claim 1, characterized by having a configuration such that the data input section forming surface of the main unit is a bottom surface, permitting the connecting unit and the display unit to be stably mounted in a state in which the display unit is set in a direction extending upward from the main unit.
[Claim 5]
The information processing apparatus according to claim 1, characterized by having a configuration such that one surface of the connecting unit is a bottom surface, permitting the main unit and the display unit to be stably mounted in a state in which the main unit and the display unit are set in a direction extending upward from the connecting unit.
[Claim 6]
The information processing apparatus according to claim 1, characterized in that the pivot portion which enables the connecting unit and the main unit to rotate with respect to each other is configured such that the center of the rotation axis lies in a unit extension portion that is constituted by being integrated into either the connecting unit or the main unit, and the unit extension portion extends parallel to a unit surface of the unit in which the unit extension portion is configured.
[Claim 7]
The information processing apparatus according to claim 1, characterized in that the pivot portion which enables the connecting unit and the main unit to rotate with respect to each other has a configuration in which the center of the rotation axis lies in a unit extension portion that is constituted by being integrated into either the connecting unit or the main unit, with the unit extension portion extending in a direction away from a unit surface of the unit in which the unit extension portion is configured.
[Claim 8]
The information processing apparatus according to claim 1, characterized in that the pivot portion which enables the connecting unit and the main unit to rotate with respect to each other is configured such that the centers of the rotation axes are set at positions on the unit surfaces, or separated from the unit surfaces, of both the connecting unit and the main unit.
[Claim 9]
The information processing apparatus according to claim 1, characterized in that the pivot portion which connects the display unit, the main unit, and the connecting unit to each other pivotably is configured to have a holding strength that can maintain each unit which has been set to some angle at the setting angle.
[Claim 10]

The information processing apparatus according to claim 1, characterized in that the connecting unit is configured with electronic components mounted thereupon.

[Claim 11]

The information processing apparatus according to claim 10, characterized in that the connecting unit has a detachable connector section applied to the transfer of data with the main unit or the display unit.

[Claim 12]

The information processing apparatus according to claim 10 or claim 11, characterized in that the electronic components are comprised of at least one from among a keyboard, a display, a speaker, a memory, a memory mounting unit, a battery, a touch pad, a pointing device, a direction input key, and a numeric keypad.

[Detailed Description of the Invention]

[Technical field]

[0001]

The present invention relates to an information processing apparatus. In particular, the present invention relates to an information processing apparatus, such as a laptop PC having a display and an input unit such as a keyboard or the like, that can be changed to various shapes based on the user's style to achieve a configuration that improves operability by the user and visibility of the display, and is easy to store.

[Background technology]

[0002]

Recently, the size of information processing apparatus such as personal computers (PCs) has been decreasing. In particular, a large number of thinner and lighter laptop-type PCs have been developed. Generally, a laptop-type PC has a configuration permitting the folding of a display unit consisting of a liquid crystal display and a main unit equipped with a keyboard, and is carried in the folded state. When in use, the display unit is used in a state where the display unit is substantially upright or set at an angle of 90 to 120 degrees with respect to the main unit having the keyboard unit.

[0003]

Thus, a conventional general laptop PC is configured such that only the relative angle between the main unit having the keyboard and the display unit can be adjusted. In such a configuration, there is no problem when using the laptop PC on a desk. However, for example, when operating the PC with it placed on a knee, when operating it when lying on a sofa or the floor, or when operating it while holding it with one hand, there is a problem in that operations such as the operation of keyboard input become difficult, and the display becomes difficult to see.

[0004]

An example of a configuration proposed for the purpose of improving the operability and visibility of a laptop-type PC is described in Patent Document 1. The configuration described in Patent Document 1 has a display 101 and a main unit case 110, as shown in FIG. 1. Main unit case 110 is divided into a front main unit case 111 and a rear main unit case 112, and the two are coupled by a hinge 120. A configuration is shown permitting front main unit case 111 to be held in a state tilted from the horizontal plane by 10 to 15 degrees by lifting up hinge 120, that is, the abutted portions of front main unit case 111 and rear main unit case 112.

[0005]

In this way, based on the configuration described in Patent Document 1, hinge 120 is held in a lifted state, causing front main unit case 111 on which the keyboard section is configured to be tilted forward by 10 to 15 degrees and fixed, thereby improving the operability of keyboard input by the user.

[0006]

Based on the configuration described in Patent Document 1, operability of the user can be improved to some extent. However, this configuration only makes it possible to set the angle of the keyboard within a range of about 0 to 15 degrees with respect to the horizontal plane. It seeks only to improve operability in the general mode of use of a PC, in other words, in the mode of using a PC by placing it on a desk.

[0007]

The configuration of Patent Document 1 was not devised for various modes of use such as, for example, when conducting keyboard input with one hand while holding the PC in the other hand, when using the PC as a TV, when operating the PC while lying on a sofa or on the floor, when placing the PC on a narrow shelf in an operable state, when storing the PC in an upright position, or the like. When such modes of use are adopted, even with the configuration of Patent Document 1, the problems of the difficulty of operation of keyboard input, the display becoming difficult to see, and being difficult to store are not solved.

[Patent Document 1] Unexamined Japanese Patent Application Publication No. 1993-108228

[Disclosure of the invention]

[Problem to be Solved by the Invention]

[0008]

The present invention was devised in light of such situations. One object of the present invention is to provide an information processing apparatus whereby an information processing apparatus comprising a display and an input section such as a keyboard or the like can be changed into various shapes based on the user's mode of use to improve ease of operation by the user, improve display visibility, and facilitate apparatus storage.

[0009]

A further object of the present invention is to provide an information processing apparatus having a configuration that can be used for various modes of use of a PC. These include, for example, when using a PC as a TV, when operating a PC while lying on a sofa or on the floor, when placing a PC on a narrow shelf in an operable state without loss of operability or visibility of the display, or when storing a PC in an upright position.

[Means for Solving the Problem]

[0010]

The first aspect of the invention is:

an information processing apparatus comprising,

a display unit equipped with a display, a main unit equipped with a data input section, and

a connection unit that is located between the main unit and the display unit, that is connected to each of the main unit and the display unit respectively through a pivot portion, and that can rotate with respect to each of the main unit and the display unit,

characterized in that the main unit has a configuration capable of rotating with respect to the connecting unit by 90 degrees or more in at least one direction.

[0011]

Another embodiment of the information processing apparatus of the present invention is characterized by the main unit having a configuration such that the main unit is capable of rotating by 180 degrees in at least one direction with respect to the connecting unit.

[0012]

Another embodiment of the information processing apparatus of the present invention is characterized by the main unit having a configuration such that the main unit is capable of rotating at least 90 degrees in both directions with respect to the connecting unit.

[0013]

Another embodiment of the information processing apparatus of the present invention is characterized by having a configuration such that the data input section forming surface of the main unit is a bottom surface, permitting the connecting unit and the display unit to be stably mounted in a state in which the display unit is set in a direction extending upward from the main unit.

[0014]

Another embodiment of the information processing apparatus of the present invention is characterized by having a configuration such that one surface of the connecting unit is a bottom surface, permitting the main unit and the display unit to be stably mounted in a state in which the main unit and the display unit are set in a direction extending upward from the connecting unit.

[0015]

Another embodiment of the information processing apparatus of the present invention is characterized in that the pivot portion which enables the connecting unit and the main unit to rotate with respect to each other is configured such that the center of the rotation axis lies in a unit extension portion that is constituted by being integrated into either the connecting unit or the main unit, and the unit extension portion extends parallel to a unit surface of the unit in which the unit extension portion is configured.

[0016]

Another embodiment of the information processing apparatus of the present invention is characterized in that the pivot portion which enables the connecting unit and the main unit to rotate with respect to each other is configured such that the center of the rotation axis lies in a unit extension portion that is constituted by being integrated into either the connecting unit or the main unit, with the unit extension portion extending in a direction away from a unit surface of the unit in which the unit extension portion is configured.

[0017]

Another embodiment of the information processing apparatus of the present invention is characterized in that the pivot portion which enables the connecting unit and the main unit to rotate with respect to each other is configured such that the centers of the rotation axes are set at positions on the unit surfaces, or separated from the unit surfaces, of both the connecting unit and the main unit.

[0018]

Another embodiment of the information processing apparatus of the present invention is characterized in that the pivot portion which connects the display unit, the main unit, and the connecting unit to each other pivotably is configured to have a holding strength that can maintain each unit which has been set to some angle at the setting angle.

[0019]

Another embodiment of the information processing apparatus of the present invention is characterized in that the connecting unit is configured with electronic components mounted thereupon.

[0020]

Another embodiment of the information processing apparatus of the present invention is characterized in that the connecting unit has a detachable connector section applied to the transfer of data with the main unit or the display unit.

[0021]

Another embodiment of the information processing apparatus of the present invention is characterized in that the electronic components are comprised of at least one from among a keyboard, a display, a speaker, a memory, a memory mounting unit, a battery, a touch pad, a pointing device, a direction input key, and a numeric keypad.

[Effect of the Invention]

[0022]

Based on the configuration of the present invention, an information processing apparatus such as a laptop PC having an input unit such as a display and a keyboard makes it possible to change the shape of the apparatus to various shapes based on the usage style of the user. In addition, there are many variations in the shape that can be set, and an information processing apparatus is achieved that allows comfortable use without compromising the operability of keyboard input by the user or visibility of the display.

[0023]

Based on the configuration of the present invention, the main unit and the connecting unit are configured to be able to rotate at least 90 degrees in one direction, allowing for many variations in the shape that can be set. A configuration is provided which achieves comfortable use without loss of operability or visibility of the display in a variety of modes of use, such as making keyboard inputs with one hand while holding the PC in the other hand, operating the PC while lying on a sofa or on the floor, when placing the PC on a narrow shelf in an operable state, and the like. In addition, an information processing apparatus is achieved that has a configuration corresponding to various modes of use and storage, such as storing the PC in an upright position.

[Best Modes of Carrying Out the Invention]

[0024]

The information processing apparatus of the present invention is described in detail below with reference to the drawings.

[Embodiment 1]

[0025]

FIG. 2 shows a cross-sectional view of an information processing apparatus based on a first embodiment of the present invention. FIG.2(a) is a diagram describing the configuration when the information processing apparatus is in a closed state, and 2(b) is a diagram describing the configuration and movement in an open state.

[0026]

The information processing apparatus is, for example, a portable information processing apparatus such as a laptop personal computer (PC) or a personal digital assistant (PDA), and is configured to comprise a display as a data output unit and a keyboard as a data input unit.

[0027]

As shown in FIG. 2(a), in the information processing apparatus of the present invention, a display unit 213 is connected to a connecting unit 212 by a pivot portion 302 in a rotatable manner. Further, connecting unit 212 is connected by a pivot portion 301 to a main unit 211 which is equipped with a data input unit such as a keyboard.

[0028]

The relative movements of the different units of the information processing apparatus of the present invention will be described with reference to FIG. 2(b). Display unit 213 pivots as shown by arrow B centering on pivot portion 302 which is a connecting portion with connecting unit 212.

[0029]

In addition, main unit 211, which comprises a data input unit such as a keyboard, pivots as indicated by arrows A1 and A2, with pivot portion 301, which is a connecting portion with connecting unit 212, as the center of the rotation axis. Main unit 211 is configured to be able to rotate at least 90 degrees in one direction (A2 direction) with respect to connecting unit 212. The configurational example shown in the figure is one in which connecting unit 212 can be rotated by 90 degrees or more in an upward direction (A1). That is, an example is shown here of a configuration in which main unit 211 can be rotated by 90 degrees or more in both directions with respect to connecting unit 212.

[0030]

FIG. 3 shows a plan view of an information processing apparatus of the present invention. The information processing apparatus of the present invention shown in FIG. 3 has three units, a main unit 211 provided with a data input unit such as a keyboard, a connecting unit 212, and a display unit 213. Main unit 211 and connecting unit 212 are connected to each other pivotably via a pivot portion 301. Connecting unit 212 and display unit 213 are also connected to each other in a pivotable manner via a pivot portion 302.

[0031]

A specific configurational example of pivot portion 101 connecting main unit 211 and connecting unit 212 will be described below with reference to FIG. 4.

[0032]

As shown in FIG. 4(a), the pivot portion 301 that connects main unit 211 with connecting unit 212 is configured as shown in FIG. 4(a) so that the main unit 211 is able to rotate by more than 90 degrees in at least one direction with respect to connecting unit 212. FIG.4(a) is the state in which main unit 211 and connecting unit 212 are set in the same plane, 4(b) is the state in which main unit 211 is folded upward by 90 degrees with respect to connecting unit 212, and 4(c) is the state in which main unit 211 is folded downward by 90 degrees with respect to connecting unit 212.

[0033]

FIG. 4(b) shows an enlarged view of the vicinity of pivot portion 301. As shown in FIG. 4(b), connecting unit 212 is configured with a unit extension section 231 extending parallel to the unit surface that is integrated with connecting unit 212. Pivot portion 301 is formed with the center of the rotation axis thereof in unit extension section 231.

[0034]

By having such a pivot portion configuration, in the state shown in 4(b), that is, in the state in which main unit 211 is folded upward to 90 degrees with respect to connecting unit 212, it is possible for the top surface of the main unit to be folded at 90 degrees without contacting the side surface of the connecting unit and without inhibiting rotation. Similarly, in the state shown in 4(c), that is, in the state in which main unit 211 is folded downward to 90 degrees with respect to connecting unit 212, it is possible for the bottom surface of the main unit to be folded at 90 degrees without contacting the side surface of the connecting unit and without inhibiting rotation.

[0035]

In the configuration shown in FIG. 4, although an example is shown of a configuration in which unit extension section 231 extends parallel to a unit surface that is integrated with connecting unit 212, it is also possible to configure the unit extension section so as to extend parallel to the main unit surface on the main unit side. In that configuration, as well, the main unit and the connecting unit can rotate 90 degrees in the same direction.

[0036]

The pivot portion that mutually connects display unit 213, main unit 211, and connecting unit 212 in a rotatable manner has a holding strength that allows each unit which has been set to some angle to be maintained at the setting angle. That is, it has a holding strength due to which the angle is not easily changed even when the user performs keyboard operations in a state of folding at a prescribed angle.

[0037]

Note that the configuration of the pivot portion shown in FIG. 4 is merely one example, and other configurations may be applied as long as main unit 211 is configured to be able to rotate 90 degrees or more in the same direction with respect to connecting unit 212.

[0038]

An example of use of the information processing apparatus of the present invention having such a configuration will be described below with reference to FIG. 5 and beyond.

[0039]

FIG. 5(1), an example of general use, is a configuration in which main unit 211 equipped with a data input unit such as a keyboard and connecting unit 212 are set in the same plane. Only the display unit is set slightly upward from the vertical. This a general example of use by operation when placed on a desk.

[0040]

FIG. 5(2) shows an example of a configuration in which the information processing apparatus of the present invention is used on a narrow shelf without ample space, such as, for example, on a train table. This is an example of use in which the bottom surface of connecting unit 212 is placed on a shelf, and main unit 211 equipped with a data input unit such as a keyboard is set at an angle facilitating user operation.

[0041]

FIG. 6(3) is an example in which main unit 211 equipped with a data input unit such as a keyboard and connecting unit 212 are placed in a mountain shape. As shown in the figure, when sitting on the floor, it is possible to set a state of easy operability and easy viewing of the display when the information processing apparatus (PC) is placed on the knees while the user is sitting with knees folded. In addition, by adjusting the angle of each unit, it is also possible to set a state of easy operability and easy viewing of the display when the information processing apparatus (PC) is positioned while the user is lying on the floor or on a sofa.

[0042]

FIG. 6(4) is an example in which main unit 211 equipped with a data input unit such as a keyboard is folded to the rear side of connecting unit 212. It is set, for example, to a usage mode that does not require keyboard input, such as when the user is viewing content such as movies and television programs that are displayed on the display. The top surface (keyboard surface) of main unit 21 can be placed on and in contact with the surface of the floor or a table, and the display can be adjusted to any angle with the keyboard hidden from the user and the display held high. Since main unit 211 can be folded by 90 degrees or more with respect to connecting unit 212, when the shape is set as shown in FIG. 6(4), the centers of gravity (G) of display unit 213 and main unit 211 will be set on the side of connecting unit 212, so that the keyboard can be hidden from the user and the display can be stably placed in a high position.

[0043]

In this manner, the information processing apparatus of the present invention has a configuration permitting placement in a stable manner even when the data input section forming the surface of main unit 211 is the bottom surface, with connecting unit 212 and display unit 213 set in a direction extending upward from main unit 211.

[0044]

FIG. 7(5) shows an example of a setting such that display unit 213 and connecting unit 212 are parallel to each other, with main unit 211, which is equipped with a data input unit such as a keyboard, being set to 90 degrees in front of connecting unit 212. In this example, the folded portion of display unit 213 and connecting unit 212 can be held by the user with one hand, and keyboard input can be conducted by the user with the other hand.

[0045]

The lower side of the display of display unit 213 is obscured by connecting unit 212, but the data display can be set in the upper area of display unit 213 excluding the lower side of the display by conventional display area adjustment processing in the display program. The user can thus display all display data on the upper portion of the display.

[0046]

In the configuration shown in FIG. 7(5), even when there is no place to put the information processing apparatus (PC), the user can perform data input operations through the keyboard. It is even possible to display the display data on the display.

[0047]

A modified example of the information processing apparatus based on this embodiment is shown in FIG. 8.

FIG. 8(a) is a completely closed state.

FIG.8 (b) is a state in which main unit 211 and connecting unit 212 are set in the same plane. Only display unit 213 is lifted up, with the apparatus assuming an optimal shape for use on a normal table.

[0048]

FIG. 8(c) corresponds to the configuration described in reference to FIG. 6(3). Main unit 211 and connecting unit 212 are set in the form of a mountain, display unit 213 is upright, and the shape is optimal for use on a knee or in a lying state. The setting angle between main unit 211 and connecting unit 212 can be set to any angle of at least 90 degrees, and can be freely set to match the user's mode of usage.

[0049]

FIG. 8(d) is a state in which connecting unit 212 is placed on the lower side while main unit 211 and display unit 213 are placed upright, making this an optimal shape for storage in a narrow space. Although the shape shown in 8(a) is thinner, vertical placement in the shape of 8 (a) is not possible if there is no wall for support. In the case of the shape of 8(d), stable storage is possible even if there is no wall for support. Display unit 213 and main unit 211 can be folded by 90 degrees or more with respect to connecting unit 211. In the case of the shape shown in 8 (d), the centers of gravity of display unit 213 and main unit 211 are set to the inside, that is, set on the side of connecting unit 212, permitting stable placement of the apparatus.

[0050]

In this manner, the information processing apparatus of the present invention is configured such that one surface of connecting unit 212 is made the bottom surface, permitting main unit 211 and display unit 213 to be stably placed in a state in which they are set in a direction extending upward from connecting unit 212.

[0051]

FIG. 8(e), as previously described with reference to FIG. 7, is an example in which display unit 213 and connecting unit 212 are set parallel and main unit 211 equipped with a data input unit such as a keyboard is folded at 90 degrees in front of connecting unit 212. This is an ideal shape for holding the folded portion of display unit 213 and connecting unit 212 with one hand and performing keyboard input with the other hand.

[0052]

FIG. 8(f), corresponding to the configuration described with reference to FIG. 5(2), is a configuration having a display unit 213 that is folded upward by approximately 90 degrees with respect to connecting unit 212, and a main unit 211 that is folded downwards by approximately 90 degrees with respect to connecting unit 212. This is an optimal shape for use when the information processing apparatus of the present invention is used on a narrow shelf with insufficient space, such as on a table in a train.

[0053]

FIG. 8(g) is a configuration corresponding to the configuration described with reference to FIG. 6(4). This is an example of a shape in which main unit 211 equipped with a data input unit such as a keyboard is set by folding to the rear side of connecting unit 212. It is an optimal shape for user viewing, for example, when the usage mode does not require keyboard input, such as when a user is displaying content such as a movie or a television program on the display. Since main unit 211 can be folded by 90 degrees or more with respect to connecting unit 211, in the case of a shape such as 8(g), the centers of gravity of display unit 213 and main unit 211 are set towards connecting unit 212, allowing the keyboard to be hidden from the user and the display to be stably placed in a high position.

[Embodiment 2]

[0054]

In the above-mentioned embodiment, an example of a configuration has been described in which main unit 211 equipped with a data input unit such as a keyboard can be rotated by 90 degrees with respect to connecting unit 212. An example of a configuration in which main unit 211 can be rotated by 180 degrees in one direction with respect to the connecting unit 212 will be described below as a second embodiment.

[0055]

Referring to FIG. 9, a description will be given below of a specific example of the configuration of pivot portion 351 connecting main unit 211 and connecting unit 212 in the present embodiment.

[0056]

As shown in FIG. 9(A), pivot portion 351 connecting main unit 211 and connecting unit 212 is configured so that main unit 211 can be rotated with respect to connecting unit 212 by 180 degrees or more. In state (a), main unit 211 and connecting unit 212 are set in the same plane; in state (b), main unit 211 is folded towards the lower side by 45 degrees with respect to connecting unit 212; and in state (c), main unit 211 is folded to the lower side by 180 degrees with respect to connecting unit 212.

[0057]

FIG. 9(B) shows an enlarged view of the vicinity of pivot portion 351. As shown in FIG. 9(B), the configuration is one in which in pivot portion 351, which permits relative rotation of main unit 211 and connecting unit 212, a center of rotation axis 352 is set at or beneath the lower surfaces of main unit 211 and connecting unit 212. In other words, this is a configuration in which the center of rotation axis is set at the unit surfaces (bottom surfaces) of both connecting unit 212 and main unit 211 or at a position separated from the unit surfaces.

[0058]

As is shown in the figure, in the state of FIG. 9(B)(a), in which main unit 211 and connecting unit 212 are set in the same plane, the plane of intersection of the center of the rotation axes is set at a position below the surface on the lower side of main unit 211 and connecting unit 212. This configuration allows main unit 211 to rotate with respect to connecting unit 212 as shown in FIGS. 9(B)(b) and (c), and main unit 211 to rotate 180 degrees in one direction with respect to connecting unit 212.

[0059]

The pivot portion that mutually connects display unit 213, main unit 211, and connecting unit 212 in a rotatable manner has a holding strength that allows each unit which has been set at some angle to be maintained at the setting angle.

[0060]

The configuration of the pivot portion shown in FIG. 9 is one example, and other configurations may be applied as long as main unit 211 is configured to be able to rotate 180 degrees or more with respect to connecting unit 212. For example, the configuration shown in FIG. 10 can be applied.

[0061]

FIG. 10(a) is a configuration in which a unit extension section 381 is provided in a direction separated from the unit surface on the bottom surface of main unit 211 so as, for example, to extend in a direction perpendicular to the unit surface, and a pivot portion 361, provided with a center of rotation axis 362, is set in a plane passing through approximately the central portion in the thickness direction of connecting unit 212.

[0062]

FIG. 10(b) is a configuration in which a unit extension section 382 is provided in a direction separated from the unit surface on the bottom surface of main unit 212 so as, for example, to extend in a direction perpendicular to the unit surface, and a pivot portion 371, provided with center of rotation axis 372, is set in a plane passing through approximately the central portion in the thickness direction of main unit 211.

[0063]

Even when the pivot portion configuration is as shown in FIGS. 10(a) and (b), main unit 211 and connecting unit 212 can rotate by 180 degrees in the same direction.

[0064]

An example of a usage configuration of the information processing apparatus based on the present embodiment having a configuration in which main unit 211 is able to rotate 180 degrees in the same direction with respect to connecting unit 212 will be described here with reference to FIG. 11.

[0065]

11(a) is the fully closed state.

11(b) is a state in which main unit 211 and connecting unit 212 are set in the same plane and only display unit 213 is lifted up, with the apparatus having an optimal shape for use on a normal table.

[0066]

11(c) is a configuration in which the bottom surface of main unit 211 and the bottom surface of connecting unit 212 are folded 180 degrees so as to face each other, with connecting unit 212 and display unit 213 being set to form a single surface. This is an optimal shape for storage in a narrow space, or when a display viewer and a keyboard input operator are facing each other with the information processing apparatus located between them, and the keyboard operator wishes to perform a keyboard input operation with the keyboard input information being hidden from the display viewer.

[0067]

FIG. 11(d) is a mode in which main unit 211 equipped with a data input unit such as a keyboard, connecting unit 212, and display unit 213 are arranged in an approximate N-shape. This is an optimal shape for a usage configuration where operation is required in a narrow place, or for a storage configuration or the like. FIG. 11(a) shows a shape in which main unit 211 is rotated by 180 degrees from the normal closed state with respect to connecting unit 212.

[0068]

FIG. 11(e) is an example in which main unit 211 equipped with a data input unit such as a keyboard; connecting unit 212; and display unit 213 are arranged in an approximate N-shape. This is a form in which the keyboard is inclined towards the front, and is an optimal shape for use in cases where operation in a narrow place is required. When used in this shape, the lower side of the display of display unit 213 is covered and obscured by connecting unit 212. However, using the conventional display area adjustment process in the display program, it is possible to set the data display to be in the upper area of display unit 213 and exclude the lower side of the display, allowing the user to display all the display data in the upper area of the display.

[0069]

FIG. 11(f) is an example in which main unit 211 equipped with a data input unit such as a keyboard is set by folding to the rear side of connecting unit 212. This shape is optimal for a usage mode that, for example, does not require keyboard input, such as when contents such as a movie or a television program are being displayed on the display.

[0070]

Although examples of the configuration of the pivot portion have been described thus far with reference to FIG. 4 or to FIGS. 9 and 10, the configurations of the pivot portion described above are merely examples. Various configurations can be applied as pivot portion configurations other than the configurations described above, such as configurations in which the main unit and the connecting unit can be rotated by 90 degrees or more, or configurations in which they can be rotated by 180 degrees. An example of a configuration of one pivot portion that is applicable is shown in FIG. 12. In the configuration shown in FIG. 12, a recessed portion 393 is formed in the portion of main unit 391 abutting connecting unit 392, while a convex portion (extension section) is formed in main unit 392. The configuration is one in which connecting unit 392 and main unit 391 are mated together, and a pivot portion 395 is provided by which the units can be rotated mutually with the center of the mating portion as the axis of rotation. In this manner, various configurations can be applied as configurations in which the main unit and the connecting unit can be rotated by 90 degrees or more, or as configurations in which the main unit and the connecting unit can be rotated by 180 degrees.

[Embodiment 3]

[0071]

In the embodiments described above, although the connecting unit has been described as a member that connects a main unit equipped with a data input unit such as a keyboard with a display unit, it is also possible to have configurations in which an operation unit, an output unit, or another electronic device is mounted on the connecting unit.

[0072]

Examples of configurations in which an operation unit, an output unit, or another electronic device is mounted on a connecting unit will be described here with reference to FIGS. 13, 14, and 15.

[0073]

FIG. 13(A) is an example of the configuration of a connecting unit constituting a keyboard 411. For example, this constitutes a complementary keyboard to the keyboard on the main unit side, such as a numeric keypad and function keys.

[0074]

FIG. 13(B) is an example of the configuration of a connecting unit constituting a display 412. Information different from that on the display on the display unit side can be displayed on display 412 on the connecting unit side. For example, a display on the display unit side displays the document data during work, and a display on the connecting unit side displays streaming content such as a movie or television program.

[0075]

FIG. 13(C) is an example of the configuration of a connecting unit constituting a speaker 413. By using the area of the connecting unit 413, it is possible to set a large speaker, which is optimal for playing back music content.

[0076]

FIG. 14(D) is an example of the configuration of a connecting unit in which a memory card slot 414 has been set for a memory card such as a flash memory. FIG. 14(E) is an example of the configuration of a connecting unit in which a hard disk 415 is housed.

[0077]

FIG. 15(F) is an example of the configuration of a connecting unit in which a touchpad 416 has been provided. FIG. 15(G) is an example of the configuration of a connecting unit in which direction input keys 417 have been arranged.

[0078]

In addition, it is possible to configure a connecting unit in which various electronic components are installed, such as a battery, a memory card, a memory mounting unit, a recording medium drive, a touch

pad, a tracking pointer, a numeric keypad, and a directional input unit, as well as an input unit and an output unit.

[0079]

When configuring a connection unit in which the electronic components shown in FIGS. 13, 14, and 15, or other electronic components are mounted, it is necessary for the configuration to enable the transfer of control signals, electric power, or data between the connection unit and the main unit or the display unit.

[0080]

For example, a connector for connecting a signal line for transferring control signals, power, or data may be provided in each of the connecting unit and the main unit or the display unit so that each unit can be interconnected or disconnected.

[0081]

By enabling such connector connections, it becomes possible for the user to suitably select different connecting units (A) to (G) shown in FIGS. 13, 14, and 15, and to use the selected connecting unit by connecting with the main unit or the display unit.

[0082]

The present invention has been described in detail above with reference to specific embodiments. However, it merits noting that a person skilled in the art will be able to modify or make substitutions to the embodiments without departing from the scope and intent of the present invention. That is, the present invention has been disclosed in the form of examples, and the present invention is not to be construed as being limited by the examples. In order to determine the scope of the present invention, it is necessary to take into account the scope of the patent claims described at the outset.

[Industrial Applicability]

[0083]

As described above, based on the configuration of the present invention, an information processing apparatus such as a laptop PC having a display and an input unit such as a keyboard can be changed to various shapes based on the style of usage by the user. In addition, there are many variations in the shape that can be set, and an information processing apparatus is achieved that allows comfortable use without compromising the operability of the keyboard input by the user and the visibility of the display. It is applicable to an information processing apparatus such as a laptop-type PC for which various usage forms can be envisaged.

[0084]

Based on the configuration of the present invention, the main unit and the connecting unit are configured to be able to rotate at least 90 degrees in one direction, and there are many variations in the shape that can be set. In a variety of applications, such as placing the PC on a narrow shelf in an operable state when operating while lying on a sofa or on the floor, a configuration is provided that achieves comfortable use without compromising operability or visibility of the display. Further, since an information processing apparatus is achieved having a configuration corresponding to various usage forms and storage forms, such as being able to be stored while placed upright, it is applicable to an information processing apparatus such as a laptop-type PC for which various usage forms can be envisaged.

[Brief description of the drawings]

[0085]

FIG. 1 is a diagram showing an example of a configuration of a conventional foldable laptop PC.

FIG. 2 is a diagram describing a configuration of an information processing apparatus according to the present invention in a closed state and an open state.

FIG. 3 is a plan view of an information processing apparatus according to the present invention.

FIG. 4 is a diagram describing the detailed configuration of the pivot portion of an information processing apparatus according to the present invention which is capable of rotating at least 90 degrees in one direction.

FIG. 5 is a diagram describing an example of the use of an information processing apparatus according to the present invention.

FIG. 6 is a diagram describing an example of the use of an information processing apparatus according to the present invention.

FIG. 7 is a diagram describing an example of the use of an information processing apparatus according to the present invention.

FIG. 8 is a diagram describing an example of the use of an information processing apparatus according to the present invention.

FIG. 9 is a diagram describing the detailed configuration of the pivot portion of an information processing apparatus according to a second embodiment of the present invention, and the configuration of a pivot portion that can be rotated by 180 degrees in one direction.

FIG. 10 is a diagram describing a detailed configuration of the pivot portion of an information processing apparatus according to a second embodiment of the present invention, and the configuration of a pivot portion that can be moved by 180 degrees in one direction.

FIG. 11 is a diagram describing an example of the use of an information processing apparatus according to a second embodiment of the present invention.

FIG. 12 is a diagram describing an example of the configuration of a pivot portion applicable to an information processing apparatus according to the present invention.

FIG. 13 is a diagram describing an example of the configuration of the connecting unit of an information processing apparatus according to a third embodiment of the present invention, and an example of a configuration of a connecting unit in which electronic components are mounted.

FIG. 14 is a diagram describing an example of the configuration of the connecting unit of an information processing apparatus according to a third embodiment of the present invention, and an example of a configuration of a connecting unit in which electronic components are mounted.

FIG. 15 is a diagram describing an example of the configuration of the connecting unit of an information processing apparatus according to a third embodiment of the present invention, and an example of a configuration of a connecting unit in which electronic components are mounted.

[List of symbols]

[0086]

101 Display
110 Main unit case
111 Front main unit case
112 Rear main unit case
120 Hinge
211 Main unit
212 Connecting unit
213 Display unit
301, 302 Pivot portions
231 Unit extension portion
351, 361, 371 Pivot portions
352, 362, 372 Central axes of rotation
381, 382 Unit extension portions
391 Connecting unit
392 Main unit
393 Recessed portion
394 Convex portion
395 Pivot portion
411 Keyboard
412 Display
413 Speaker
414 Memory card slot
415 Hard disk
416 Touchpad
417 Direction input key

FIG. 1

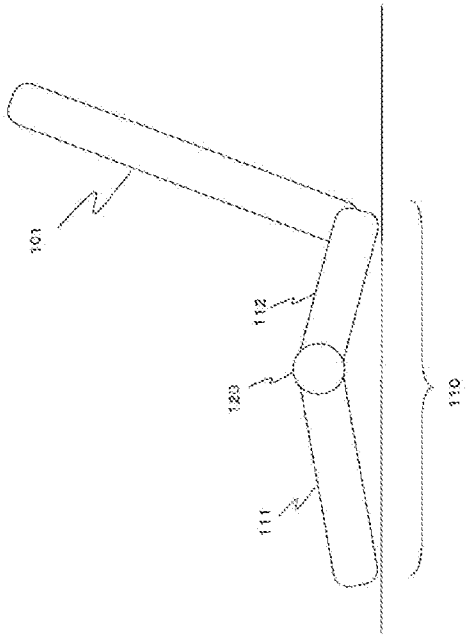


FIG. 2

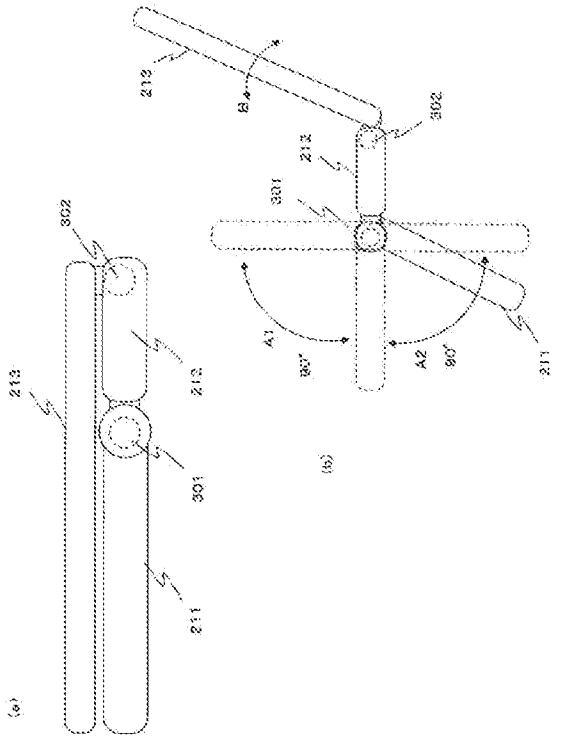


FIG. 3

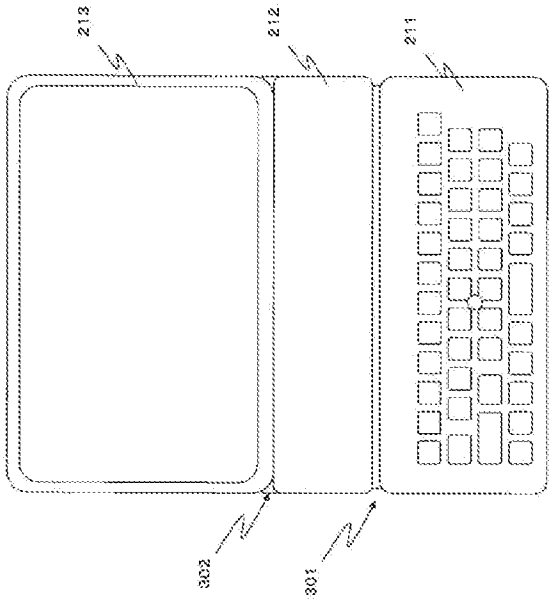


FIG. 4

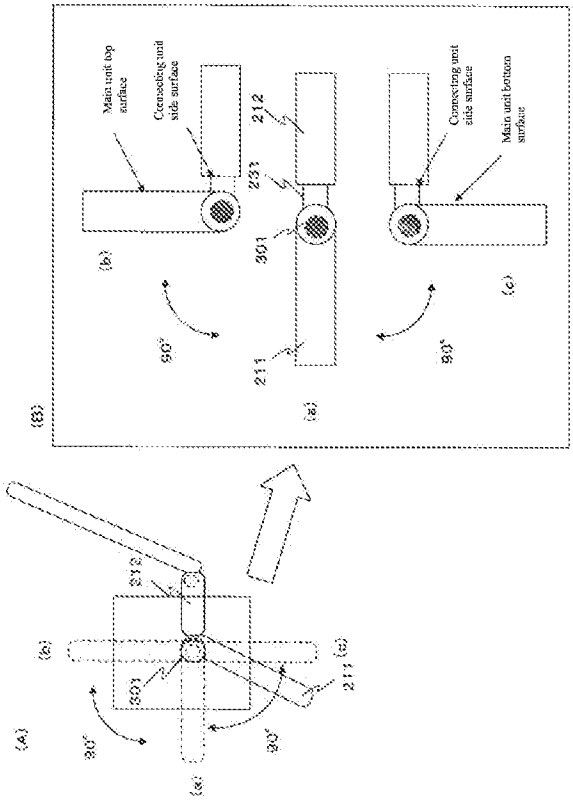


FIG. 5

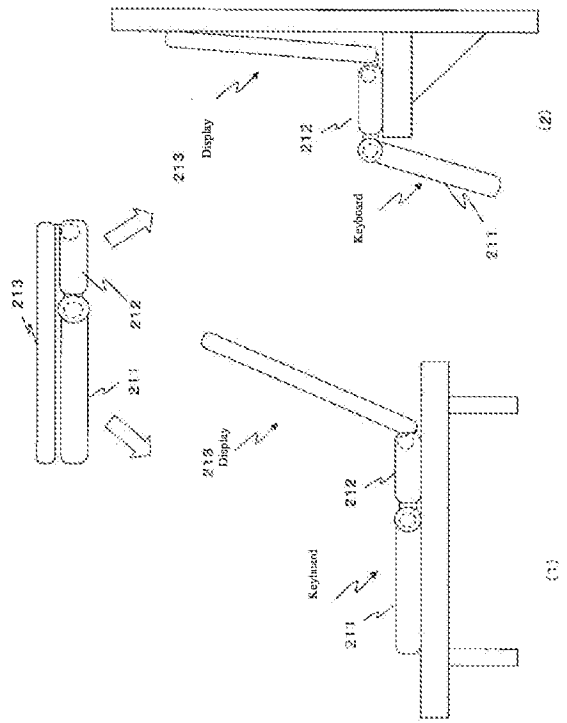


FIG. 6

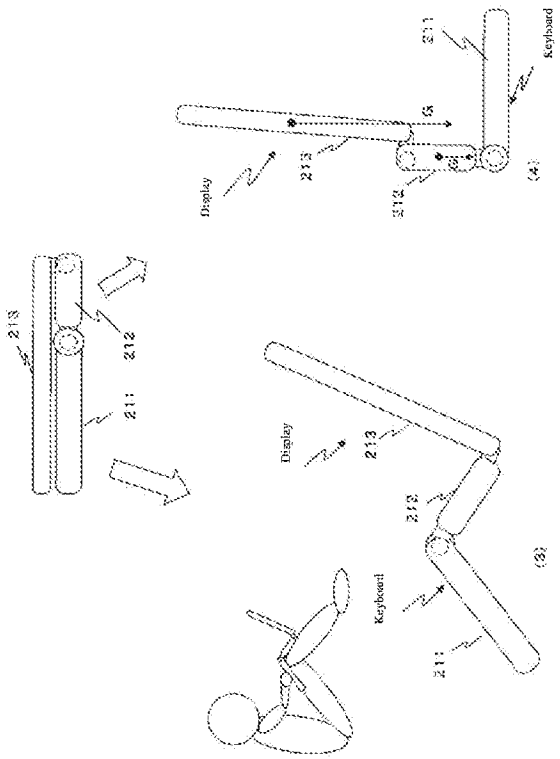


FIG. 7

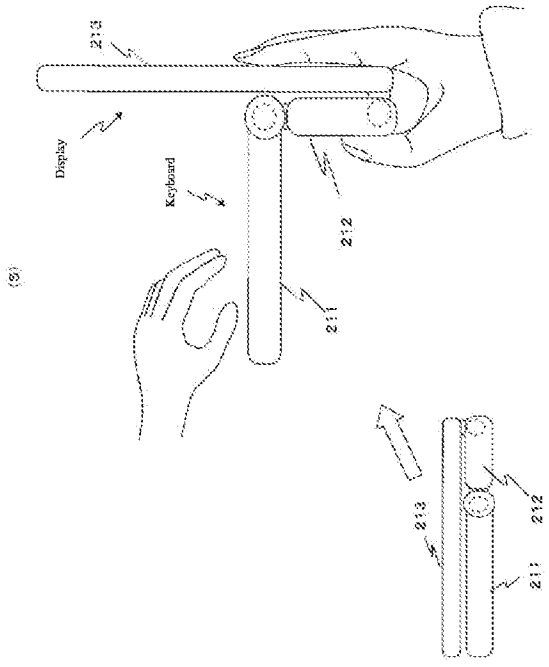


FIG. 8

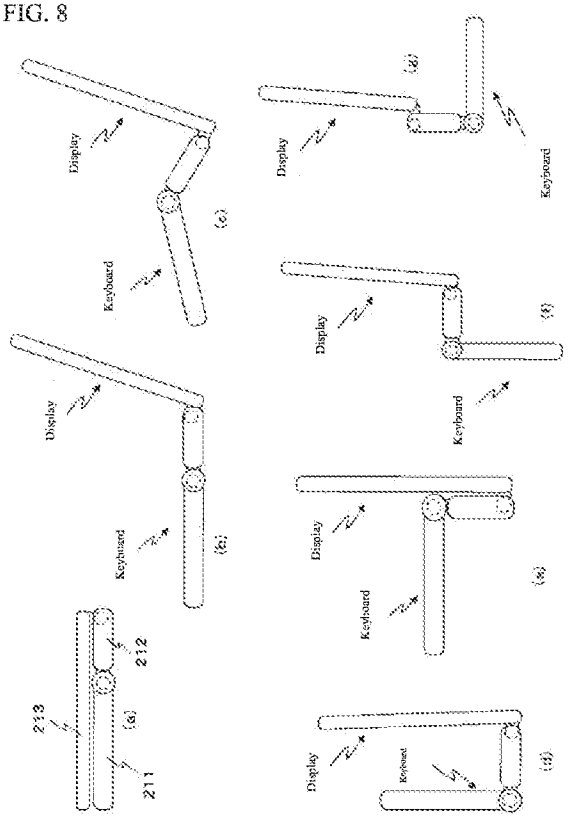


FIG. 9

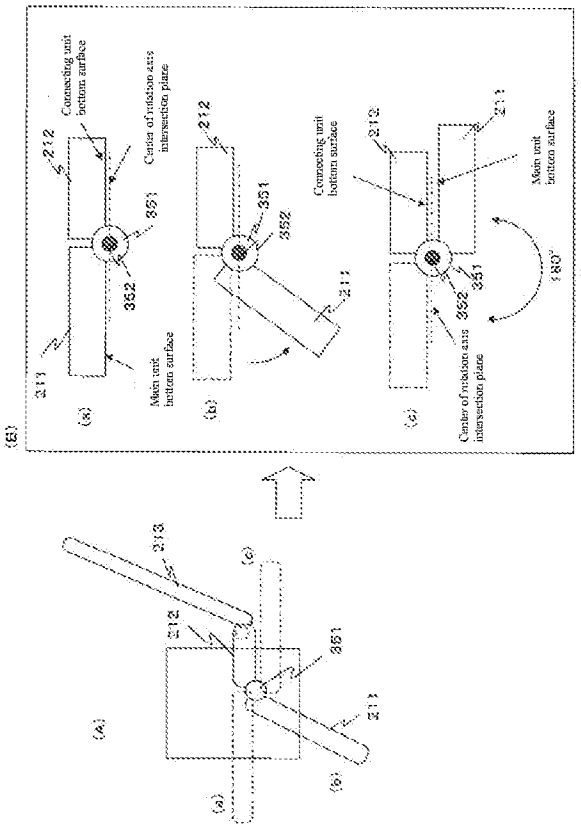


FIG. 10

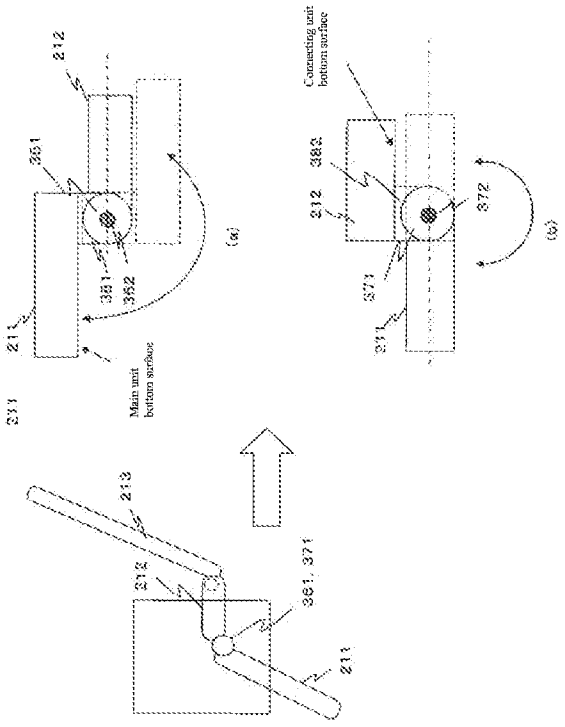


FIG. 11

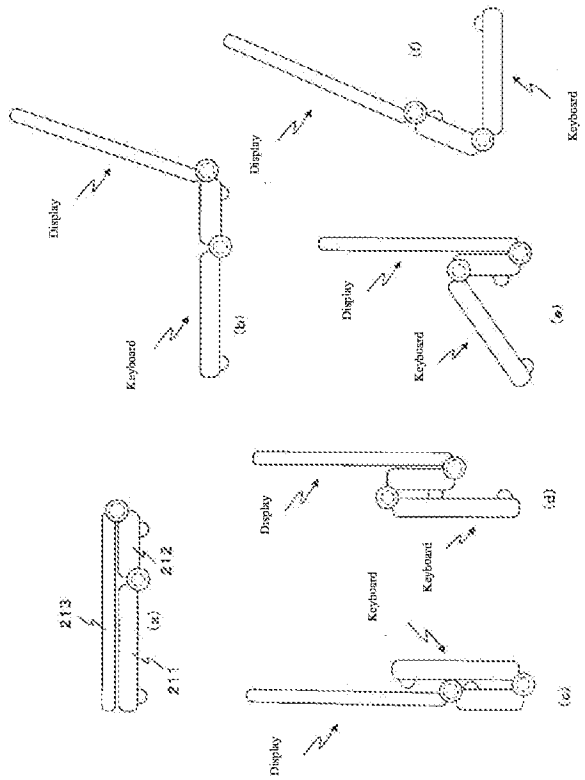


FIG. 12

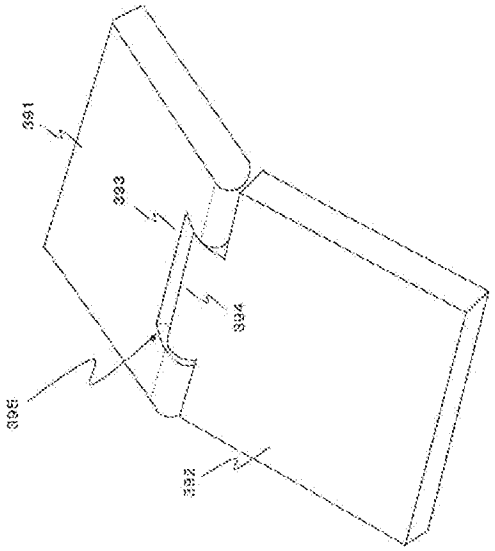


FIG. 13

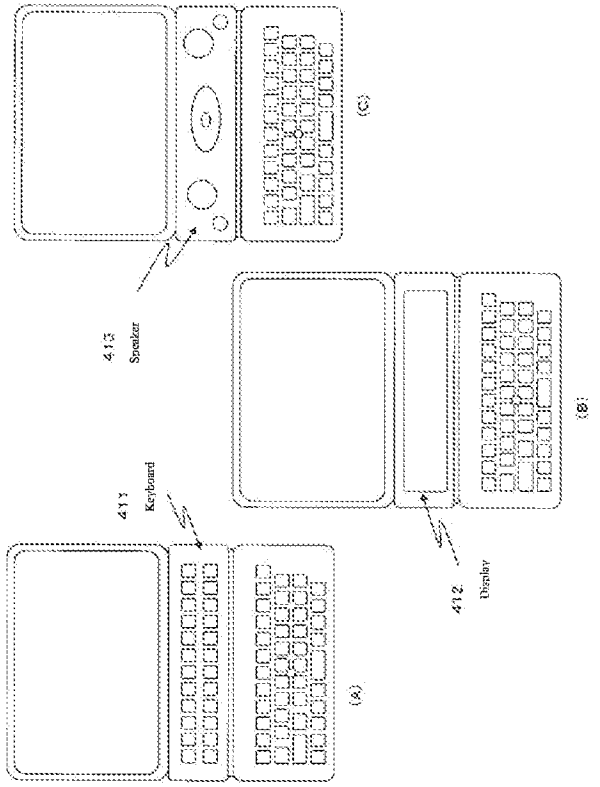


FIG. 14

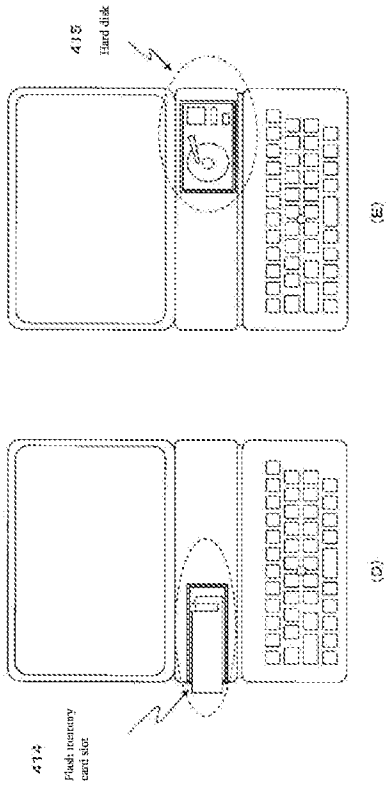
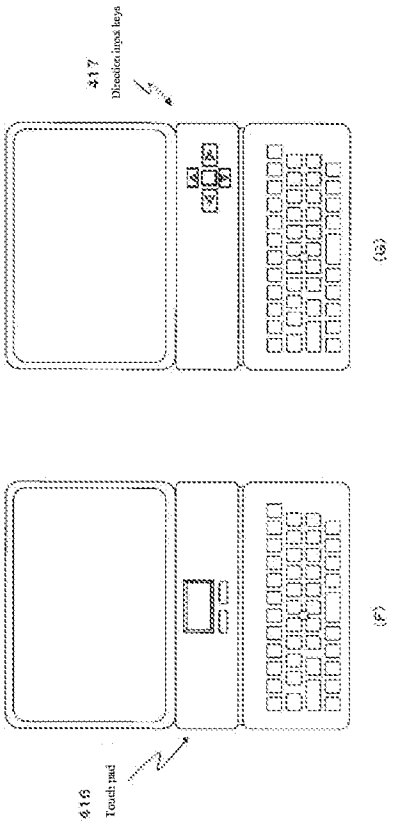


FIG. 15



TARGEM TRANSLATIONS

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info@targemtranslations.com
TargemTranslations.com

I, Dr. M. S. Niranjan, declare as follows:

1. I am over eighteen years of age and fully competent to make this affidavit. I have personal knowledge of the information contained in this affidavit, and it is true and accurate to the best of my knowledge.

2. I am a translator fluent in the Japanese and English languages.

3. I translated the Japan patent file *2005-71297 (P2005-71297A)* and the English translation is a true and accurate translation of the Japan patent *2005-71297 (P2005-71297A)*.

I declare under penalty of perjury of the laws of the United States of America that the foregoing information is true and accurate to the best of my knowledge. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. § 1001) and may jeopardize the validity of the application or any patent issuing thereon.

Executed on: December 16, 2021 at 211 COAL Layout, Sahakaranagar, Bengaluru 560092 India

M. S. Niranjan

Signed by Dr. M. S. Niranjan

Exhibit 1038

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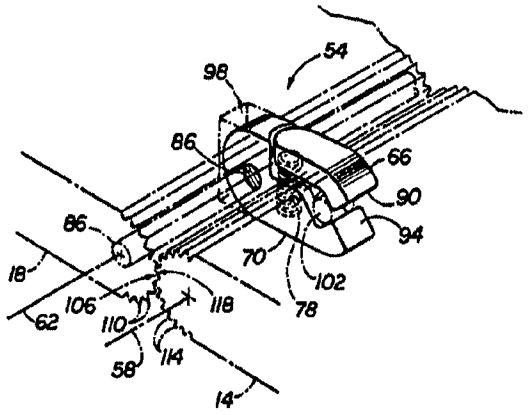
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(57) Abstract

A modular, reconfigurable system designed to permit coupling and decoupling of devices or components (14, 18) of varying types, including portable computers or other electrical devices, is disclosed. The system also is adapted to rotate about two adjacent, parallel axes (58, 62) permitting components to be positioned throughout approximately 0-360 degrees. The components (14, 18) are coupled by a connector (54).

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MODULAR, RECONFIGURABLE DEVICES

FIELD OF THE INVENTION

This invention relates to modular devices and more particularly to reconfigurable portable computers and other electronic or similar apparatus.

BACKGROUND OF THE INVENTION

Technological advances in the computing, electronics, and telecommunications industries have created devices useful to an ever-expanding number of users in a wider variety of operating situations. Increased memory capacities, processing speeds, and telecommunications capabilities of "portable" computers, for example, have combined with decreased size and weight to contribute to greater use of these devices. The advent of multi-media apparatus and component commonality has also augmented the usefulness of many electronic devices, as has rapid improvement in quality and capability of individual components. These rapid improvements to components of an overall device have contributed to consumers desiring periodically to upgrade their systems merely by purchasing the improved components. Consumers also appear eager for access to reconfigurable components to meet the requirements of the varied locations and situations in which the components operate. Many existing electronic systems have components which can neither be decoupled nor reconfigured, however, and thus fail to address these and other consumer needs.

U.S. Patent No. 5,103,376 to Blonder (incorporated herein in its entirety by this reference), for example, provides a laptop computer having keyboard and display portions whose

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positions relative to a user can be reversed. The computer includes a pair of dual-pivoting hinges, each capable of rotation about respective pins, to permit the reversal. According to the Blonder patent, however, the reversing portions are designed merely to facilitate information entry via both the keyboard and a graphics pen associated with the computer. As a result, neither the keyboard nor display is detachable from the remainder of the device, and their reconfigurability is severely limited.

U.S. Patent No. 5,034,858 to Kawamoto, et al., also incorporated herein in its entirety by this reference, discloses electronic equipment having a separable keyboard. The equipment also includes a display that can be both rotated about an axis and tilted into place about a perpendicular axis for use. As with that disclosed in the Blonder patent, however, the display cannot be detached from the main equipment body. Additionally, neither the Blonder nor Kawamoto patent contemplates rotation about two adjacent, parallel axes to permit reconfiguration of components throughout approximately 0-360°.

SUMMARY OF THE INVENTION

The present invention, by contrast, provides a modular, reconfigurable system designed to permit mechanical (and, if necessary, electrical) coupling and decoupling of devices or components of varying types. Because system elements can be decoupled, consumers can upgrade individual components as desired without having to purchase an entirely new system. Component redundancy can also be decreased, as a single electronic display, for example, can be coupled for use not only with computers but with appropriate audio-visual or

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telecommunications equipment as well. In essence, the invention permits a user to "mix and match" electronic or other devices and components as needed.

The innovative system also is adapted to rotate about at least two adjacent, parallel axes. Consequently, the present invention permits components to be repositioned about each other throughout approximately 0-360°, allowing use of a visual display not only in a standard laptop computer format but also in formats facilitating use of the display as, for example, a television or telecommunications monitor or a pen-based computing tablet.

It is therefore an object of the present invention to provide a system composed of reconfigurable modules.

It is another object of the present invention to provide a modular system permitting coupling and decoupling of devices and components, particularly electronic devices and components.

It is also an object of the present invention to provide a system having two adjacent, parallel axes of rotation to facilitate component rotation about approximately 0-360°.

Other objects, features, and advantages of the present invention will become apparent with reference to the remainder of the written portion and the drawings of this application.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an exemplary modular device incorporating the technology of the present invention shown in a nominally "open" position.

FIG. 2 is a perspective view of the device of FIG. 1 shown in a nominally "closed" position.

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FIG. 3 is a fragmentary perspective view of a connector of the present invention.

FIG. 4 is a cross-sectional view of the connector of FIG. 3.

FIGS. 5-9 are a series of fragmentary side cross-sectional views of the device of FIG. 1 shown in various configurations.

FIG. 10 is a perspective view of the device of FIG. 1 having a support.

FIG. 11 is an exploded perspective view of a mechanism connected to the support of FIG. 10.

FIGS. 12-13 are a series of side elevational views of the device of FIG. 10 shown in various configurations.

FIG. 14 is a perspective view of an alternate coupling mechanism forming part of the present invention.

FIG. 15 is a perspective view of an alternate exemplary modular device incorporating the technology of the present invention shown in a nominally "open" position.

FIG. 16 is a perspective view of the device of FIG. 15 shown in a nominally "closed" position.

FIG. 17 is a perspective view of the device of FIG. 15 illustrating a coupling mechanism.

FIG. 18 is a perspective view of the device of FIG. 15 illustrating an alternate coupling mechanism.

FIGS. 19-28 are a series of side elevational views of an exemplary modular device incorporating the technology of the present invention shown in various configurations.

FIG. 29 is an elevational view of a position indicator that can be incorporated in the modular devices of the present invention.

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DETAILED DESCRIPTION

FIGS. 1-2 illustrate generally an exemplary modular device 10 consistent with the present invention. As shown in FIG. 1, device 10 may be a portable computer comprising first module 14 (e.g. a keyboard) and second module 18 (e.g. a display). Also appearing in FIG. 1 are disk 22, a magnetic storage device which may be loaded into port 26, and compact disc 30 (which may be loaded into another port not shown in FIG. 1). An electronic mouse or other pointer 32 adapted to convert manual pressure to electronic signals capable of moving a cursor about the visual display 35 provided by second module 18 may also be included, as may video camera 34. FIG. 1 illustrates device 10 in a nominally "open" position permitting access both to visual display 35 and keys 36, while FIG. 2 shows device 10 in a nominally "closed" position. Torque-generating device 37, such as a spring, is designed to retain second module 18 in a selected position relative to first module 14 when device 10 is in use.

Also shown in FIG. 1 (and FIG. 29) as part of second module 18 is position-indicating mechanism 38. Mechanism 38 includes a moveable conductor 42 (such as liquid mercury) in a spherical cavity 46 having contacts 50 spaced about its periphery. Conductor 42 responds via gravitational forces to spatial reorientation of mechanism 38 by moving relative to contacts 50 (to contact at least one contact 50 to close its respective circuit). Including mechanism 38 as a component of either first or second modules 14 or 18 would thus permit it to indicate the spatial orientation of that module. Doing so would also allow mechanism 38 to assist device 10 (and its associated software) in determining, for example, whether the information

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to appear on visual display 35 should be in "landscape" or "portrait" position as the visual display 35 is spatially configured, the direction in which to move a curser of second module 18 when a visual display, or whether to render keys 36 of first module 14 inoperable when unused.

One or more connectors 54 operate to attach first and second modules 14 and 18. As shown in FIG. 3, for example, first module 14 defines a primary axis of rotation 58, while second module 18 defines a corresponding primary axis of rotation 62 parallel to axis 58. In some embodiments of device 10, the size of connector 54 is designed to be approximately equal to the combined thicknesses of first module 14 and second module 18. As a result, in these embodiments the size of connector 54 is significantly less than the length of either first module 14 or second module 18, placing parallel axes 58 and 62 essentially adjacent each other. Connector 54 mechanically couples first module 14 and second module 18 and can provide electrical coupling of the modules as well. Alternatively, first and second modules 14 and 18 may be coupled electrically using conventional means.

FIGS. 3-4 detail connector 54 of the present invention. Connector 54 comprises (moveable) leg 66, (fixed) leg 70, pin 74, and spring 78 and defines tube 82 for permanently receiving axle 86 embedded within second module 18. Leg 66 is designed to pivot about pin 74, with its flared end 90 biased by spring 78 toward a similar flared end 94 of leg 70. As a consequence, legs 66 and 70 of connector 54, when fitted into slots 98 of first module 14, snap, or clamp, onto axle 102 of that module and thereby connect first and second modules 14 and 18. The camming action of connector 54

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forces axles 82 and 94 toward each other, facilitating attachment of the modules.

Edge 106 of second module 18 may also include teeth 110 which are complementary to and designed to engage corresponding teeth 114 of edge 118 of first module 14. If present, teeth 110 and 114 permit more consistent rotation of first and second modules 14 and 18. Engaging the teeth 110 and 114 also permits use of a torque-generating device 37 in only one of first and second modules 14 and 18, providing a commensurate savings in space, weight, and cost. Use of teeth 110 and 114 may also reduce stress on connectors 54, stabilizing device 10 when in use by supporting the upper of first or second modules 14 or 18 along a greater length of the lower of axes 58 or 62. Teeth 110 and 114 additionally provide a convenient hand-grip surface for carrying first and second modules 14 and 18 when device 10 is configured as in FIG. 2.

Although slots 98 are shown in FIGS. 1-3 as formed at edge 118 of first module 14, they may additionally or alternatively appear along other edges or portions of first module 14 (e.g. slots 98A of FIG. 1). If so placed, the slots would permit device 10 to be configured in other ways, including, for example, as illustrated in FIGS. 22-23. Connector 54 could, moreover, be permanently connected to axle 102 rather than axle 86 or not permanently connected to either.

FIGS. 5-9 show first and second modules 14 and 18 of device 10 in various configurations accessible using the present invention. FIG. 5 shows second module 18 in an unrotated, or nominally closed, position relative to first module 14, placing the first and second modules 14 and 18 in parallel planes respectively intersecting axes 58 and 62. This position protects visual display

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35 and keys 36 from damage by securing them within the interior of device 10. FIG. 6, by contrast, illustrates second module 18 rotated about axis 62 to form an obtuse angle relative to first module 14 (described above as a nominally "open" position), positions representative of those assumed by the displays and keyboards of many operating laptop computers.

FIG. 7 illustrates an alternative positioning, in which second module 18 has been rotated approximately 180° relative to first module 14 to expose visual display 35. In FIG. 8, the rotation of second module 18 exceeds 270°, useful particularly when only visual display 35 need be accessible. FIG. 9, finally, shows second module 18 rotated approximately 360° relative to first module 14 (or vice-versa), exposing visual display 35 for use as, for example, a tablet for pen-based computing. Providing an upper surface 120 for keys 36 of first module 14 essentially flush with (or not protruding beyond) its upper surface 121 reduces the likelihood of damage to keys 36 in this configuration.

FIG. 10 details support 122 that may be incorporated into device 10. Support 122 rotates away from second module 18 and is held in position by mechanism 126 either to brace second module 18 (see FIG. 12) or elevate, for instance, a keyboard used as first module 14 (see FIG. 13) to facilitate information or data entry. By positioning support 122 other than at edge 106 of second module 18, the edge 106 continues to be available for locating ports, jacks, or other useful or necessary devices. If present, knobs 128 of support 122 may be fitted into recesses 130, with key 134, spring 138, and tension-adjustment screw 142 of mechanism 126 utilized to retain them in place. As shown in FIG.

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11, key 134 includes radial teeth 146 that engage similar teeth 150 on knob 128, with protrusion 154 of key 134 fitting into keyway 158 for rotational stability.

FIG. 14 details an alternative connector 162, such as a ball joint, of the present invention. Unlike connector 54, connector 162 permits rotation about an axis perpendicular to axes 58 and 62. This in turn increases the versatility of device 10, allowing a wider variety of possible configurations to be assumed without having to detach first and second modules 14 and 18.

FIGS. 15-19 illustrate more of the modular, reconfigurable nature of devices made according to the present invention. Shown in FIGS. 15-19 is device 210, which may include first, second, and third modules 214, 218, and 222, respectively. First and second modules 214 and 218 may be connected as described earlier or using either of the mechanical connectors 226 and 230 shown in FIGS. 17 and 18. If mechanical connectors 226 or 230 are employed, electrical connections between first and second modules 214 and 218 may be made using conventional ribbon cable 234, for example. Third module 222 may be connected to either first module 214 or second module 218 (and switched back and forth as desired), with slots 238 along edges 242 and 246 receiving connectors 250. Although keys 254 appear on first module 214 and visual display 258 is shown on second module 218, either or both modules could be electronic tablets, videotape or compact disc players, radios, television receivers, video game players, or other entertainment, educational, or scientific instrumentation modules. Among other devices conceivable as first, second, and third modules 214, 218, and 222 are communications modules

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(including cellular telephones, portable facsimile, copying, scanning, and printing devices, digital dictaphones), digital still or video cameras, digital transducers and data recorders, bar-code readers, and other electronic equipment. FIG. 16 illustrates recess 260 formed when device 210 is nominally "closed," which provides an area to which a user can apply pressure when opening the device 210 manually.

FIGS. 19-28 detail various couplings of the first and second modules 14 and 18 (or 214 and 218) useful with the present invention. In the nominally closed position of FIG. 19, second module 18 is unrotated relative to first module 14, protecting visual display 35 of second module 18 from damage by securing it within the interior of device 10. FIG. 27 shows second module 18 rotated approximately 360° relative to first module 14 (or vice-versa), exposing visual display 35 for use as, for example, a tablet for pen-based computing. FIG. 21 illustrates an alternative positioning, in which second module 18 has been rotated approximately 180° relative to first module 14 to expose visual display 35. Other alternative positionings involving rotation of second module 18 about axis 62 are detailed in FIG. 20 (in which second module 18 is rotated more than 90° to provide a standard "desktop" orientation) and in FIGS. 25 and 28 (in which second module 18 is rotated more than 270°, when only the visual display 35 need be accessible).

FIG. 22, 23, and 24 detail additional alternative positionings of first module 14 and second module 18. Detaching connector 54 from first module 14 and reattaching it about a secondary axis 262 of that module (if first module 14 is adapted for such axis to be present) permits

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device 10 to be configured as shown in FIG. 22, while thereafter detaching connector 54 from second module 18 and reattaching it about secondary axis 266 (again if that module is adapted to permit attachment about the axis) reconfigures device 10 as illustrated in FIG. 23. Similarly, reattaching connector 54 about secondary axis 266 of second module 18 while retaining its connection about axis 58 of first module 14 configures device 10 according to FIG. 24. FIG. 26, finally, illustrates the detachable mechanical connection between first module 14 and second module 18, permitting visual display 35 to be visible and device 10 to operate with merely an electrical connector 270 between the first and second modules 14 and 18.

The foregoing is provided for purposes of illustrating, explaining, and describing embodiments of the present invention. Modifications and adaptations to these embodiments will be apparent to those skilled in the art and may be made without departing from the scope or spirit of the invention.

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I claim:

1. A modular, reconfigurable system comprising:
   a. a first electronic module defining a first axis of rotation;
   b. a second electronic module defining a second axis of rotation parallel to the first axis of rotation;
   c. means for connecting the first and second electronic modules; and
   d. means for retaining the second electronic module in a selected position relative to the first electronic module.

2. A system according to claim 1 in which the connecting means intersects the first and second axes of rotation and permits rotation of the second electronic module approximately 0-360° about the first electronic module.

3. A system according to claim 1 further comprising means for hindering the first electronic module from rotating about the first axis of rotation.

4. A system according to claim 1 further comprising means for hindering the second electronic module from rotating about the second axis of rotation.

5. A system according to claim 1 in which the connecting means comprises means for detachably connecting the first and second electronic modules.

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6. A system according to claim 1 in which the first electronic module defines a secondary axis of rotation.

7. A system according to claim 6 in which the connecting means intersects the secondary axis of rotation.

8. A system according to claim 1 in which:
   a. the first electronic module comprises a curved surface radial to the first axis of rotation, which curved surface includes a plurality of first teeth; and
   b. the second electronic module comprises a curved surface radial to the second axis of rotation, which curved surface includes a plurality of second teeth complementary to and engaging the first teeth.

9. A system according to claim 1 in which the second electronic module comprises an integral position indicator, which position indicator comprises:
   a. a fluid conductor;
   b. a housing for the conductor, which housing:
      i. is adapted to permit the conductor to move responsive to reorientation of the second electronic module; and
      ii. comprises a plurality of electrical contacts, each adapted to contact the fluid conductor as a function of the orientation of the second electronic module.

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10. A system according to claim 1 further comprising means, connected to the second electronic module, for supporting the first electronic module.

11. A system according to claim 10 in which the supporting means comprises:
    a. an extension adapted to rotate about the second axis of rotation; and
    b. means for retaining the extension in a selected position.

12. A system according to claim 1 in which the first electronic module:
    a. defines a surface; and
    b. comprises a keyboard having a plurality of keys, each key having:
        i. an upper surface not protruding beyond the surface of the first electronic module; and
        ii. a recessed portion for accommodating a fingertip of a user.

13. A system according to claim 12 in which the first electronic module further comprises an electronic cursor-moving device comprising:
    a. an upper surface flush with the surface of the first electronic module, for receiving pressure from the fingertip of the user; and
    b. means for translating the fingertip pressure into motion of an electronic cursor.

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14. A system according to claim 1 further comprising means for selectively hindering the first electronic module from rotating about the first axis of rotation and in which the connecting means:
    a. intersects the first and second axes of rotation; and
    b. comprises means for detachably connecting the first and second electronic modules.

15. A system according to claim 14 in which the first electronic module defines a secondary axis of rotation and the connecting means intersects the secondary axis of rotation.

16. A system according to claim 14 further comprising means, connected to the first electronic module, for supporting the first electronic module, which supporting means comprises:
    a. an extension adapted to rotate about the first axis of rotation; and
    b. means for retaining the extension in a selected position.

17. A system according to claim 1 in which (1) the second electronic module defines a third axis of rotation perpendicular to the first and second axes of rotation and (2) the connecting means permits rotation of the second electronic module about the third axis of rotation.

18. A system according to claim 1 in which the connecting means comprises:

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a. a fixed leg connected to the second electronic module and having a length and a recess;
b. a spring positioned within the recess;
c. a pin spanning at least a portion of the length of the fixed leg; and
d. a moveable leg contacted by the spring and adapted to pivot about the pin.

19. A system according to claim 11 in which the extension-retaining means comprises a key positioned within the second electronic module and having a surface adapted to engage the extension.

20. A system according to claim 1 in which the first electronic module comprises a generally curved surface radial to the first axis of rotation, which generally curved surface comprises a recess.

21. A modular system comprising:
a. a keyboard;
b. a visual display mechanically and electrically connected to the keyboard; and
c. a telephone mechanically connected to at least one of the keyboard and visual display.

22. A modular, reconfigurable system comprising:
a. a first module defining:
i. a first primary axis of rotation;
ii. a secondary axis of rotation; and
iii. a curved surface radial to the first primary axis of rotation,

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which curved surface includes a plurality of first teeth;

b. a second module defining:
   i. a second primary axis of rotation parallel to the first primary axis of rotation; and
   ii. a curved surface radial to the second primary axis of rotation, which curved surface includes a plurality of second teeth complementary to and engaging the first teeth;

c. means, intersecting at least two of the first and second primary axes of rotation and the secondary axis of rotation, for detachably connecting the first and second modules;

d. torque-generating means for retaining the second module in a selected position relative to the first module;

e. means for selectively hindering the first module from rotating about the first primary axis of rotation; and

f. means, connected to the first module, for supporting the first module, which means comprises:
   i. an extension adapted to rotate about the first primary axis of rotation; and
   ii. means for retaining the extension in a selected position.

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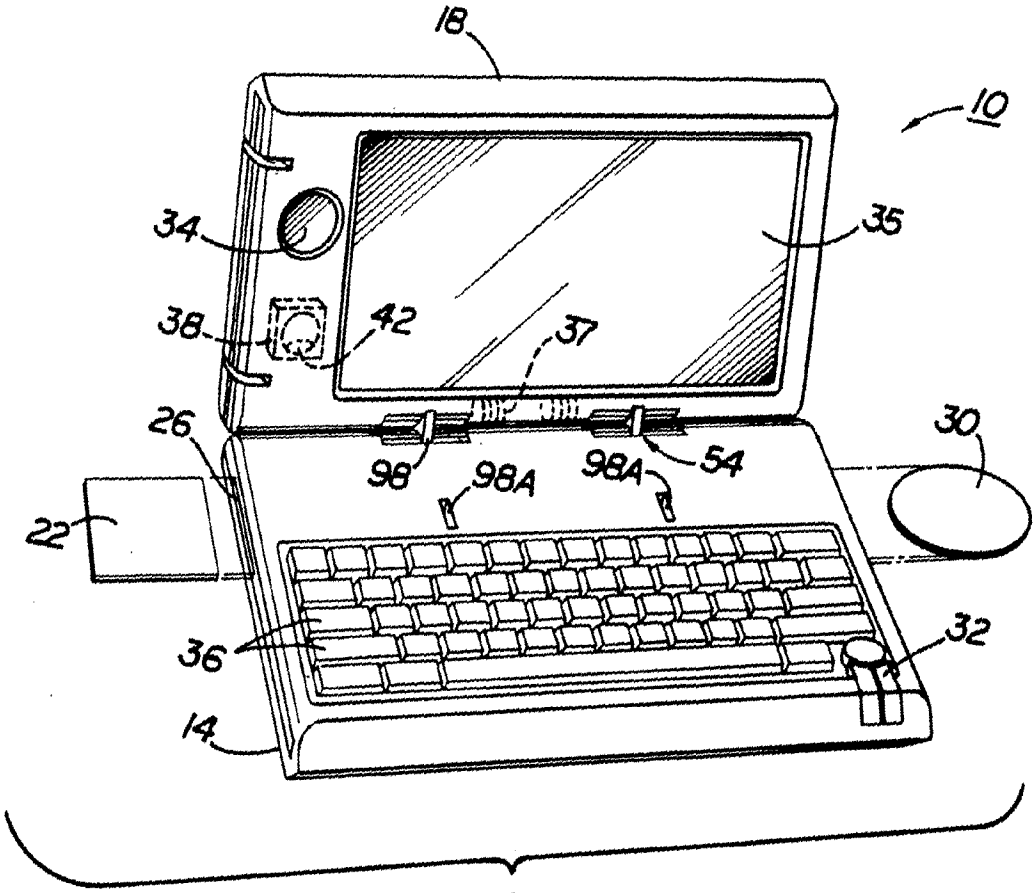


FIG 1

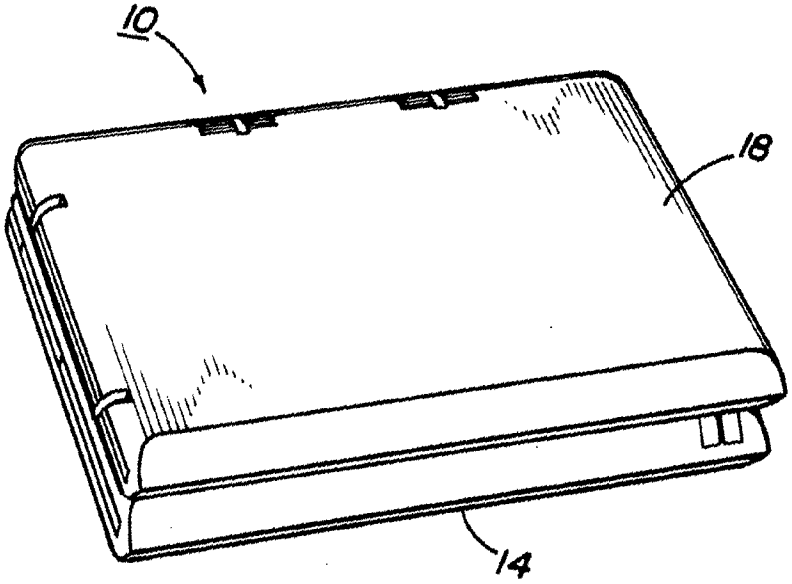


FIG 2

HP Inc. - Exhibit 1005 - Page 5399

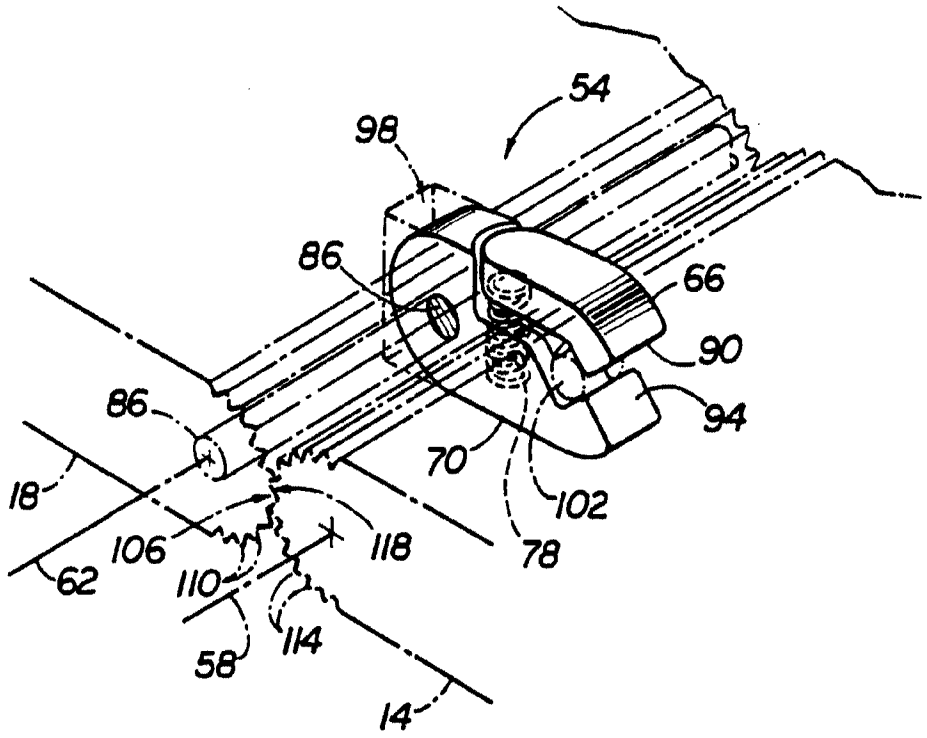


FIG 3

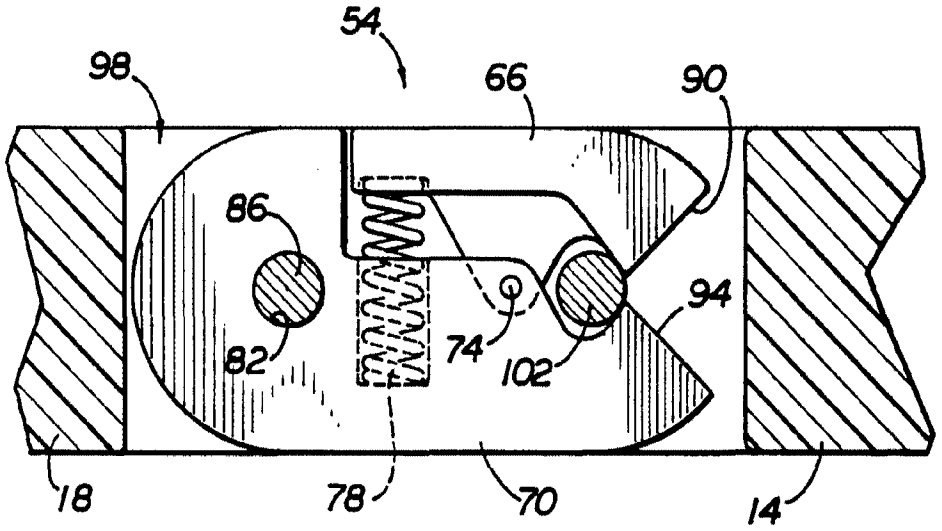


FIG 4

HP Inc. - Exhibit 1005 - Page 5400

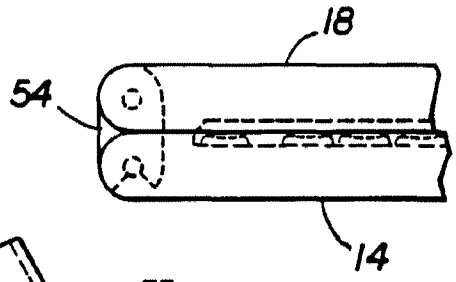


FIG 5

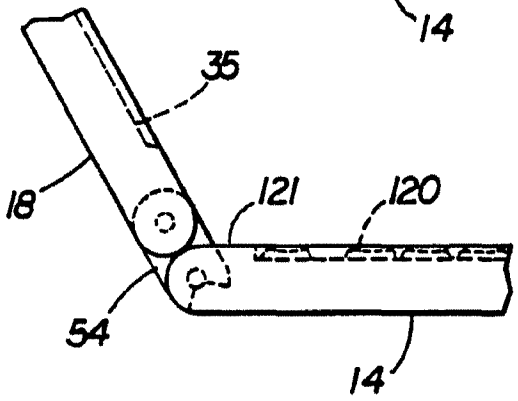


FIG 6

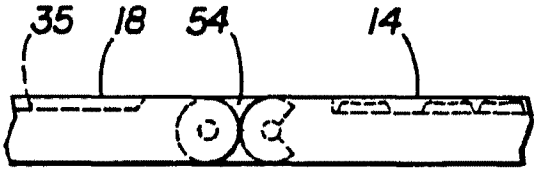


FIG 7

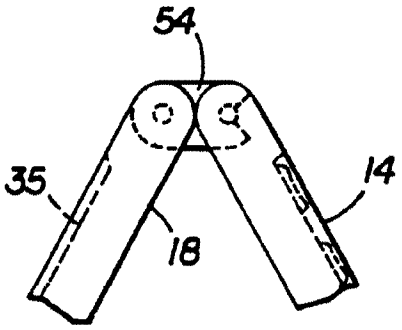


FIG 8

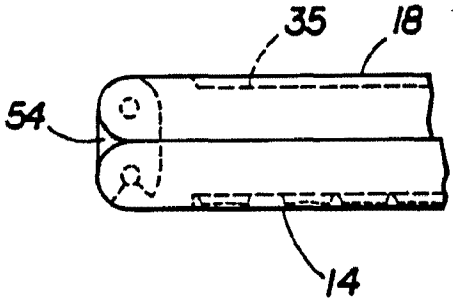


FIG 9

HP Inc. - Exhibit 1005 - Page 5401

FIG 10

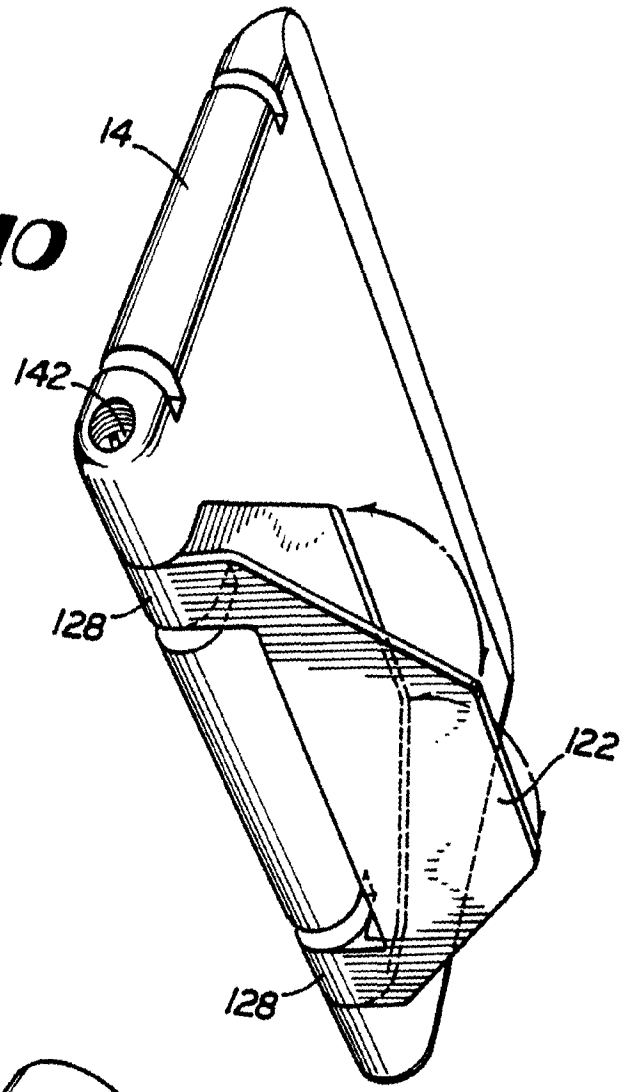
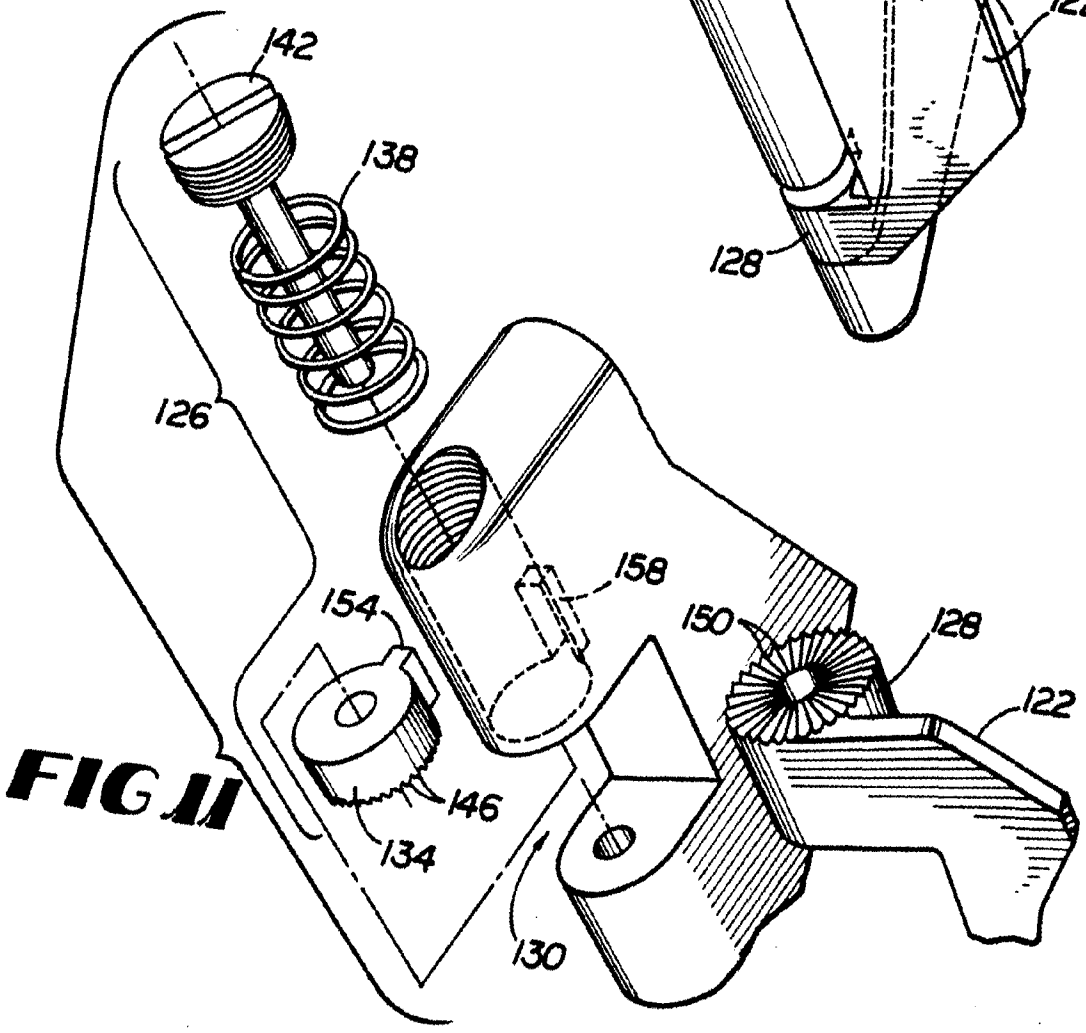


FIG 11



HP Inc. - Exhibit 1005 - Page 5402

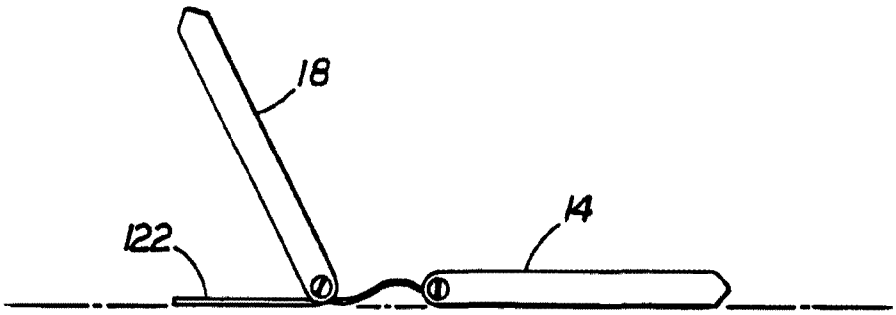


FIG 12

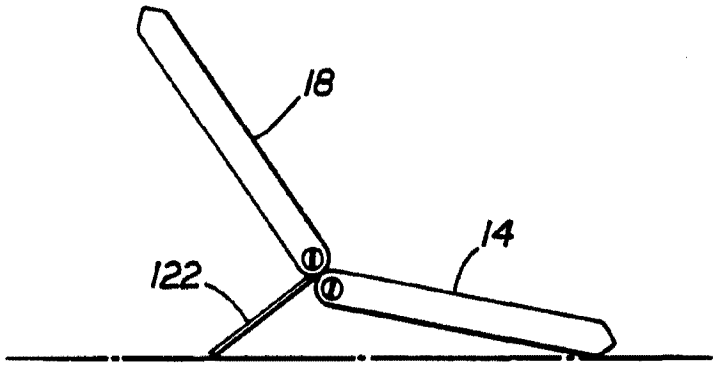


FIG 13

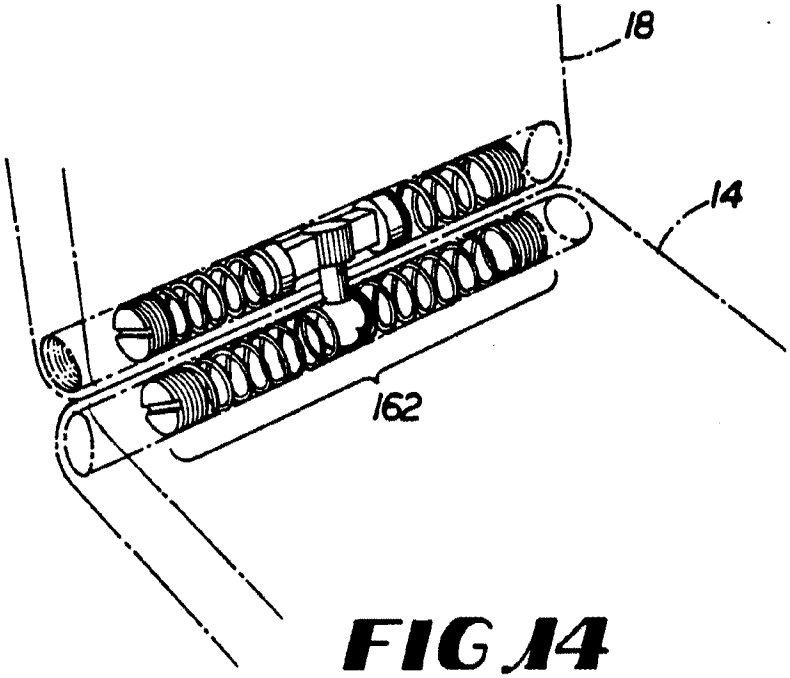


FIG 14

HP Inc. - Exhibit 1005 - Page 5403

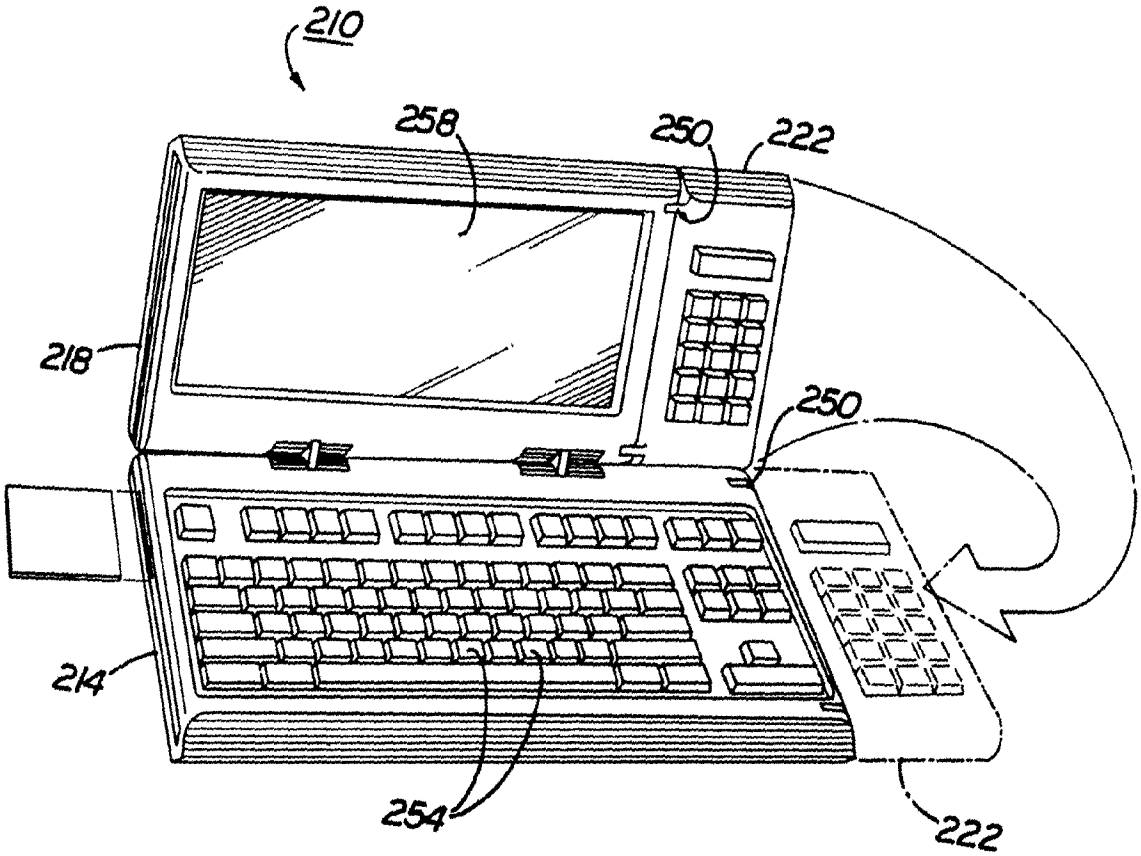


FIG 15

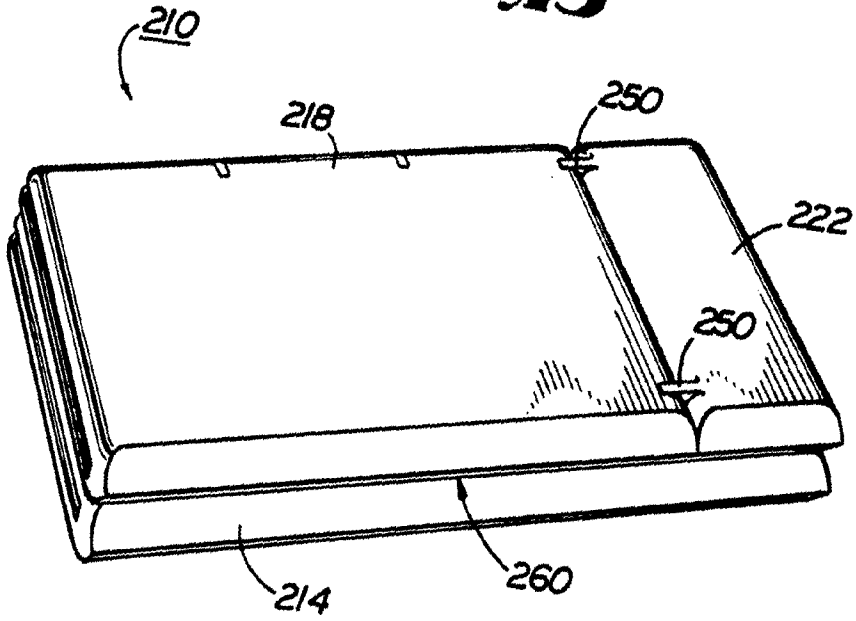


FIG 16

HP Inc. - Exhibit 1005 - Page 5404

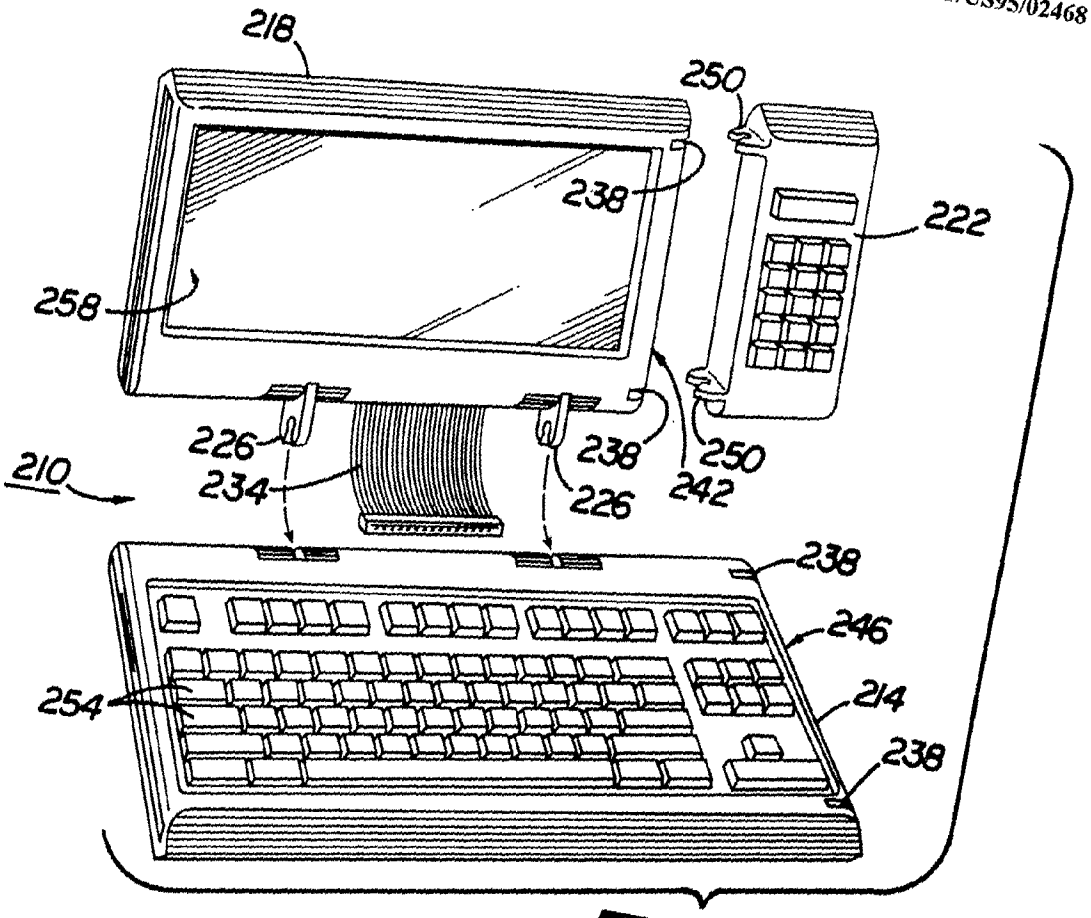


FIG 17

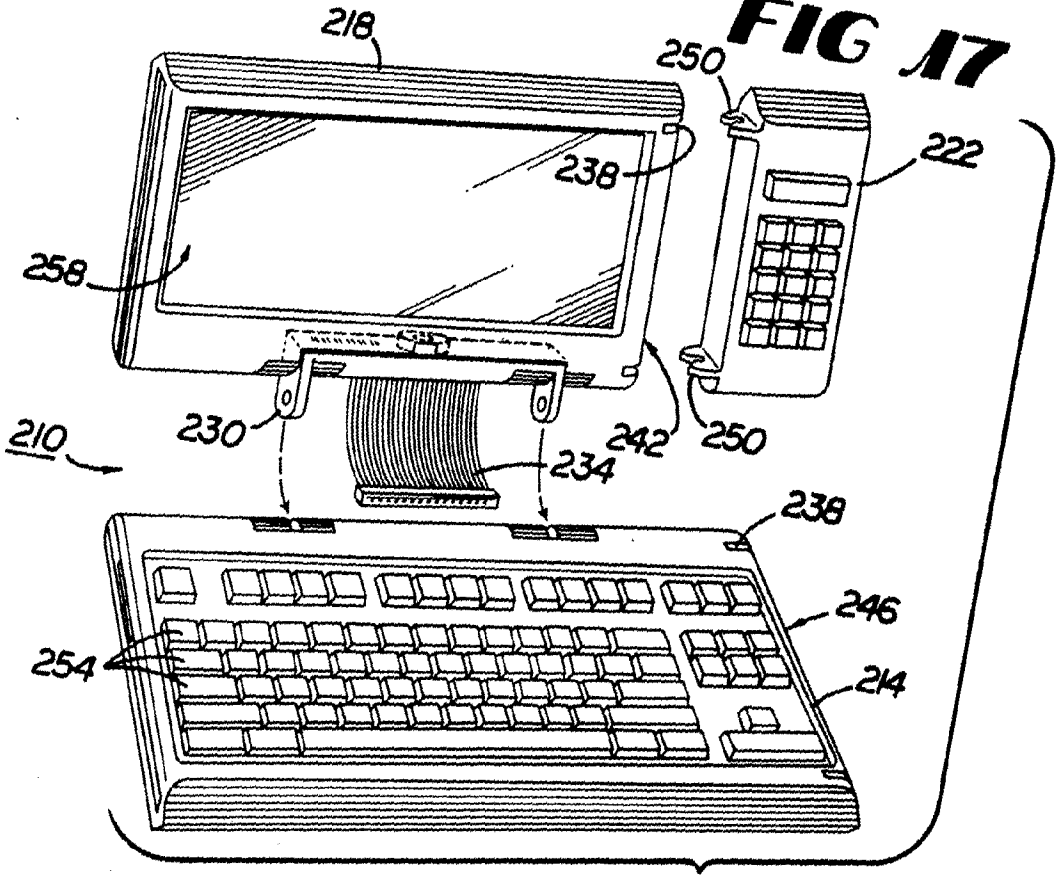


FIG 18

SUBSTITUTE SHEET (RULE 26)

HP Inc. - Exhibit 1005 - Page 5405

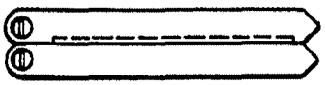


FIG 19

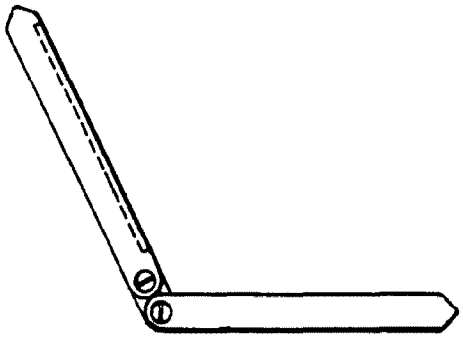


FIG 20



FIG 21

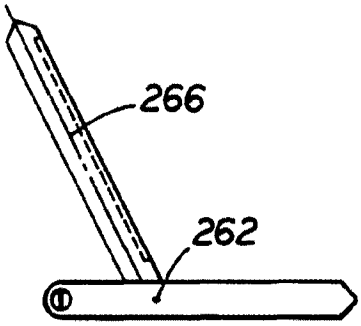


FIG 22

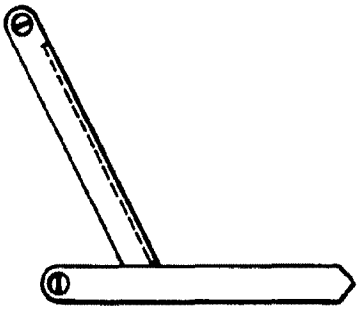


FIG 23

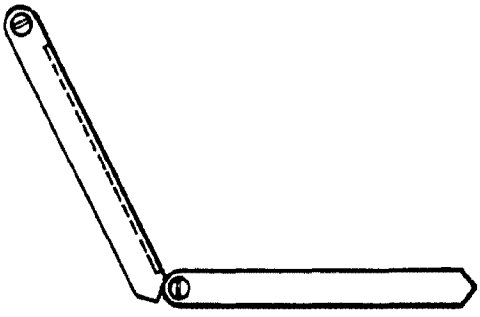


FIG 24

HP Inc. - Exhibit 1005 - Page 5406

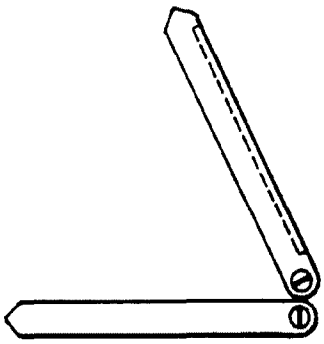


FIG 25

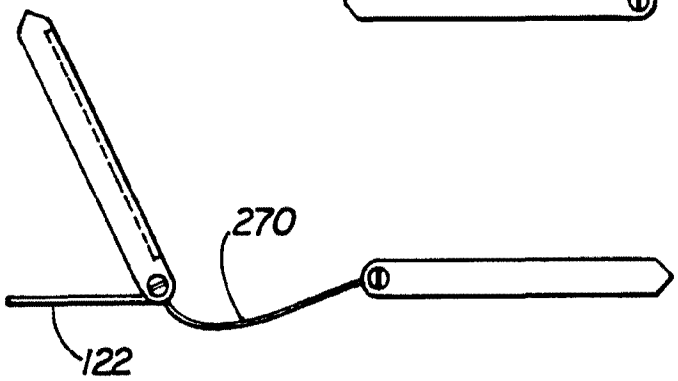


FIG 26

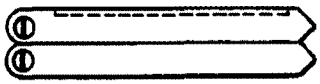


FIG 27

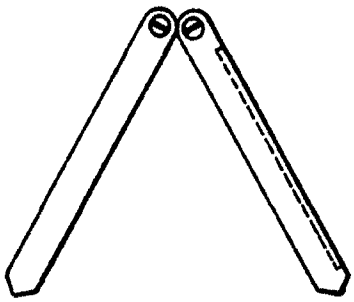


FIG 28

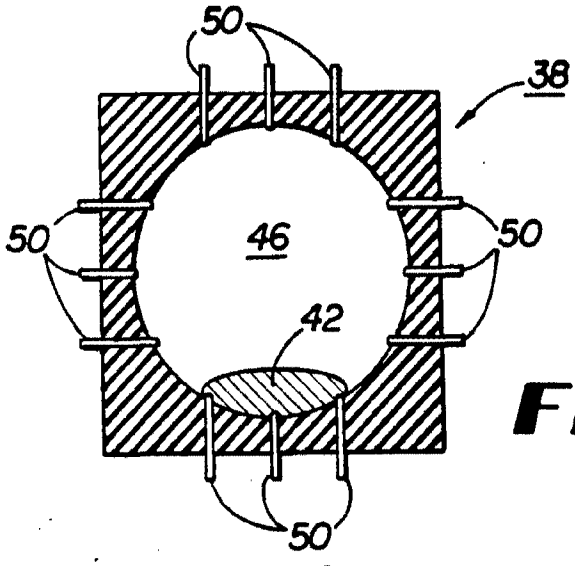


FIG 29

HP Inc. - Exhibit 1005 - Page 5407

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02468

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06F 1/16; H05K 7/12
US CL :361/683

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)

U.S. : 361/680-683; 364/708.1; 439/928

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, A, 5,268,817 (MIYAGAWA ET AL) 07 December 1993, Figures 8A-11B and column 6, line 66- column 9, line 59.	1-5, 14 --- 6, 7, 15, 16
Y	US, A, 5,034,858 (KAWAMOTO ET AL) 23 JULY 1991, Figures 9-15 and column 4, line 1- column 5, line 23.	6, 7, 15
Y	US, A, 5,235,495 (BLAIR ET AL) 10 August 1993, see the entire document.	16

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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
06 JUNE 1995

Date of mailing of the international search report
10 JUL 1995

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer
MICHAEL W. PHILLIPS

Telephone No. (703) 308-3191

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02468

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-7, 14-16, and 22

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02468

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING
This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s)1-7, 14-16, and 22, drawn to a system having the special technical feature of a means for detachably connecting modules.
Group II, claim 8, drawn to a system having the special technical feature of teeth.
Group III, claim 9, drawn to a system having the special technical feature of a position indicator.
Group IV, claims 10, 11, and 19, drawn to a system having the special technical feature of means for supporting.
Group V, claims 12 and 13, drawn to a system having the special technical feature of a keys with a recessed portion for accommodating a fingertip.
Group VI, claim 17, drawn to a system having the special technical feature of a third axis of rotation.
Group VII, claim 18, drawn to a system having the special technical feature of a fixed leg.
Group VIII, claim 20, drawn to a system having the special technical feature of a recess.
Group IX, claim 21, drawn to a system having the special technical feature of a telephone.
The inventions listed as Groups I-IX do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: a special technical feature is a technical feature which defines a contribution over the prior art. The technical features in claims 1-4 are not special technical feature because they do not define a contribution over the prior art as shown by Figures 8A-11B of U. S. Patent No. 5,268,817 to Miyagawa et al., issued 07 December 1993. These Figures show two modules connected, retained, and hindered from rotation as claimed in claims 1-4 (and also claim 6). Thus claim 5 is the first claim with a special technical feature, i.e. a means for detachably connecting modules.

Groups II-IX do not include the special technical feature of a means for detachably connecting modules. Thus unity of invention is lacking.

Exhibit 1040

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 283 407 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
10.10.2018 Bulletin 2018/41

(21) Application number: **09727165.4**

(22) Date of filing: **27.03.2009**

(51) Int Cl.:
G06F 1/16 *(2006.01)* ***G06F 3/0481*** *(2013.01)*
G06F 3/0482 *(2013.01)*

(86) International application number:
PCT/US2009/038599

(87) International publication number:
WO 2009/123931 (08.10.2009 Gazette 2009/41)

(54) PORTABLE COMPUTER WITH MULTIPLE DISPLAY CONFIGURATIONS

TRAGBARER COMPUTER MIT MEHREREN ANZEIGEKONFIGURATIONEN

ORDINATEUR PORTABLE AVEC MULTIPLES CONFIGURATIONS D'AFFICHAGE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

(30) Priority: **01.04.2008 US 41365 P**
10.07.2008 US 170951
10.07.2008 US 170939

(43) Date of publication of application:
16.02.2011 Bulletin 2011/07

(73) Proprietor: **LITL LLC**
Boston, MA 02116 (US)

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  San Francisco, CA 94117 (US)
- **HIBMACRONAN, Christopher**
  Oakland, CA 94602 (US)
- **EDAHIRO, Naoya**
  San Francisco, CA 94110 (US)
- **DAY, Matthew, David**
  San Francisco, CA 94107 (US)

(74) Representative: **HGF Limited**
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Sheffield S1 2JA (GB)

(56) References cited:
EP-A- 0 588 210
DE-A1- 19 952 486
JP-A- H06 242 853
US-A1- 2007 182 663
US-B1- 7 164 432
WO-A1-95/24007
GB-A- 2 321 982
US-A- 6 154 359
US-B1- 6 493 216

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

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Description

BACKGROUND

Field of Invention

[0001] The present invention relates generally to portable computers and, more particularly, to a portable computer that is configurable into different functional and positional modes.

Discussion of Related Art

[0002] Portable computers, such as laptop computers or notebook computers, have become increasingly popular and ubiquitous in the home and workplace. Conventional portable computers most commonly have a "clamshell" configuration, with a base including the keyboard, various ports, connectors and/or inputs (e.g., for power and connecting peripheral devices), and the majority of the electrical components (e.g., the central processing unit and memory), and a display component pivotably coupled to the base by a hinge. The display component is movable about the hinge between a closed position, with the display screen positioned adjacent the keyboard, and an open position, with the display screen inclined at a desired viewing angle.

[0003] Some portable computers are able to accept user inputs via a touch screen in addition to via conventional tools, such as a keyboard or mouse. The use of a touch screen to input data is sometimes referred to as operating in "tablet mode" because the computer is being used in a manner similar to a tablet of paper. U.S. Patent No. 6,771,494 discloses a hybrid tablet-type portable computer that is capable of operating either as a normal laptop computer receiving user input via a keyboard ("laptop mode"), or as a tablet computer receiving user input via a touch screen. The '494 patent further discloses that the display component of the computer is attached to the base of the computer by hinges that allow the display to be tilted relative to the base (for laptop mode), and to be rotated and folded against the base to configure the computer into tablet mode. Further variations of a portable computer with a moveable display are disclosed in WO95/24007 or U.S. Patent No. 6,266,236. The '236 patent discloses a computer including a base, a display member and an arm assembly coupling the display member to the base. According to the '236 patent, the arm assembly allows pivotable movement of the display member between a plurality of positions, including a notebook mode configuration, a tablet mode configuration, a presentation mode configuration, and a closed mode. DE19952486 discloses a presentation device with a first display and a displaceable keyboard that reveals a second display. The device is configurable between a laptop mode and a presentation mode.

SUMMARY OF INVENTION

[0004] The invention is defined in the appended claims. Aspects and embodiments of the present invention are directed to a portable computer that is configurable between a laptop mode (in which the portable computer has a conventional laptop appearance) and an easel mode in which the base of the computer and its display component stand upright forming an inverted "V," as discussed further below. The display component is pivotably coupled to the base of the portable computer by a hinge that allows the display component to be rotated or tilted about a longitudinal axis running along an interface between the base and the display component. Unlike the computers discussed in U.S. Patent No. 6,266,236 and U.S. Patent No. 6,771,494 above, the portable computer according to embodiments of the invention does not require an arm assembly, nor multiple, different hinge assemblies to be configured into the different modes. Furthermore, the portable computer according to embodiments of the invention is capable of different display modes and different functionality in the different configurations, as discussed below.

[0005] Further aspects and embodiments are directed to a portable computer having an embedded scroll wheel that can be configured to allow a user to control various features and functionality of the portable computer. For example, as discussed further below the scroll wheel can be used to navigate among information displayed on the portable computer's display and/or to alter operating modes of the portable computer, and/or to control features such as volume, display brightness, etc.

[0006] According to one embodiment, a portable computer is configurable between various modes, including a closed mode, a laptop mode, an easel mode, a flat mode and a frame mode. The portable computer may comprise a display component including a display screen, a base, and a hinge assembly at least partially housed within the base and configured to pivotably couple the display component to the base. The display component may be rotatable about a longitudinal axis running along an interface between the display component and the base. In the closed mode, the display screen may be disposed substantially against the base, and rotating the display component about the longitudinal axis up to approximately 180 degrees from the closed mode may configure the portable computer into the laptop mode. Rotating the display component about the longitudinal axis beyond approximately 180 degrees axis from the closed mode may configure the portable computer into the easel mode.

[0007] In one example of the portable computer, the display component is rotatable about the longitudinal axis up to approximately 320 degrees from the closed mode. In another example, the portable computer comprises a display orientation module that displays content on the display screen in one of a plurality of orientations relative to the longitudinal axis. The orientation of the displayed

content may be dependent on the current display mode of the portable computer, or may be configurable responsive to a user input. The portable computer may further comprise a mode sensor which detects a current display mode of the portable computer, and the display orientation module may display content on the display screen in an orientation dependent on the current display mode detected by the mode sensor. Depending on the hinge assembly used, the longitudinal axis may comprises multiple parallel axes, and the hinge assembly may be configured to permit rotation of the display component about any of the multiple parallel axes to configure the portable computer between the plurality of display modes.

[0008] Another embodiment is directed to a portable computer comprising a base, a display component rotatably coupled to the base, and means for rotating the display component in a single direction relative to the base to configure the portable computer between a laptop mode and an easel mode.

[0009] In another embodiment of a portable computer configurable between multiple modes including a laptop mode and an easel mode, the portable computer comprises a display component, a base, and a hinge assembly configured to rotatably couple the display component to the base. The hinge assembly may be configured to permit rotation of the display component about a single axis to configure the portable computer between the laptop mode and the easel mode. In one example, the single axis is a longitudinal axis running along an interface between the display component and the base. The portable computer may further comprise a scroll wheel disposed at least partially about the longitudinal axis. In one example, the display component comprises a display screen, and the scroll wheel is configured to permit a user to manipulate content displayed on the display screen.

[0010] Another embodiment is directed to a method of automatically orienting content displayed on a portable computer. The method comprises rotating a display component of the portable computer about a longitudinal axis running along an interface between the display component and a base of the portable computer, detecting a degree of rotation of the display component relative to the base, providing a signal representative of the degree of rotation of the display component, and automatically configuring an orientation, relative to the longitudinal axis, of the content displayed on the portable computer responsive to the signal.

[0011] According to another embodiment, a portable computer comprises a base unit, a display unit including a display screen configured to display content, an orientation sensor which detects an orientation of the display unit relative to the base unit, and a display orientation module which orients the content displayed on the display screen responsive to the orientation detected by the orientation sensor.

[0012] Another embodiment of a portable computer comprises a base, a display component rotatably coupled to the base such that the display component and the base are rotatable with respect to one another about a longitudinal axis running along an interface between the display component and the base, the display component including a display screen, and a scroll wheel disposed at least partially within the base and rotatable about the longitudinal axis, the scroll wheel configured to permit a user to control at least one of operating parameters of the portable computer and content displayed on the display screen. In one example, the scroll wheel is configured to permit the user to adjust a volume of sound produced by the portable computer. In another example, the screen is configured to display at least one of a plurality of modes of content, and the scroll wheel is configured to permit the user to select a mode of content for display by the portable computer. The portable computer further comprises one or more navigation buttons that may be used in conjunction with the scroll wheel to control aspects of the portable computer and displayed content.

[0013] According to another embodiment, a portable computer is configurable between a plurality of display modes including a laptop mode and an easel mode, the portable computer comprising a base, a display component rotatably coupled to the base and including a screen which displays content, and a scroll wheel accessible in each of the plurality of display modes and configured to permit a user to manipulate at least one of operating parameters of the portable computer and the content displayed on the screen. In one example, the scroll wheel is disposed at leas partially about an axis of rotation of the display component relative to the base.

[0014] In another embodiment, a portable computer comprises a base, a display component including a screen configured to display content, a hinge assembly configured to rotatably couple the display component to the base and to permit rotation of the display component about a longitudinal axis running along an interface between the display component and the base, and a scroll wheel disposed at least partially about the longitudinal axis.

[0015] Still other aspects, embodiments, and advantages of these exemplary aspects and embodiments, are discussed in detail below. Moreover, it is to be understood that both the foregoing information and the following detailed description are merely illustrative examples of various aspects and embodiments, and are intended to provide an overview or framework for understanding the nature and character of the claimed aspects and embodiments. Any embodiment disclosed herein may be combined with any other embodiment in any manner consistent with the objects, aims, and needs disclosed herein, and references to "an embodiment," "some embodiments," "an alternate embodiment," "various embodiments," "one embodiment" or the like are not necessarily mutually exclusive and are intended to indicate that a particular feature, structure, or characteristic described in connection with the embodiment may be included in

at least one embodiment. The appearances of such terms herein are not necessarily all referring to the same embodiment. The accompanying drawings are included to provide illustration and a further understanding of the various aspects and embodiments, and are incorporated in and constitute a part of this specification. The drawings, together with the remainder of the specification, serve to explain principles and operations of the described and claimed aspects and embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Various aspects of at least one embodiment are discussed below with reference to the accompanying figures, which are not intended to be drawn to scale. Where technical features in the figures, detailed description or any claim are followed by references signs, the reference signs have been included for the sole purpose of increasing the intelligibility of the figures, detailed description, and claims. Accordingly, neither the reference signs nor their absence are intended to have any limiting effect on the scope of any claim elements. In the figures, each identical or nearly identical component that is illustrated in various figures is represented by a like numeral. For purposes of clarity, not every component may be labeled in every figure. The figures are provided for the purposes of illustration and explanation and are not intended as a definition of the limits of the invention. In the figures:

FIG. 1 is an illustration of one example of a portable computer, according to aspects of the invention, in a "laptop" configuration;
FIG. 2 is a view of the portable computer of FIG. 1 in the closed position;
FIG. 3 is a plan view of the exterior of the bottom of the portable computer of FIG. 1;
FIG. 4 is a perspective view of the portable computer of FIG. 1 in the easel mode;
FIG. 5 is a side view of the portable computer of FIG. 4, illustrating the adjustable angle of the easel mode;
FIGS. 6A-C are diagrams illustrating different positions of the portable computer of FIG. 4 in easel mode;
FIG. 7A is an illustration of a portion of the portable computer of FIG. 1 in the laptop mode, illustrating a hinge assembly according to aspects of the invention;
FIG. 7B is an in illustration of a portion of the portable computer of FIG. 1 in the easel mode, illustrating the hinge assembly according to aspects of the invention;
FIG. 8 is a diagram of one example of the hinge assembly of FIGS. 7A and 7B;
FIG. 9 is a cross-sectional diagram of a portion of the hinge assembly of FIG. 8, taken along line 9-9 in FIG. 8;
FIG. 10 is an exploded view of the hinge assembly of FIG. 8;
FIG. 11 is a block diagram of one example of a portable computer user interface architecture, according to aspects of the invention;
FIG. 12 is a screen shot illustrating one example of a graphical user interface, according to aspects of the invention;
FIG. 13 is a screen shot illustrating another example of a graphical user interface according to aspects of the invention;
FIG. 14 is an illustration of a user adjusting the scroll wheel on a portable computer in the easel mode, according to aspects of the invention;
FIG. 15 is an illustration of a user pressing the scroll wheel on a portable computer, according to aspects of the invention;
FIG. 16 is an illustration of a user pressing a navigation button on the portable computer, according to aspects of the invention;
FIG. 17 is an illustration of an example of the portable computer in the laptop mode, according to aspects of the invention;
FIG. 18 is a view of a portion of the portable computer illustrating a wireless signal indicator feature, according to aspects of the invention;
FIG. 19 is a view of a portion of the portable computer in the closed position, according to aspects of the invention;
FIG. 20 is a plan view of one example of a power adaptor, according to aspects of the invention;
FIG. 21 is a side view of the power adaptor of FIG. 20;
FIG. 22A is another side view of the power adaptor of FIG. 20, illustrating the power cord would around a cord spool, according to aspects of the invention;
FIG. 22B is a plan view of the power adaptor of FIG. 22A
FIG. 23 is an illustration of the portable computer coupled to a docking station, according to aspects of the invention;
FIG. 24 is an illustration of the portable computer showing one example of a docking connector, according to aspects of the invention;
FIG. 25 is an illustration of a hinge assembly coupled to a computer frame, according to aspects of the invention;
FIG. 26 is an illustration of the portable computer configured into a "frame" mode, according to aspects of the invention; and
FIG. 27 is an illustration of the portable computer configured into a "flat" mode, according to aspects of the invention.

DETAILED DESCRIPTION

[0017] Aspects and embodiments are directed to a portable computer that is configurable between different operating modes, including a laptop mode (in which the portable computer has a conventional laptop appearance), a flat mode, a frame mode, and an easel mode in

which the base of the computer and its display component stand vertically forming an inverted "V," as discussed further below. The portable computer is capable of different display formats and functionality in the different modes, and includes a graphical user interface that may work seamlessly with the computer hardware to provide a unified, comfortable, holistic user experience. In particular, the portable computer may provide access to a wide array of functions, both those traditionally provided by computing devices and those traditionally provided by other passive information devices. For example, the hardware and software, including the graphical user interface, of the portable computer may be focused toward providing access to entertainment media, such as audio and video (e.g., playing music, streaming video, viewing photographs, etc.), email, and internet, while also providing state-of-the-art computer processing capability.

[0018] It is to be appreciated that embodiments of the methods and apparatuses discussed herein are not limited in application to the details of construction and the arrangement of components set forth in the following description or illustrated in the accompanying drawings. The methods and apparatuses are capable of implementation in other embodiments and of being practiced or of being carried out in various ways. Examples of specific implementations are provided herein for illustrative purposes only and are not intended to be limiting. In particular, acts, elements and features discussed in connection with any one or more embodiments are not intended to be excluded from a similar role in any other embodiments. Also, the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. Any references to embodiments or elements or acts of the systems and methods herein referred to in the singular may also embrace embodiments including a plurality of these elements, and any references in plural to any embodiment or element or act herein may also embrace embodiments including only a single element. References in the singular or plural form are not intended to limit the presently disclosed systems or methods, their components, acts, or elements. The use herein of "including," "comprising," "having," "containing," "involving," and variations thereof is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. References to "or" may be construed as inclusive so that any terms described using "or" may indicate any of a single, more than one, and all of the described terms.

[0019] Referring to FIG. 1, there is illustrated one example of a portable computer according to aspects of the invention. In FIG. 1, the portable computer 100 is illustrated in the "laptop" mode, with the display component 102 inclined at a viewing angle from the base 104. The display component 102 is pivotably coupled to the base 104 by a hinge assembly (not shown) that allows the display component to be rotated with respect to the base. The hinge assembly may include a single or multiple hinges, which may be any of a variety of hinge types, including, but not limited, to single-axis hinges, multiple-axis hinges, geared hinges, etc. In one example, the hinge assembly allows the display component 102 to be rotated (or tilted) about a longitudinal axis 101 running along an interface between the display component and the base 104, as illustrated in FIG. 1 and discussed further below. The base 104 includes a keyboard 106 and internal electronic components (not shown), such as a central processing unit, memory, and other components necessary to operate the portable computer, as known to those skilled in the art. In some embodiments, the base 104 may also include a touch pad 108 or trackball (not shown) for receiving user commands, as known to those skilled in the art.

[0020] Still referring to FIG. 1, the display component 102 includes a display screen 110, and may also include a camera 112, microphone 114, and infrared receiver 116, as discussed further below. It is to be appreciated that the locations of the camera 112, microphone 114 and infrared receiver 114 are not limited to the example illustrated in FIG. 1, and may be placed in other locations on the display component 102 and/or base 104, as would be recognized by those skilled in the art. The display component 102 may also include cushions 118 that provide soft contact points between the base 104 and the display component 102 when the portable computer is closed. In one example, the cushions 118 are made of rubber. However, it is to be appreciated that the invention is not so limited, and the cushions 118 may comprise materials other than rubber, including, for example, a polymer, felt, or other suitable materials as would be recognized by those skilled in the art.

[0021] Referring to FIG. 2, there is illustrated a side view of the portable computer 100 of FIG. 1 in the closed configuration. As is the case for conventional clam-shell type portable computers, when the portable computer 100 is closed, the display screen is disposed "face down" against the keyboard of the base 104. In the illustrated embodiment, the base 104 includes a rounded portion 120 that houses the hinge (not shown) that pivotably couples the display component 102 to the base, as discussed further below. It is to be appreciated that the rounded portion 120 is not limited to having a round shape, but may instead have another shape, which may be dependent on the type of hinge used. In one embodiment, a power button 122, configured to turn the portable computer ON and OFF, may also be provided on the rounded portion 120, as illustrated in FIG. 2. However, it is to be appreciated that the invention is not so limited, and the power button 122 may be located elsewhere on the base 104. In one example, the power button 122 may be slightly recessed relative to the surface of the base 104, so as decrease the potential for the power button to be accidentally pressed.

[0022] An exterior view of the bottom of the base 104 (the underside of the portable computer 100) is illustrated in FIG. 3. As can be seen in FIG. 3, in one embodiment, the base 104 includes a plurality of feet 124. In one ex-

ample, the feet 124 are made of rubber; however, it is to be appreciated that the invention is not so limited and the feet may be made of another material, such as, for example, a polymer or felt. A ventilation slit 126 may be provided near an interface between the base 104 and the display component 102, as illustrated, or elsewhere as may be desired, to allow heat to dissipate from the internal electronic components in the base. The base 104 may also include one or more speakers 128. In one example, the base 104 includes two stereo speakers 128, positioned at either side of the base, as illustrated in FIG. 3; however, it is to be appreciated that the portable computer 100 may comprise more or fewer speakers which may be placed at any location on the base 104. A scroll wheel 132 may be provided to allow a user to control certain functionality of the portable computer 100, such as navigating web pages, controlling speaker volume, selecting programs, etc., as discussed further below.

[0023] According to one embodiment, the base 104 may comprise a cushioning strip 130 disposed along an edge of the base 104 opposite to the interface between the display component 102 and the base, as illustrated in FIG. 3. The cushioning strip 130, which may comprise rubber, a polymer, or another suitable material, may serve as a "foot" when the portable computer is configured into the easel mode, as discussed further below. In one embodiment, the display component 102 may be provided with a similar cushioning strip that may serve as a second supporting foot when the portable computer is configured into the easel mode.

[0024] Referring to FIG. 4, there is illustrated an example of the portable computer 100 configured into the easel mode. To convert the portable computer 100 from the laptop mode (or closed position) into the easel mode, the display component 102 may be folded away from the base 104, in the same direction as to open the computer (i.e., to configure the computer from the closed position into the laptop mode) such that the base 104 and the display component 102 form an inverted "V" shape with the bottom of the base and the back of the display component face another, as illustrated in FIG. 4. In the easel mode, the display screen 110 is visible and accessible on one side of the portable computer 100 and the keyboard 106 (not shown in FIG. 4) is visible and accessible on the other side.

[0025] As illustrated in FIG. 4, in one embodiment, the portable computer may comprise integrated hardware volume controls, including a volume control button 204 and a mute button 206. In one example, the volume control button 204 may be a rocker switch that allows a user to easily increase or decrease the volume of audio played through the speakers 128. When the user presses the volume control button 204, a volume indicator may temporarily appear on the display screen 110, to provide a visual indication of the amount by which the volume is being increased or decreased. Similarly, pressing the mute button 206 may cause a visual indication that the volume is muted to appear on the display screen 110.

[0026] According to one embodiment, when the portable computer 100 is configured into the easel mode, the visual display on the display screen 110 is automatically rotated 180 degrees such that the information appears "right-way-up," even through the display screen is upside-down compared to when the portable computer is in the laptop mode. Thus, a user may simply "flip" the portable computer 100 into the easel mode and immediately be able to comfortably view information on the display screen 110, without having to access display screen controls to adjust the orientation of the visual display. In one embodiment, the portable computer 100 includes an orientation (or mode) sensor that is configured to detect whether the portable computer is in the laptop mode or the easel mode, and to adjust the display accordingly. The orientation sensor may be incorporated into the base component 104, for example, underneath the keyboard 106, or into the display component. In one example, locating the orientation sensor in the display component 102, rather than the base 104, may provide more robust detection and therefore, may be presently preferred in some embodiments. The orientation sensor may be used to determine a precise relative orientation of the base component 104 with respect to the display component 102, or vice versa, for example, to determine whether the device is in the laptop mode, easel mode, or some point in between the two modes. In one example, the orientation sensor includes an accelerometer whose output is fed to the computer operating system (or to dedicated logic circuitry) which then triggers a display inversion as appropriate.

[0027] Accelerometers have been used in portable devices such as cellular phones, media players or computers, as sudden motion sensors, or "drop detectors," to protect against hard drive crashes in the event that the device is dropped. By contrast, however, the accelerometer in the portable computer according to an embodiment of the invention is not used to detect motion of the overall computer, but rather to detect a configuration of the portable computer 100 (e.g., laptop mode or easel mode), particularly, to detect an orientation of the display component 102 relative to the base component 104. In one example, information from the accelerometer is provided to a display controller in the portable computer and used to switch the display between portrait or landscape mode, as is done in some conventional devices.

[0028] Referring to FIG. 5, when the portable computer 100 is in the easel mode, the base 104 is disposed at an angle 134 to the display component 102. This angle 134 is adjustable, for example, to allow a comfortable viewing angle to the display screen 110 to be maintained for different positions of a user 136 and of the portable computer 100, as illustrated in FIGS. 6A, 6B and 6C. For example, when the user 136 is further from the portable computer, the angle 134a (FIG. 6A) may be made smaller than the angle 134b when the user is closer to the portable computer (FIG. 6B). As discussed above, in one example, the orientation sensor (not shown) may be used

to detect, either approximately or precisely, the angle 134 and to provide the information to the computer operating system.

[0029] According to one embodiment, the display component 102 is pivotably coupled to the base 104 by a hinge that allows the display component to be moved relative to the base so as to allow the portable computer 100 to be configured into the closed position, the laptop mode or the easel mode. As discussed above, in conventional "clamshell" type portable computers, the hinges that couple the display component to the base generally do not permit more than about 180 degrees of rotation of the display component. Thus, these conventional portable computers can be in a closed position or open, laptop configuration, but cannot be configured into an easel mode because the conventional hinges do not permit sufficient movement of the display component. Similarly, the tablet-type portable computers discussed above have displays that can be opened, rotated and folded such that they lie flat against the keyboard on the base, but cannot be configured into an easel mode. Although, as discussed above, U.S. Patent No. 6,266,236 discloses a computer that is configurable into a presentation mode, this requires a complex arm assembly. By contrast, the portable computer according to embodiments of the present invention may be configured into the easel mode by simply continuing to tilt or rotate the display component past the "laptop positions" until a desired easel angle 134 is reached.

[0030] Referring to FIGS. 7A and 7B, there is illustrated a portion of the portable computer 100 illustrating a hinge assembly 138 that allows the portable computer to be configured into either the laptop mode (FIG. 7A) or the easel mode (FIG. 7B), according to aspects of the invention. According to one embodiment, the hinge assembly 138 accommodates 0-320 degrees of rotation, allowing a minimum angle 134 (see FIG. 5) of 40 degrees. However, it is to be appreciated that the hinge assembly 138 may allow greater or fewer degrees of rotation, provided only that sufficient rotation is allowed so as to configure the portable computer 100 into either the laptop mode or the easel mode. As discussed above, in one embodiment the portable computer 100 includes an orientation sensor (not shown) that is configured to detect a relative orientation of the display component 102 and the base component 104. In one example, the orientation sensor may be an accelerometer incorporated into the base component 104, as discussed above. Alternatively, the orientation sensor may be incorporated into the hinge assembly 138 and may be used to detect movement of the hinge assembly, and to translate that movement into an information about the relative orientation of the display component 102 and the base component 104 (for example, a size of the angle 134). It is also to be appreciated that the orientation sensor may include electronic or mechanical components, or a combination thereof. For example, the hinge assembly may be provide with detents that provide an indication of the mode of the portable computer.

[0031] As discussed above, and also illustrated in FIGS. 7A and 7B, the portable computer may also comprise a scroll wheel 132 that allows a user to adjust, control and/or select various aspects of the portable computer (e.g., wireless capability or speaker volume) or items displayed on the display screen 110. A housing 160 may contain or support various mechanical and/or electronic components (not shown) that are coupled to the scroll wheel 132 and are configured to convert physical movement of the scroll wheel into electrical signals. These electrical signals may be provided to the central processing unit of the portable computer 100 which processes the electrical signals so as to translate movement of the scroll wheel into control of a selected feature, for example, adjusting the volume of the speaker(s) or selecting a particular item displayed on the display screen, as discussed further below.

[0032] One embodiment of the hinge assembly 138 is illustrated in FIG. 8. The hinge assembly includes a bracket 140 rotatably coupled to a housing 142. The housing 142 may include a first flange 144 that may be fastened to an internal frame in the base 104, as illustrated in FIG. 7A. The first flange 144 may include holes 146 to allow the first flange to be fastened to the base 104 using fasteners, such as, for example, screws, rivets or bolts. The bracket 140 may include a second flange 148 that may be similarly coupled to the display component 102 using fasteners 150. In one embodiment, the display screen 110 (see FIG. 1) may be an LCD screen. As known to those skilled in the art, an LCD screen generally comprises a frame and plastic housing. In one example, the second flange 148 may be fastened to either or both of the display screen frame and the screen's plastic housing. Referring to FIG. 25, there is illustrated an example of two hinge assemblies 138 coupled to the display frame 208 of the display component, and to the base frame 210 of the base component 104. According to one embodiment, the bracket 140 and/or housing 142 may be formed of cast zinc. However, it is to be appreciated that other materials, including other metals, may be used, and the bracket 140 and/or housing 142 may be formed using a procedure other than casting, such as, for example, machining or molding.

[0033] Referring again to FIG. 8, in one embodiment, the hinge assembly 138 may also incorporate an area 152 for locating the power button (FIG. 2, 122) or a navigation control button (FIG. 4, 166), as discussed further below.

[0034] Referring to FIG. 9, there is illustrated a cross-sectional view of a portion of the hinge assembly 138 taken along line A-A in FIG. 8. As shown in FIG. 9, in one embodiment the hinge assembly 138 comprises a shaft 154 located within the hinge housing 142. The shaft 154 may be held in position within the hinge housing 142, and rotatably coupled to the housing, by torsion elements, such as springs 156. In one example, the springs 156 may be formed by stamping; however, it is to be appreciated that other methods of manufacture may be used.

In one example, the hinge assembly may accommodate about 320 degrees of rotation, as discussed above, and may provide about 6.5 in-lbs in symmetric torque.

[0035] FIG. 10 is an exploded view of the hinge assembly of FIGS. 8 and 9. As shown in FIG. 10, the shaft 154 is coupled to a member 158. This member 158 may be integral with or coupled to the bracket 140 which is, in turn, fastened to the display component, as discussed above. Thus, the shaft 154 and springs 156 provide a rotatable coupling between the fixed elements of the hinge assembly, namely, the hinge housing 142 and bracket 140 which are fastened to the base 104 and display component 102 of the portable computer. In this manner, the hinge assembly allows the display component 102 to be moved relative to the base 104, thereby allowing the portable computer to be easily and quickly configured into any of the closed position, laptop mode or easel mode. For example, simply rotating or tilting the display component about the longitudinal axis 101 (see FIG. 1) up to approximately 180 degrees from the closed mode configures the portable computer into the laptop mode, and rotating the display component about the longitudinal axis 101 beyond approximately 180 degrees axis from the closed mode configures the portable computer into the easel mode.

[0036] According to one embodiment, the portable computer includes integrated "navigation" hardware that allows a user to easily and comfortable control various features and functions of the portable computer, and to manipulate content displayed on the portable computer. For example, as discussed above, the portable computer 100 may comprise a scroll wheel 132 that allows a user to control, adjust and/or select various functionality of the portable computer. According to another embodiment, the scroll wheel 132 may be used to provide "hardware navigation" through information, such as menus, icons, etc., displayed on the display screen 110, as discussed further below with reference to FIG. 17. A common display configuration used in conventional computers is a "desktop" view in which multiple icons representing links to various programs or applications are displayed over a background image. Navigation is conventionally performed using a mouse, touch pad or trackball, as known to those skilled in the art. In one embodiment, the portable computer 100 may display information on the display screen 110 in the conventional desktop configuration, and navigation may be performed using either conventional tools, such as a touchpad 108, trackball (not shown) or peripheral, for example, a mouse, that is connected to the portable computer 100 via a port 164, or the scroll wheel 132, or a combination thereof. According to another embodiment, the portable computer 100 includes a streamlined graphical user interface that supports "map" navigation. The map user interface provides a clear overview of the entire computing environment and searching capability within the environment that may be accessed using the scroll wheel 132 and one or navigation buttons 166, 168 that are provided on the base 104 of the portable computer 100 (button 166) and/or in the keyboard 106 (button 168), illustrated in FIG. 17. In one embodiment, the map mode of navigation is a hierarchical mode that reduces the number of items to select amongst at any stage of navigation, thereby facilitating user access with the scroll wheel 132 and, optionally, the navigation button(s) 166, 168. Of course, it is to be appreciated that the map user interface may also be navigated using conventional tools, such as a trackball, touchpad, mouse or arrow keys.

[0037] Referring to FIG. 11, there is illustrated a block diagram of one example of an architecture of the portable computer including a map user interface. The user interface "home" screen 170 that displays a plurality of modes of content 172. In the illustrated example, the home screen 170 contains five modes of content 172; however, it is to be appreciated that the home screen may include more or fewer than five modes of content and that the modes of content may differ from the examples discussed below. According to one example, the modes of content 172 accessible via the home screen 170 may include "media" 172a, "connect" 172b, "web" 172c, "applications" 172d, and "channels" 172e. Using the map user interface, information, programs, features and applications may be grouped into the various modes of content 172. By selecting any mode of content 172, for example, by using the scroll wheel 132 and/or navigation buttons 166, 168, as discussed further below, the user may access the content organized within that mode. For example, the media mode 172a may provide access to a medial player to play, view, search and organize media such as music, video, photos, etc. The connect mode 172b may provide access to features such as, for example, email, voice-over-IP, instant messaging, etc., and the web mode 172c may provide access to internet browsing and searching. The application mode 172d may provide access to, for example, computer applications or programs, such as word processor, spreadsheet, calculator, etc. In one example, these applications or programs may be provided as web-based services rather than programs or applications residing on the portable computer 100. The channels mode 172e may provide access to different functionality of the portable computer, with the different functions or features defined as different channels. For example, a channel may include an alarm clock channel in which the portable computer is configured to display a clock and can be programmed to activate an alarm, e.g., a sound, piece of music, etc., at a predetermined time. Another example of a channel may include a "photo frame" channel in which the portable computer may be configured to display a pre-selected image or set of images, etc. Another example of a channel is a "television" channel, in which the portable computer is configured to stream Internet television. In one example, a user may configure particular Internet television channels (e.g., a news channel, a movie channel, a home and garden channel, etc.) into sub-channels within the channels mode of content 172(e). Some or all of the modes

of content 172 may access, retrieve and/or store information on the Internet 174.

[0038] According to one embodiment, the different modes of content 172 may be displayed as a series of bars across the display screen 110, as illustrated in FIG. 12. The following discussion of various features, including hardware navigation through the map user interface may refer primarily to the display configuration illustrated in FIG. 12. However, it is to be appreciated that the invention is not so limited, and the modes of content may be displayed in other configurations, including, for example, a "desktop" and icon configuration, a "dashboard" type display, as illustrated in FIG. 13, or another configuration, as would be recognized by those skilled in the art. Similarly, navigation is discussed below primarily with reference to the scroll wheel 132 and navigation buttons 166, 168; however, it is to be appreciation that navigation may also be accomplished using any of the conventional tools discussed above or known to those skilled in the art.

[0039] As discussed above, according to one embodiment, the scroll wheel 132 and the navigation buttons 166, 168 may be used to navigate the user interface. Referring again to FIG. 12, scrolling the scroll wheel may sequentially highlight different ones of the modes of content 172. In one example, the highlighting may be achieved by changing the color of the selected mode, and/or by providing a visual indicator, such as a colored bar 176. A highlighted mode 172 may be selected by pressing the scroll wheel, thereby bringing up a new "page" or screen on the user interface corresponding to the selected mode. Once within a selected mode of content 172, the scroll wheel may similarly be used to select particular functions, features or applications within that mode. In one embodiment, the default action for the scroll wheel 132 may vary depending on whether the portable computer 100 is in the laptop mode or the easel mode. For example, in easel mode, the default action for the scroll wheel may be channel selection within the channels mode 172(e).

[0040] As discussed above, in one embodiment volume control for the speakers 128 may be provided by the volume control button 204 and mute button 206. Alternatively, according to another embodiment, volume control may be provided using the scroll wheel 132. Thus, as a user scrolls the scroll wheel 132, as illustrated in FIG. 14 by arrow 161, a volume indicator may appear on the display screen 110. In one example, the volume indicator may comprise a transparent, or partially transparent, box 162 containing volume level indicators that may appear directly below the scroll wheel 132 on the display screen 110. In this example, as the user scrolls the scroll wheel 132, different volume levels in the volume box 162 may be successively highlighted, to indicate to the user that the volume is increasing or decreasing.

[0041] In one embodiment, the scroll wheel 132 may be depressible as well as scrollable. Thus, pressing the scroll wheel 132, as illustrated in FIG. 15, may allow further control, such as, for example, selecting a channel onto which the user has scrolled, or "play" and "pause" of audio or video being played through the portable computer 100.

[0042] As discussed above, according to one embodiment, one or more navigation buttons are used in conjunction with the scroll wheel. In particular, in one embodiment, the navigation button(s) are used to change the action of the scroll wheel. As discussed above, in one example, the default action of the scroll wheel is volume control. This action is changed by pressing the navigation button 166, as illustrated in FIG. 16, for example, from volume control to menu navigation in the user interface, and vice versa. According to one embodiment, the effect of pressing the navigation button 166 varies depending on active the mode of content of the portable computer 100. For example, if a user is in the media mode using a photo viewing application, pressing the navigation button 166 may change the action of the scroll wheel 132 from mode navigation to slideshow controls for the photos. When the navigation button 166 is pressed, an control indicator box (similar to the volume indicator box 162 discussed above with reference to FIG. 14) may appear containing different actions for the photo slideshow, such as "play," "next," "back," "skip," "full screen view," etc., and scrolling the scroll wheel 132 may allow a user to select one of these actions. Pressing the navigation button 166 again may return the scroll wheel action to menu navigation, to allow the user to, for example, move to a different feature or application within the active mode, or to select a different mode.

[0043] As can be seen in FIG. 16, the navigation button 166 may be easily accessed when the portable computer 100 is in the easel mode, providing a convenient navigation tool for this configuration. A similar navigation button 168 may be provided on the keyboard 106, as illustrated in FIG. 17. In one example, the functionality of the two navigation buttons 166, 168 may be the same, with the different locations providing easy, comfortable access in the different configuration modes (i.e., laptop or easel) of the portable computer 100. Thus, a user may use either navigation button 166 or navigation button 168, depending on personal preference. In another example, the two navigation buttons may have different functionality. For example, the navigation button 166 may be used to alter the action of the scroll wheel 132, as discussed above, while the navigation button 168 is used to navigate "up" or "down" a level within the map user interface. For example, pressing the navigation button 168 while within a given mode of content may allow the user to "back up" to the home screen; or pressing the navigation button 168 while within a selected channel (in the channel mode of the content 172e) may allow the user to "back-up" to the channel mode main page.

[0044] It is to be appreciated that numerous variations on the functionality of the navigation buttons 166, 168 is possible, as would be recognized by those skilled in the art, and the above examples are given for illustration only and are not intended to be limiting. In addition, any func-

tions described with reference to one navigation button (166 or 168) may be instead (or additionally) implemented with the other navigation button. In one example, the function of the navigation buttons 166, 168 may vary depending on whether the portable computer 100 is configured into the laptop mode or the easel mode. For example, only the navigation button 166 may be active in the easel mode, and only the navigation button 168 may be active in the laptop mode. Alternatively, both navigation buttons 166, 168 may be usable in either the laptop mode or the easel mode, but their functionality may vary. For example, when the portable computer 100 is in the easel mode, the default action for the navigation button 166 may be channel selection whereas the default action for the navigation button 168 is to access the "home" screen. Furthermore, the portable computer 100 is not limited to the use of two navigation buttons and may instead comprise only a single navigation button or more than two navigation buttons, any of which may be disposed in the locations described above (e.g., on the rounded portion 120 of the base 104 or on the keyboard 106), or in other locations on the portable computer.

[0045] As discussed above, according to one embodiment, the function or display content and/or display orientation of the portable computer may vary when the portable computer is configured from the laptop mode into the easel mode, or vice versa. For example, as discussed above, when the portable computer 100 is configured into the easel mode, the visual display on the display screen 110 is automatically rotated 180 degrees such that the information appears "right-way-up," even through the display screen is upside-down compared to when the portable computer is in the laptop mode. In another example, for at least some activities within at least some modes of content (e.g., viewing a photograph or video), when the portable computer 100 is configured into the easel mode, the display may automatically adjust to "full screen view" (i.e., the displayed image or video is displayed on the full screen size, rather than in a window) to allow for comfortable viewing.

[0046] In addition, as discussed above, the ability to configure the portable computer 100 into either the laptop mode or the easel mode provides enhanced functionality. For example, when the portable computer 100 is not being actively used, the user may configure the portable computer into the easel mode, and program the portable computer to act as a digital photo frame, displaying one or more photos of the user's choice. In the easel mode, the portable computer 100 may occupy a smaller footprint on a surface than in the laptop or closed modes because the base 104 and display component 102 are upright, as illustrated in FIGS. 4 and 5. In addition, because the portable computer can act as a passive information and/or entertainment device, such as a photo frame or clock, as discussed above, the portable computer may provide a useful function even when not being actively used by the user, and may do so (in the easel mode) without taking up much surface area.

[0047] According to another embodiment, the portable computer 100 may further comprise a wireless signal indicator 178, as illustrated in FIG. 18. The wireless signal indicator 178 may indicate the availability and/or strength of a wireless signal to which the portable computer 100 is connected, or is attempting to connect to. In one example, the color of the wireless signal indicator 178 may provide information regarding the strength of a detected wireless signal. For example, green may indicate a "good" signal; yellow may indicate a "poor" or "low" signal; and red may indicate that there is no signal available. In one example, the wireless signal indicator 178 may be ON or active whenever the portable computer 100 is powered up. Alternatively, the wireless signal indicator 178 may be activated by a user action, for example, by pressing the navigation button 166 or another button or key provided on the portable computer 100, and may remain active for a predetermined time period (e.g., for 2 seconds, 10 seconds, one minute, etc.). As discussed above, the functionality of the navigation button 166 may vary depending on the configuration mode of the portable computer 100. In one example, when the portable computer 100 is in the closed position, but still powered up, the default action for the navigation button 166 may be to activate the wireless signal indicator 178.

[0048] According to one embodiment, the portable computer 100 may be provided with power cord and adapter to allow the portable computer to be plugged into a wall supply. Referring to FIG. 19, there is illustrated a view of a portion of the portable computer 100, showing a power jack 180 to which the power adaptor can be connected. As discussed above, the portable computer 100 may also include a port 164 to which peripheral devices, such as mouse, external keyboard, portable flash drive, memory stick, etc. may be connected. In one example, the port 164 is a USB port; however, it is to be appreciated that the port may accommodate protocols other than USB. In addition, although only one port 164 is illustrated in FIG 19, the portable computer 100 may comprise multiple ports that may accommodate multiple protocols. In one example, the portable computer 100 may also comprise a headphone jack 182. It is to be appreciated that the location of any or all of the power jack 180, port(s) 164, and headphone jack 182 are not limited to the example shown in FIG. 19, but may be anywhere convenient or desirable on the portable computer 100.

[0049] Referring to FIG. 20, there is illustrated a top down view one example of a power adaptor 184 that may be used with the portable computer 100 and connected via the power jack 180. As known to those skilled in the art, the power adaptor 184 comprises a transformer (not shown) that converts the wall power to a level acceptable for use by the portable computer 100. In one embodiment, the power adaptor 184 comprises a substantially round body 186 that houses the transformer and other necessary components. A connector 188 may allow the power adaptor 184 to be connected to a wall outlet or

extension cord. In one example, the connector 188 may include foldable prongs 190 that can be folded against the connector 188 for storage, and folded out for connection, as illustrated in FIG. 21. A cord 192 may be slidably accommodated within the body 186, such that the cord may be stored within the body and flexibly extended (up to its maximum length) by a user.

[0050] According to one embodiment, the cord 192 may be wound around a cord spool 194 located within, or partially within, the body 186 of the power adaptor 184. As illustrated in FIG. 21, the cord spool 194 may be configured to slide out from the body 186 of the power adaptor 184, such that the cord 192 can be wound around the cord spool 194, as illustrated in FIGS. 22A and 22B.

[0051] According to another embodiment, the portable computer 100 may be configured to connect to a docking station 196, as illustrated in FIG. 23. In one embodiment, a connector 198 on the docking station 196 may be configured to slidably connect to connectors 200 on the portable computer 100, as illustrated in FIG. 23. In one example, the connectors 200 may include power and audio connectors, such that the portable computer 100 may receive power from the docking station and receive and/or provide audio signals from/to the docking station, respectively. For example, the docking station may be coupled to external speakers, and the portable computer may provide audio signals to the docking station to be played through the external speakers. In another example, the docking station 196 may also be coupled to an audio device (not shown), such as an MP3 player, which may provide audio signals and data to the portable computer 100, for example, to update an audio library on the portable computer. It is to be appreciated that many other variations of communication between the portable computer 100 and devices coupled to the docking station 196 are possible, as would be recognized by those skilled in the art, and such variations are intended to be within the scope of this disclosure. Furthermore, numerous variations on the connector(s) 198, 200 that couple the docking station 196 to the portable computer 100 are also possible, as would be recognized by those skilled in the art. For example, the portable computer 100 may include a multi-pin connector 202 located on the base 104, as illustrated in FIG. 24. Such and other variations are intended to be within the scope of this disclosure and the above-mentioned examples are provided for illustration only and are not intended to be limiting.

[0052] In addition, it is to be appreciated that although the above discussion refers primarily to the portable computer 100 being in either the laptop mode or easel mode, other modes or configurations are also possible. For example, as discussed above, because the portable computer 100 can be configured from the closed position, through the laptop mode into the easel mode by rotating the display component 102, a number of configurations are possible in between "true" laptop mode and "true" easel mode. In another example, the portable computer 100 may be configured into a "frame" mode, as illustrated in FIG. 26, in which the portable computer is placed on a surface 212 with the keyboard 106 "face down" on the surface 212 and the display 110 facing upward. In the frame mode, the display component 102 may be at a similar orientation, and angle 134, with respect to the base component 104 as in the easel mode. However, rather than the base component 104 and display component 102 being oriented vertically with respect to the surface 212, as in the easel mode (in which the portable computer forms an inverted "V" as discussed above), in the frame mode, the base component 104 may lie flat on the surface 212, as shown in FIG. 26. In one example, software and/or hardware protection may be provided for the keyboard to prevent keys from being pressed (or to prevent the portable computer from responding to pressed keys) when the portable computer is in the frame mode.

[0053] Similarly, referring to FIG. 27, there is illustrated another configuration of the portable computer 100, referring to as the "flat" mode. In the flat mode, the display component 102 may be rotated (or opened) to approximately 180 degrees with respect to the base component 104, such that the base component and display component lay flat on a surface, with the keyboard 106 and display screen 110 exposed, as shown in FIG. 27. Unlike the easel and frame modes, in which the keyboard may be concealed and not easily accessible, in the flat mode, the keyboard is accessible and usable. In addition, as discussed above, the visual display on the display screen 110 may be automatically rotated to accommodate comfortable viewing of information by persons located in different positions relative to the base component 104 or display component 102. The visual display on the display screen 110 may also be manually adjusted by a user using, for example, the keyboard 106, touch pad 108 or mouse (not shown), scroll wheel 132 or navigation buttons (not shown). For example, if a user (located at position A) wishes to display information for a person located opposite the user (at position B), the visual display may be rotated (automatically or manually) 180 degrees such that the information appears "right-way-up," to the person at location B, even through the display screen 110 is upside-down for that person. Similarly, in another example, the visual display may be rotated (automatically or manually) 90 degrees such that the information appears "right-way-up," for a person at location C. In one example, a user can "toggle" the visual display among various orientations. For example, a user at location A may have the visual display facing themselves while using the keyboard 106 or other controls to change or access information on the display, then toggle the display orientation 180 or 90 degrees to display the information for persons at locations B or C.

[0054] In summary, various aspects and embodiments provide a portable computer that is configurable between different operating modes, including a laptop mode and an easel mode, and that is capable of different display formats and functionality in the different modes. The abil-

ity to view and operate the portable computer in the different laptop and easel modes, and to incorporate features and functions such as an alarm clock, digital photograph frame, voice-over-IP, etc, may provide enhanced flexibility and usefulness. In addition, the portable computer may include a graphical user interface that may work seamlessly with the computer hardware to provide an enjoyable, holistic user experience.

[0055] Having thus described several aspects of at least one embodiment, it is to be appreciated various alterations, modifications, and improvements will readily occur to those skilled in the art. For example functionality or features that have been described herein in connection with hardware may instead be implemented in software, or vice versa. For example, the wireless signal indicator discussed above may instead (or in addition) be provided as a software application. Such alterations, modifications, and improvements are intended to be part of this disclosure and are intended to be within the scope of the invention. Accordingly, the foregoing description and drawings are by way of example only.

Claims

1. A portable computer (100) configurable between plurality of display modes including a laptop mode, a frame mode, and an easel mode, the portable computer (100) comprising:

   a display component (102) including a display screen (110) configured to display content;
   a base (104) comprising an integrated keyboard (106);
   a mode sensor comprising an accelerometer configured to detect a current display mode among the plurality of display modes of the portable computer; and
   a hinge assembly configured to rotatably couple the display component (102) to the base (104);
   wherein the hinge assembly is configured to permit rotation of the display component (102) and/or the base (104) about a single axis (101) to configure the portable computer (100) between the laptop mode and the easel mode, and wherein the single axis (101) is a longitudinal axis running along an interface between the display component (102) and the base (104); and wherein the display component (102) is rotatable about the longitudinal axis;
   the portable computer further comprising:

      a navigation hardware accessible in each of the plurality of display modes, the navigation hardware configured to permit a user to control at least one of operating parameters of the portable computer (100) and the content displayed on the display screen (110); and
      a first navigation button (166; 168) disposed on one of the base (104) and the display component (102), wherein the first navigation button is configured to change an action associated with the navigation hardware, wherein the action is changed according to the detected display mode;
      wherein in the easel mode, the display component (102) and the base (104) are configured relative to one another such that the display screen (110) and the keyboard (106) face away from each other, with the display screen (110) oriented toward the operator of the portable computer and the keyboard (106) oriented away from the operator of the portable computer; and
      wherein in the frame mode, the display screen (110) is disposed at an angle beyond approximately 180 degrees, measured about the longitudinal axis, relative to the base (104), and wherein the display screen (110) is oriented towards the operator, the base contacts a surface (212), and the keyboard (106) is directed towards the surface (212).

2. The portable computer (100) of claim 1, further comprising a display orientation module configured to control an orientation of the content displayed on the display screen (110); wherein the orientation of the content displayed on the display screen (110) is configurable among a plurality of orientations relative to the longitudinal axis.

3. The portable computer (100) of claim 2, wherein the plurality of orientations comprises a first orientation relative to the longitudinal axis and a second orientation relative to the longitudinal axis; and
   wherein when display orientation module is configured to automatically display the content in the first orientation when the portable computer (100) is configured into the laptop mode and in the second orientation when the portable computer (100) is configured into the easel mode.

4. The portable computer (100) of claim 2, wherein the plurality of display modes further comprises a flat mode in which the display component (102) is disposed at an angle of approximately 180 degrees, measured about the longitudinal axis, relative to the base (104); preferably, wherein the plurality of orientations comprises a first orientation relative to the longitudinal axis, a second orientation relative to the longitudinal axis, and a third orientation relative to the longitudinal axis; and
   wherein, in the flat mode, the orientation of the content displayed on the display screen (110) is config-

urable among the first, second and third orientations responsive to a user input; optionally, wherein the second orientation is 90 degrees relative to the first orientation; and
wherein the third orientation is 180 degrees relative to the first orientation.

5. The portable computer (100) of claim 2, wherein the mode sensor is configured to detect a degree of rotation of the display component (102) relative to the base (104) and to provide information representative of the degree of rotation; and
wherein the display orientation module is configured to automatically adjust the orientation of the content displayed on the display screen (110) responsive to the information from the mode sensor.

6. The portable computer (100) of claim 2, wherein the display orientation module selects the orientation of the content displayed on the display screen (110) from one of the plurality of orientations relative to the longitudinal axis responsive to the current display mode detected by the mode sensor.

7. The portable computer (100) of claim 1, wherein plurality of display modes further comprises a closed mode; and
wherein, in the closed mode, the display screen (110) is disposed substantially against the base (104).

8. The portable computer (100) of claim 7, wherein rotating the display component (102) about the longitudinal axis up to approximately 180 degrees from the closed mode configures the portable computer (100) into the laptop mode; and
wherein rotating the display component (102) about the longitudinal axis beyond approximately 180 degrees from the closed mode configures the portable computer (100) into the easel mode; optionally, wherein the display component (102) is rotatable about the longitudinal axis up to approximately 320 degrees from the closed mode.

9. The portable computer (100) of claim 1, wherein the navigation hardware is a scroll wheel (132) disposed at least partially within the base (104) and rotatable about the longitudinal axis, the scroll wheel (132) configured to permit a user to control at least one of operating parameters of the portable computer (100) and the content displayed on the display screen (110).

10. The portable computer (100) of claim 9, wherein the first navigation button (166;168) is configured to permit the user to manipulate selected content displayed on the display screen (110).

11. The portable computer (100) of claim 10, wherein the first navigation button (166;168) is configured to permit the user to select for display one of the plurality of modes of content; the portable computer further comprising a second navigation button (166;168);
wherein the first navigation button (166;168) is disposed on a major surface of the base (104); and
wherein the second navigation button (166; 168) is disposed on a minor surface of the base (104).

12. The portable computer (100) of claim 9, wherein the scroll wheel (132) is configured to permit the user to select a mode of content for display on the display screen (110); or wherein the scroll wheel (132) is configured to permit the user to control a volume of sound played by the portable computer (100); or wherein the hinge assembly is at least partially housed within the base (104) and configured to rotatably couple the display component (102) to the base (104); optionally, wherein the scroll wheel (132) is disposed at least partially within the hinge assembly.

13. The portable computer (100) of claim 1, further comprising:
a foot disposed along at least a portion of the base (104) and configured to support the portable computer (100) when in the easel mode.

14. The portable computer (100) of claim 1, wherein the portable computer (100) includes a single display screen (110).

15. The portable computer (100) of claim 1, wherein the portable computer is configured to prevent the portable computer from responding to keyboard input when the portable computer is in the frame mode.

Patentansprüche

1. Tragbarer Computer (100), der zwischen einer Vielzahl von Anzeigemodi umfassend einen Laptopmodus, einen Bildmodus und einem Staffeleimodus konfigurierbar ist, wobei der tragbare Computer (100) folgendes umfasst:

eine Anzeigekomponente (102) umfassend einen Anzeigebildschirm (110), der dazu konfiguriert ist, Inhalte anzuzeigen;
eine Basis (104) umfassend eine integrierte Tastatur (106);
einen Modussensor umfassend einen Beschleunigungsmesser, der dazu konfiguriert ist, einen aktuellen Anzeigemodus unter der Vielzahl von Anzeigemodi des tragbaren Computers zu erkennen; und

eine Scharnieranordnung, die dazu konfiguriert ist, die Anzeigekomponente (102) mit der Basis (104) drehbar zu verbinden;
wobei die Scharnieranordnung dazu konfiguriert ist, die Drehung der Anzeigekomponente (102) und/oder der Basis (104) um eine einzelne Achse (101) zu erlauben, um den tragbaren Computer (100) zwischen dem Laptopmodus und dem Staffeleimodus zu konfigurieren, und
wobei die einzelne Achse (101) eine Längsachse ist, die entlang einer Schnittstelle zwischen der Anzeigekomponente (102) und der Basis (104) verläuft; und wobei die Anzeigekomponente (102) um die Längsachse herum drehbar ist;
wobei der tragbare Computer ferner folgendes umfasst:

eine Navigationshardware, die in jedem der Vielzahl von Anzeigemodi zugänglich ist, wobei die Navigationshardware dazu konfiguriert ist, einem Benutzer zu erlauben, mindestens einen von Betriebsparametern des tragbaren Computers (100) und dem am Anzeigebildschirm (110) angezeigten Inhalt zu steuern; und
einen ersten Navigationsknopf (166; 168), der an einer von der Basis (104) und der Anzeigekomponenten (102) angeordnet ist, wobei der erste Navigationsknopf dazu konfiguriert ist, einen Vorgang in Verbindung mit der Navigationshardware zu ändern, wobei der Vorgang entsprechend dem erkannten Anzeigemodus geändert wird;
wobei im Staffeleimodus die Anzeigekomponente (102) und die Basis (104) derart relativ zueinander konfiguriert sind, dass der Anzeigebildschirm (110) und die Tastatur (106) voneinander abgewandt sind, wobei der Anzeigebildschirm (110) in Richtung des Bedieners des tragbaren Computers orientiert ist und die Tastatur (106) vom Bediener des tragbaren Computers weg orientiert ist; und
wobei im Bildmodus der Anzeigebildschirm (110) in einem Winkel über etwa 180 Grad hinaus, gemessen um die Längsachse herum, relativ zur Basis (104) angeordnet ist, und wobei der Anzeigebildschirm (110) in Richtung des Bedieners orientiert ist, die Basis eine Oberfläche (212) berührt und die Tastatur (106) in Richtung der Oberfläche (212) gerichtet ist.

2. Tragbarer Computer (100) nach Anspruch 1, ferner umfassend ein Anzeigeorientierungsmodul, das dazu konfiguriert ist, eine Orientierung des am Anzeigebildschirm (110) angezeigten Inhalts zu steuern; wobei die Orientierung des am Anzeigebildschirm (110) angezeigten Inhalts unter einer Vielzahl von Orientierungen relativ zur Längsachse konfigurierbar ist.

3. Tragbarer Computer (100) nach Anspruch 2, wobei die Vielzahl von Orientierungen eine erste Orientierung relativ zur Längsachse und eine zweite Orientierung relativ zur Längsachse umfasst; und
wobei, wenn das Anzeigeorientierungsmodul dazu konfiguriert ist, automatisch den Inhalt in der ersten Orientierung, wenn der tragbare Computer (100) in den Laptopmodus konfiguriert ist, und in der zweiten Orientierung, wenn der tragbare Computer (100) in den Staffeleimodus konfiguriert ist, anzuzeigen.

4. Tragbarer Computer (100) nach Anspruch 2, wobei die Vielzahl von Anzeigemodi ferner einen Flachmodus umfasst, in welchem die Anzeigekomponente (102) in einem Winkel von etwa 180 Grad, gemessen um die Längsachse herum, relativ zur Basis (104) angeordnet ist; vorzugsweise, wobei die Vielzahl von Orientierungen eine erste Orientierung relativ zur Längsachse, eine zweite Orientierung relativ zur Längsachse und eine dritte Orientierung relativ zur Längsachse umfasst; und
wobei, im Flachmodus die Orientierung des am Anzeigebildschirm (110) angezeigten Inhalts unter der ersten, zweiten und dritten Orientierung als Reaktion auf eine Benutzereingabe konfigurierbar ist;
optional, wobei die zweite Orientierung 90 Grad relativ zur ersten Orientierung ist; und
wobei die dritte Orientierung 180 Grad relativ zur ersten Orientierung ist.

5. Tragbarer Computer (100) nach Anspruch 2, wobei der Modussensor dazu konfiguriert ist, einen Rotationsgrad der Anzeigekomponente (102) relativ zur Basis (104) zu erkennen und Information bereitzustellen, die repräsentativ für den Rotationsgrad ist; und
wobei das Anzeigeorientierungsmodul dazu konfiguriert ist, automatisch die Orientierung des am Anzeigebildschirm (110) angezeigten Inhalts als Reaktion auf die Information vom Modussensor zu justieren.

6. Tragbarer Computer (100) nach Anspruch 2,
wobei das Anzeigeorientierungsmodul die Orientierung des am Anzeigebildschirm (110) angezeigten Inhalts von einer von der Vielzahl von Orientierungen relativ zur Längsachse als Reaktion auf den aktuellen Anzeigemodus, der vom Modus-Sensor erkannt wird, auswählt.

7. Tragbarer Computer (100) nach Anspruch 1, wobei die Vielzahl von Anzeigemodi ferner Folgendes umfasst

einen geschlossenen Modus; und
wobei, im geschlossenen Modus, der Anzeigebildschirm (110) im Wesentlichen gegen die Basis (104) angeordnet ist.

8. Tragbarer Computer (100) nach Anspruch 7, wobei ein Drehen der Anzeigekomponente (102) um die Längsachse herum bis zu etwa 180 Grad aus dem geschlossenen Modus den tragbaren Computer (100) in den Laptopmodus konfiguriert; und
wobei das Drehen der Anzeigekomponente (102) um die Längsachse herum bis zu etwa 180 Grad aus dem geschlossenen Modus den tragbaren Computer (100) in den Staffeleimodus konfiguriert; optional, wobei die Anzeigekomponente (102) um die Längsachse herum bis zu etwa 320 Grad aus dem geschlossenen Modus drehbar ist.

9. Tragbarer Computer (100) nach Anspruch 1, wobei die Navigationshardware ein Scrollrad (132) ist, das zumindest teilweise im Inneren der Basis (104) angeordnet ist und um die Längsachse herum drehbar ist, wobei das Scrollrad (132) dazu konfiguriert ist, einem Benutzer zu erlauben, mindestens eines von Betriebsparametern des tragbaren Computers (100) und des am Anzeigebildschirm (110) angezeigten Inhalts zu steuern.

10. Tragbarer Computer (100) nach Anspruch 9, wobei der erste Navigationsknopf (166; 168) dazu konfiguriert ist, dem Benutzer zu erlauben, den ausgewählten, am Anzeigebildschirm (110) angezeigten Inhalt handzuhaben.

11. Tragbarer Computer (100) nach Anspruch 10,
wobei der erste Navigationsknopf (166; 168) dazu konfiguriert ist, dem Benutzer zu erlauben, einen von der Vielzahl von Inhaltsmodi zur Anzeige auszuwählen; wobei der tragbare Computer ferner einen zweiten Navigationsknopf (166; 168) umfasst;
wobei der erste Navigationsknopf (166; 168) auf einer Hauptfläche der Basis (104) angeordnet ist; und
wobei der zweite Navigationsknopf (166; 168) auf einer Nebenfläche der Basis (104) angeordnet ist.

12. Tragbarer Computer (100) nach Anspruch 9, wobei das Scrollrad (132) dazu konfiguriert ist, dem Benutzer zu erlauben einen Inhaltsmodus zur Anzeige am Anzeigebildschirm (110) auszuwählen; oder wobei das Scrollrad (132) dazu konfiguriert ist, dem Benutzer zu erlauben ein Volumen von durch den tragbaren Computer (100) gespieltem Klang zu steuern; oder wobei die Scharnieranordnung zumindest teilweise im Inneren der Basis (104) untergebracht ist und dazu konfiguriert ist, die Anzeigekomponente (102) mit der Basis (104) drehbar zu verbinden; optional, wobei das Scrollrad (132) zumindest teilweise in Inneren der Scharnieranordnung angeordnet ist.

13. Tragbarer Computer (100) nach Anspruch 1, ferner umfassend:
einen Fuß, der entlang zumindest eines Teils der Basis (104) angeordnet ist und dazu konfiguriert ist, den tragbaren Computer (100) abzustützen, wenn er im Staffeleimodus ist.

14. Tragbarer Computer (100) nach Anspruch 1, wobei der tragbare Computer (100) einen einzigen Anzeigebildschirm (110) umfasst.

15. Tragbarer Computer (100) nach Anspruch 1, wobei der tragbare Computer dazu konfiguriert ist, zu verhindern, dass der tragbare Computer auf Tastatureingabe reagiert, wenn der tragbare Computer im Bildmodus ist.

Revendications

1. Ordinateur portable (100) configurable entre une pluralité de modes d'affichage incluant un mode portable, un mode tableau, et un mode chevalet, l'ordinateur portable (100) comprenant :

un composant d'affichage (102) incluant un écran d'affichage (110) configuré pour afficher du contenu ;
une base (104) comprenant un clavier intégré (106) ;
un capteur de mode comprenant un accéléromètre configuré pour détecter un mode d'affichage en cours entre la pluralité de modes d'affichage de l'ordinateur portable ; et
un ensemble de charnière configuré pour coupler de manière pivotante le composant d'affichage (102) à la base (104) ;
dans lequel l'ensemble de charnière est configuré pour permettre le pivotement du composant d'affichage (102) et/ou de la base (104) par rapport à un axe unique (101) pour configurer l'ordinateur portable (100) entre le mode portable et le mode chevalet, et
dans lequel l'axe unique (101) est un axe longitudinal s'étendant le long d'une interface entre le composant d'affichage (102) et la base (104) ;
et dans lequel le composant d'affichage (102) est pivotant par rapport à l'axe longitudinal ;
l'ordinateur portable comprenant en outre :

un équipement de navigation accessible dans chacun de la pluralité des modes d'affichage, l'équipement de navigation configuré pour permettre à un utilisateur de commander au moins l'un des paramètres de fonctionnement de l'ordinateur portable

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(100) et du contenu affiché sur l'écran d'affichage (110) ; et
un premier bouton de navigation (166 ; 168) disposé sur l'un de la base (104) et du composant d'affichage (102), dans lequel le premier bouton de navigation est configuré pour changer une action associée à l'équipement de navigation, dans lequel l'action est changée en fonction du mode d'affichage détecté ;
dans lequel dans le mode chevalet, le composant d'affichage (102) et la base (104) sont configurés l'un par rapport à l'autre de manière à ce que l'écran d'affichage (110) et le clavier (106) se tournent le dos, avec l'écran d'affichage (110) orienté vers l'opérateur de l'ordinateur portable et le clavier (106) orienté dans le sens contraire de l'opérateur de l'ordinateur portable ; et
dans lequel dans le mode châssis, l'écran d'affichage (110) est disposé selon un angle supérieur à environ 180 degrés, mesuré le long de l'axe longitudinal, par rapport à la base (104), et dans lequel l'écran d'affichage (110) est orienté vers l'opérateur, la base est en contact avec une surface (212), et le clavier (106) est dirigé vers la surface (212).

2. Ordinateur portable (100) selon la revendication 1, comprenant en outre un module d'orientation d'affichage configuré pour commander une orientation du contenu affiché sur l'écran d'affichage (110) ; dans lequel l'orientation du contenu affiché sur l'écran d'affichage (110) est configurable entre une pluralité d'orientations par rapport à l'axe longitudinal.

3. Ordinateur portable (100) selon la revendication 2, dans lequel la pluralité d'orientations comprend une première orientation par rapport à l'axe longitudinal et une deuxième orientation par rapport à l'axe longitudinal ; et
dans lequel quand le module d'orientation d'affichage est configuré pour afficher automatiquement le contenu dans la première orientation quand l'ordinateur portable (100) est configuré dans le mode portable et dans la deuxième orientation quand l'ordinateur portable (100) est configuré dans le mode chevalet.

4. Ordinateur portable (100) selon la revendication 2, dans lequel la pluralité de modes d'affichage comprend en outre un mode à plat dans lequel le composant d'affichage (102) est disposé selon un angle d'environ 180 degrés, mesuré le long de l'axe longitudinal, par rapport à la base (104), de préférence, dans lequel la pluralité d'orientations comprend une première orientation par rapport à l'axe longitudinal, une deuxième orientation par rapport à l'axe longitudinal, et une troisième orientation par rapport à l'axe longitudinal ; et
dans lequel, dans le mode à plat, l'orientation du contenu affiché sur l'écran d'affichage (110) est configurable entre les première, deuxième et troisième orientations en réponse à une entrée d'utilisateur ; en option, dans lequel la deuxième orientation est 90 degrés par rapport à la première orientation ; et dans lequel la troisième orientation est 180 degrés par rapport à la première orientation.

5. Ordinateur portable (100) selon la revendication 2, dans lequel le capteur de mode est configuré pour détecter un degré de pivotement du composant d'affichage (102) par rapport à la base (104) et pour fournir une information représentative du degré de pivotement ; et
dans lequel le module d'orientation d'affichage est configuré pour ajuster automatiquement l'orientation du contenu affiché sur l'écran d'affichage (110) en réponse à l'information en provenance du capteur de mode.

6. Ordinateur portable (100) selon la revendication 2, dans lequel le module d'orientation d'affichage sélectionne l'orientation du contenu affiché sur l'écran d'affichage (110) parmi l'une de la pluralité d'orientations par rapport à l'axe longitudinal en réponse au mode d'affichage en cours détecté par le capteur de mode.

7. Ordinateur portable (100) selon la revendication 1, dans lequel la pluralité de modes d'affichage comprend en outre
un mode fermé ; et
dans lequel, dans le mode fermé, l'écran d'affichage (110) est disposé sensiblement contre la base (104).

8. Ordinateur portable (100) selon la revendication 7, dans lequel le pivotement du composant d'affichage (102) par rapport à l'axe longitudinal jusqu'à environ 180 degrés depuis le mode fermé configure l'ordinateur portable (100) dans le mode portable ; et
dans lequel le pivotement du composant d'affichage (102) par rapport à l'axe longitudinal de plus d'environ 180 degrés depuis le mode fermé configure l'ordinateur portable (100) dans le mode chevalet ; en option, dans lequel le composant d'affichage (102) est pivotant par rapport à l'axe longitudinal jusqu'à environ 320 degrés depuis le mode fermé.

9. Ordinateur portable (100) selon la revendication 1, dans lequel l'équipement de navigation est une molette de défilement (132) disposée au moins partiellement à l'intérieur de la base (104) et pivotant par rapport à l'axe longitudinal, la molette de défilement (132) configurée pour permettre à un utilisateur de commander au moins l'un parmi des paramètres de

fonctionnement de l'ordinateur portable (100) et du contenu affiché sur l'écran d'affichage (110).

10. Ordinateur portable (100) selon la revendication 9, dans lequel le premier bouton de navigation (166 ; 168) est configuré pour permettre à l'utilisateur de manipuler du contenu sélectionné affiché sur l'écran d'affichage (110).

11. Ordinateur portable (100) selon la revendication 10, dans lequel le premier bouton de navigation (166 ; 168) est configuré pour permettre à l'utilisateur de sélectionner l'affichage de l'un de la pluralité de modes de contenu ; l'ordinateur portable comprenant en outre un deuxième bouton de navigation (166 ; 168) ;
dans lequel le premier bouton de navigation (166 ; 168) est disposé sur une surface principale de la base (104) ; et
dans lequel le deuxième bouton de navigation (166 ; 168) est disposé sur une surface mineure de la base (104).

12. Ordinateur portable (100) selon la revendication 9, dans lequel la molette de défilement (132) est configurée pour permettre à l'utilisateur de sélectionner un mode de contenu à afficher sur l'écran d'affichage (110) ; ou dans lequel la molette de défilement (132) est configurée pour permettre à l'utilisateur de commander un volume de son joué par l'ordinateur portable (100) ; ou dans lequel l'ensemble de charnière est au moins partiellement logé à l'intérieur de la base (104) et configuré pour coupler de manière pivotante le composant d'affichage (102) à la base (104) ; en option, dans lequel la molette de défilement (132) est disposée au moins partiellement à l'intérieur de l'ensemble de charnière.

13. Ordinateur portable (100) selon la revendication 1, comprenant en outre :
un pied disposé le long d'au moins une partie de la base (104) et configuré pour supporter l'ordinateur portable (100) lorsqu'il est dans le mode chevalet.

14. Ordinateur portable (100) selon la revendication 1, dans lequel l'ordinateur portable (100) inclut un écran d'affichage unique (110).

15. Ordinateur portable (100) selon la revendication 1, dans lequel l'ordinateur portable est configuré pour empêcher l'ordinateur portable de réagir à une entrée de clavier quand l'ordinateur portable est dans le mode tableau.

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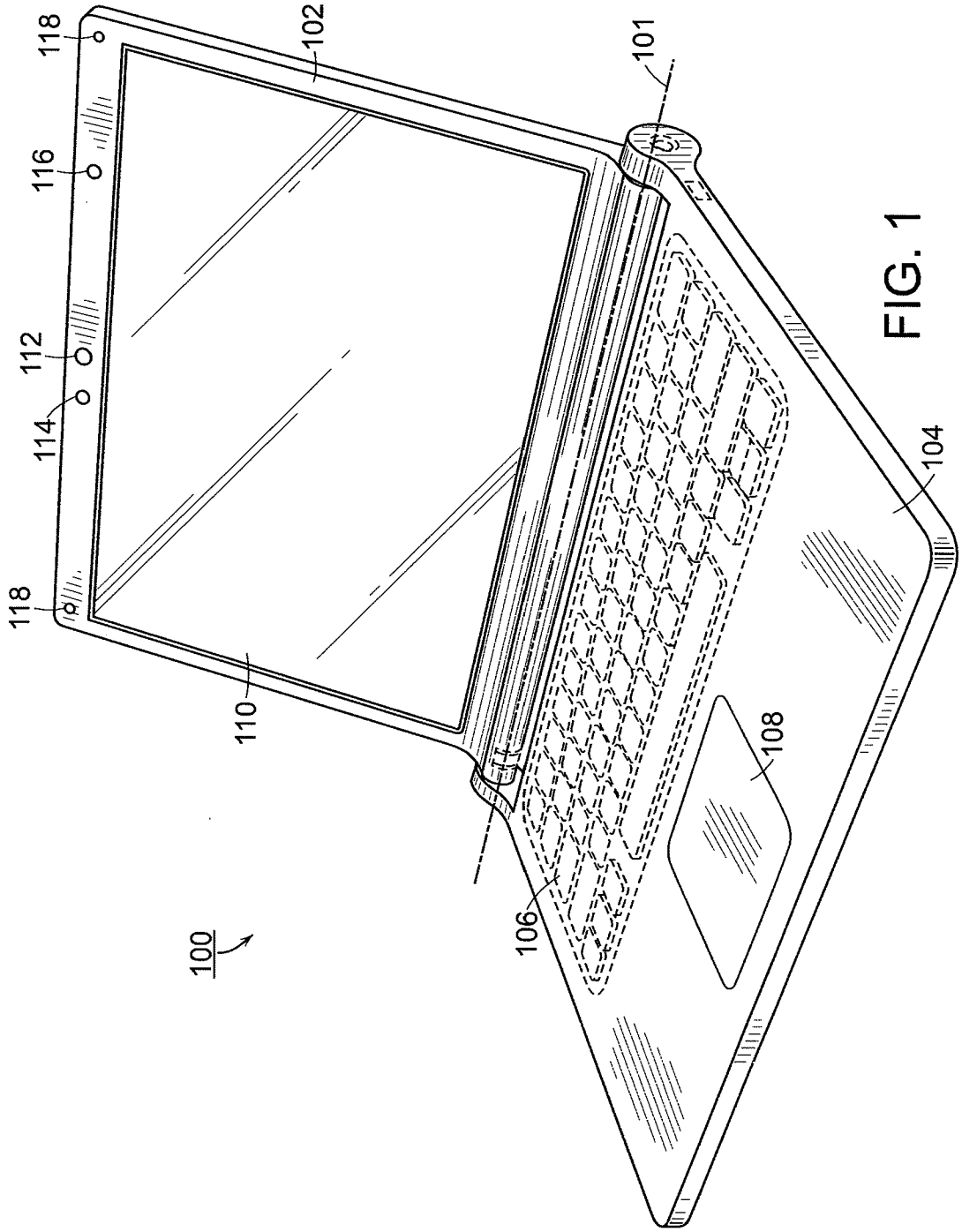


FIG. 1

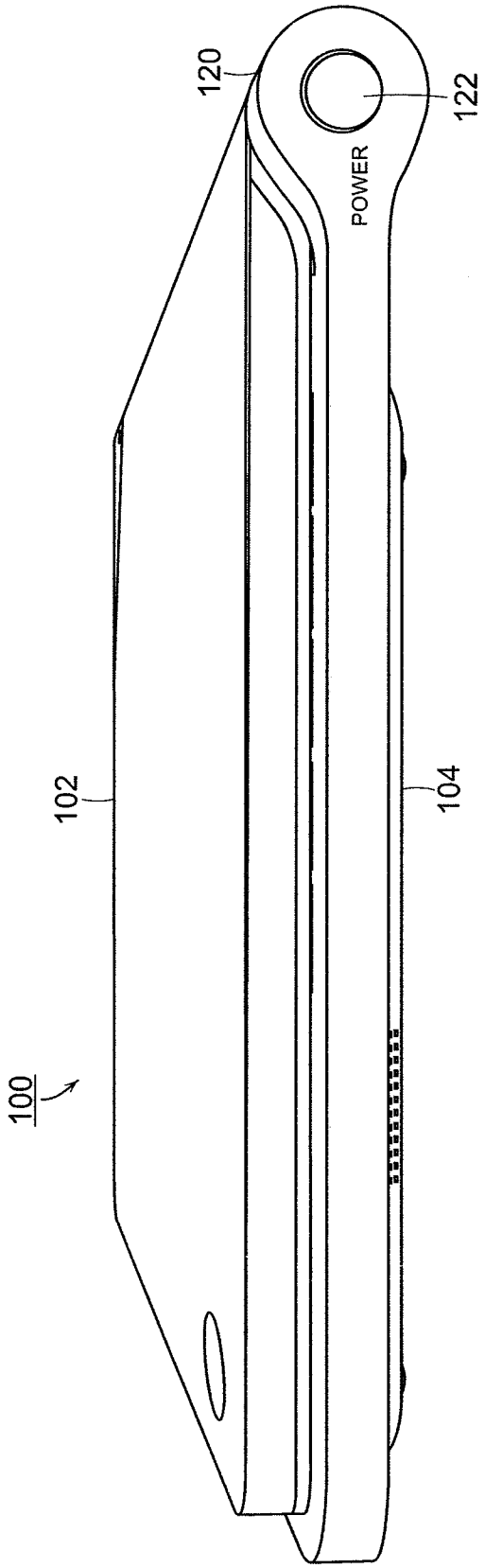


FIG. 2

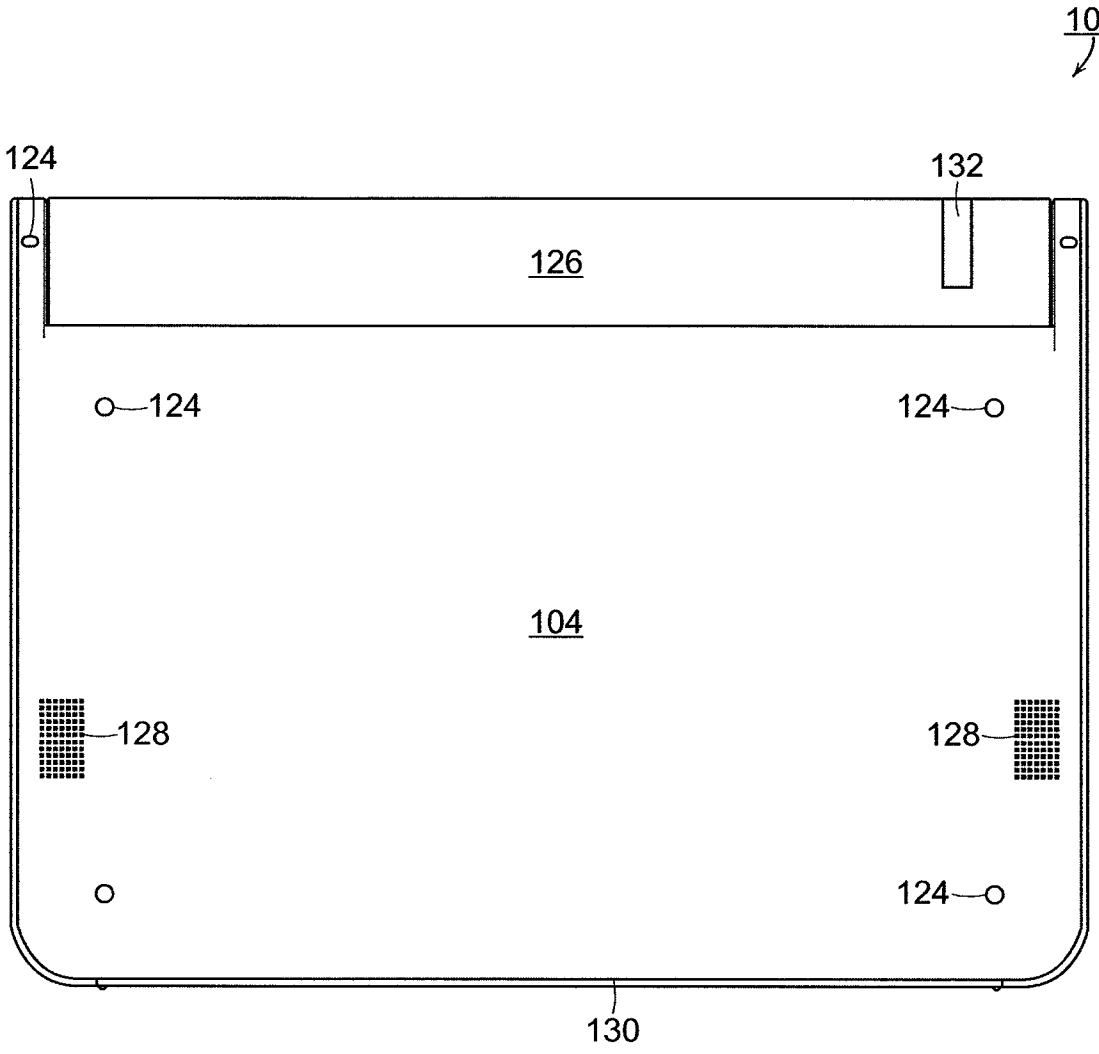


FIG. 3

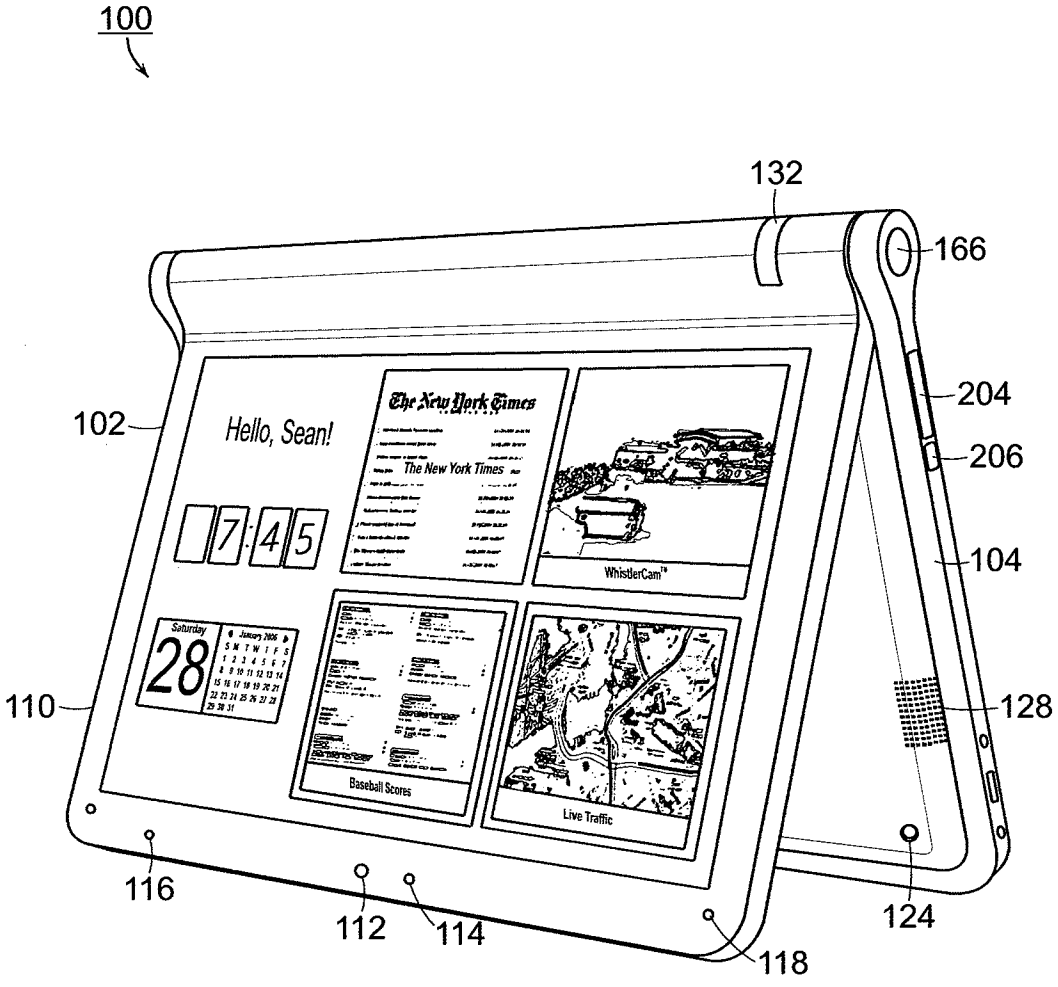

100
132
166
102
Hello, Sean!
7:45
The New York Times
The New York Times
204
206
104
WhistlerCam™
Saturday
28
110
128
Baseball Scores
Live Traffic
116
112
114
118
124

FIG. 4

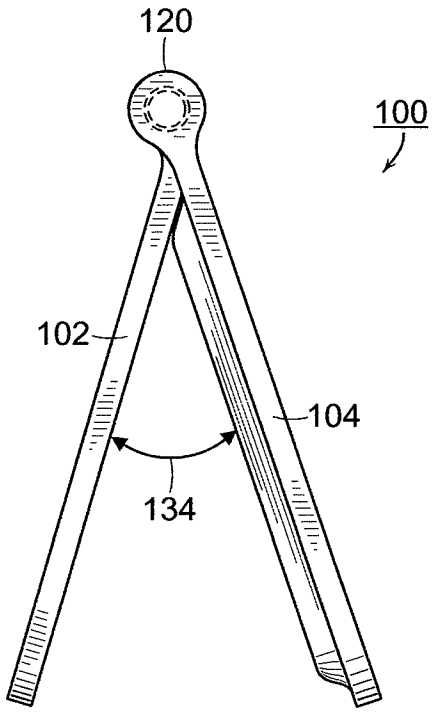


FIG. 5

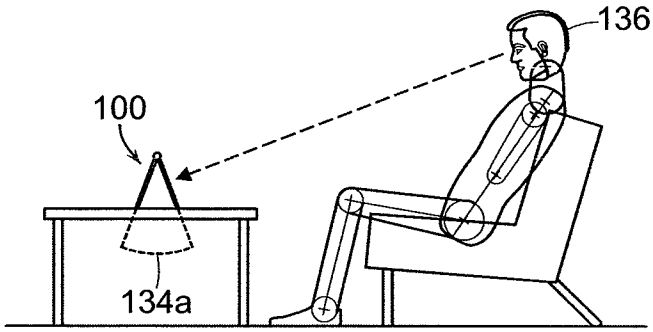


FIG. 6A

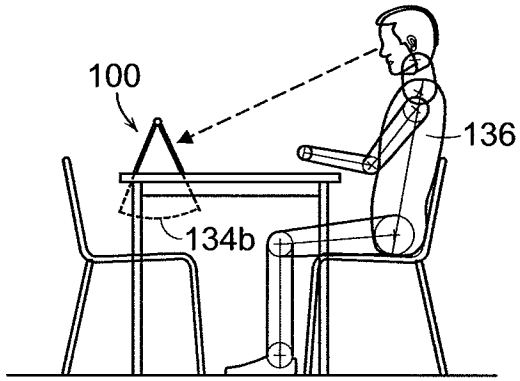


FIG. 6B

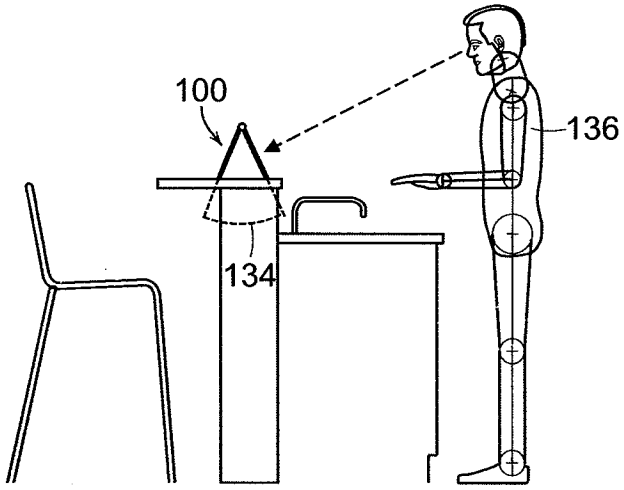


FIG. 6C

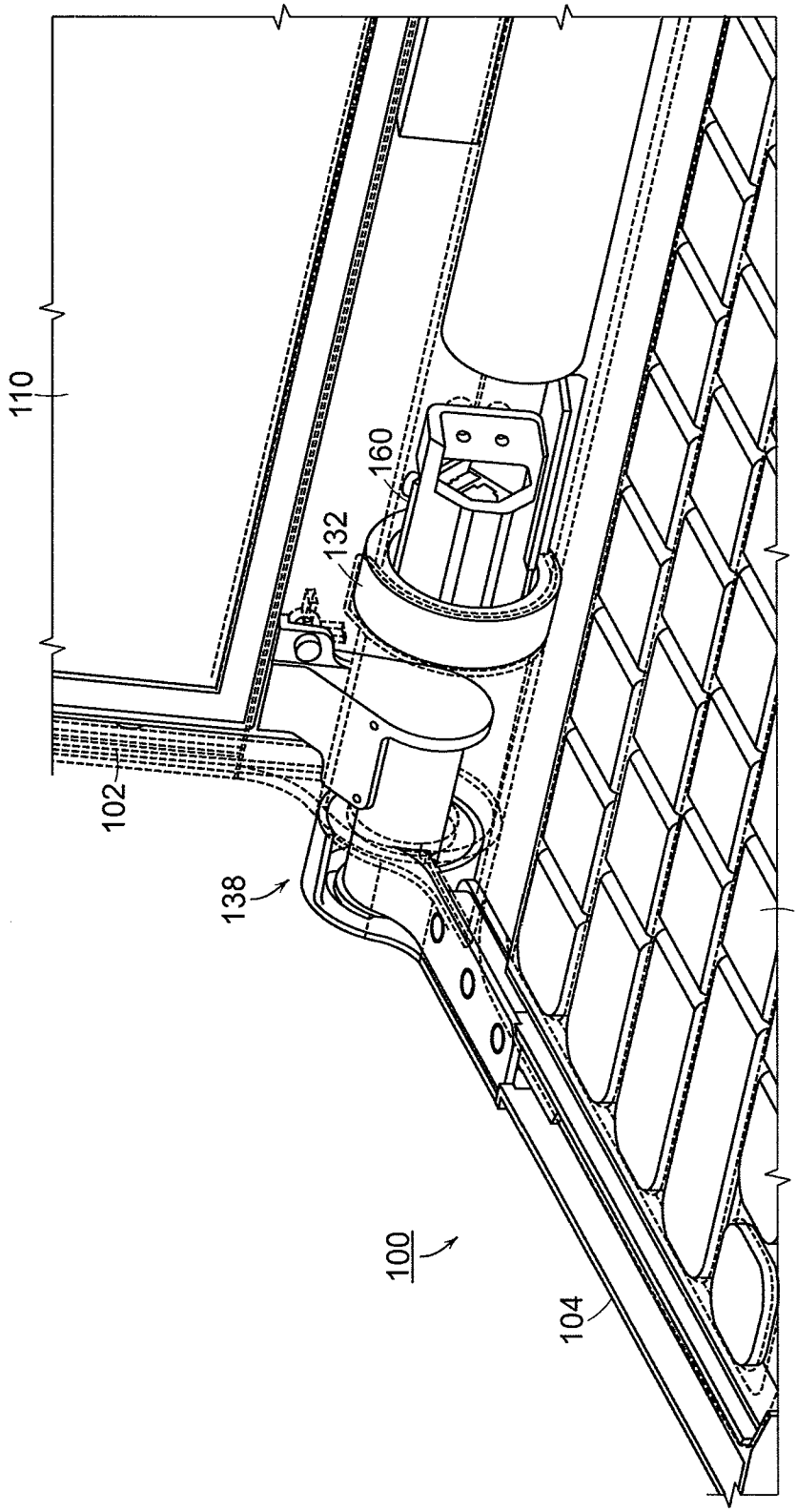


FIG. 7A

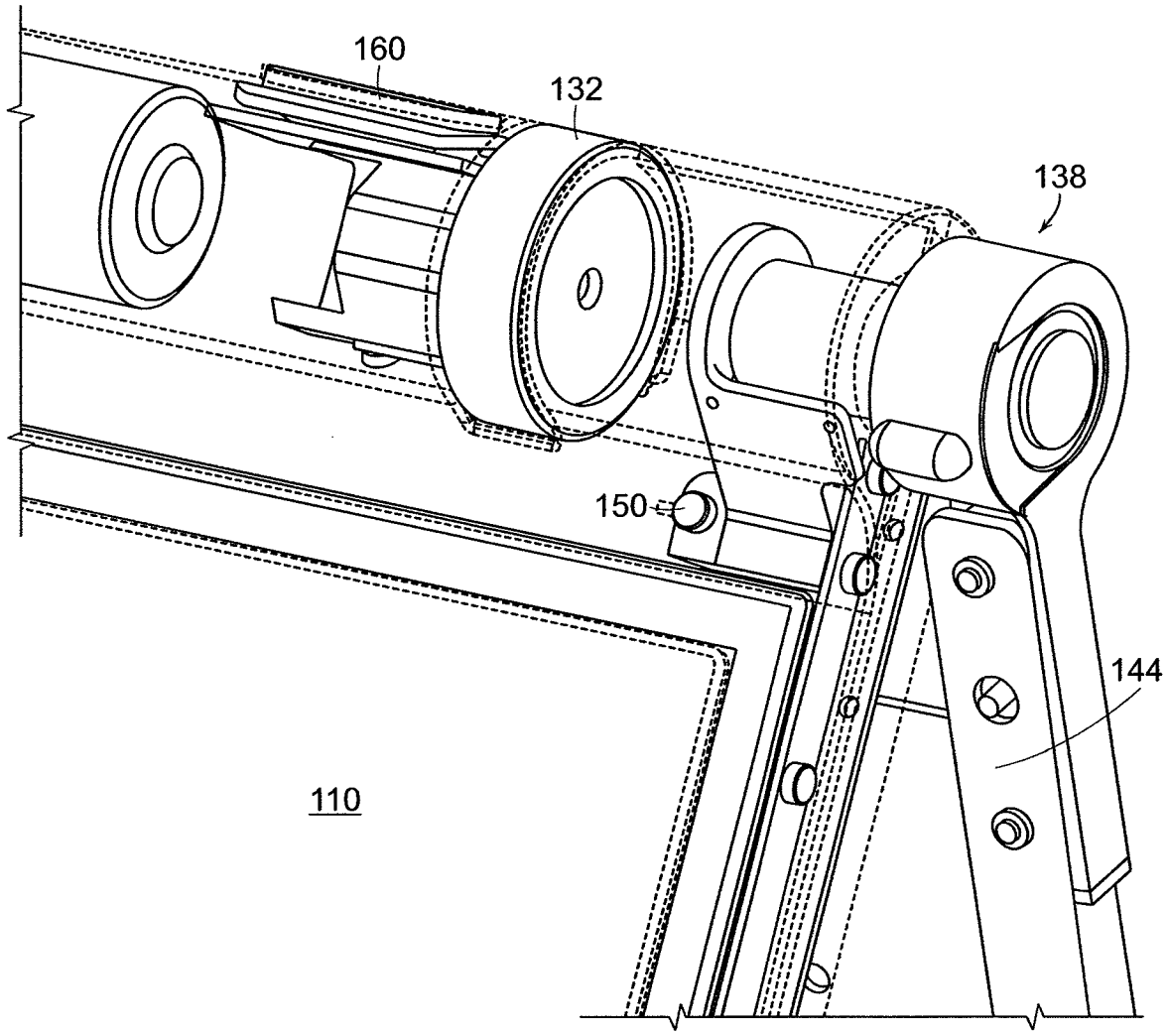


FIG. 7B

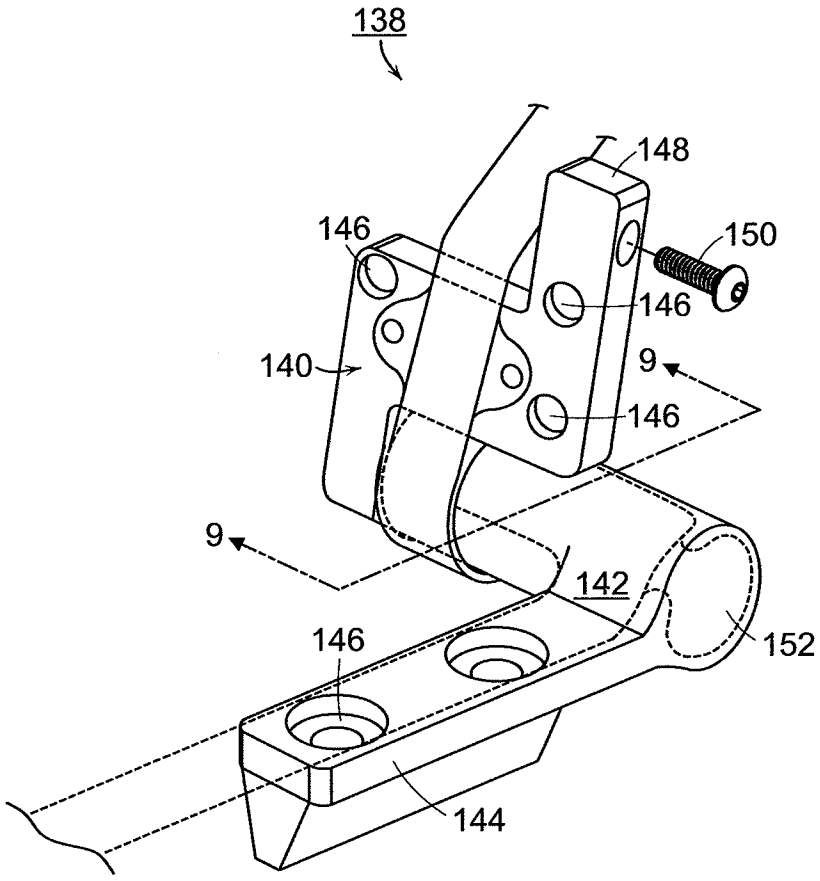


FIG. 8

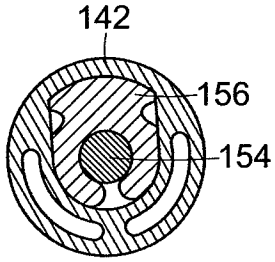


FIG. 9

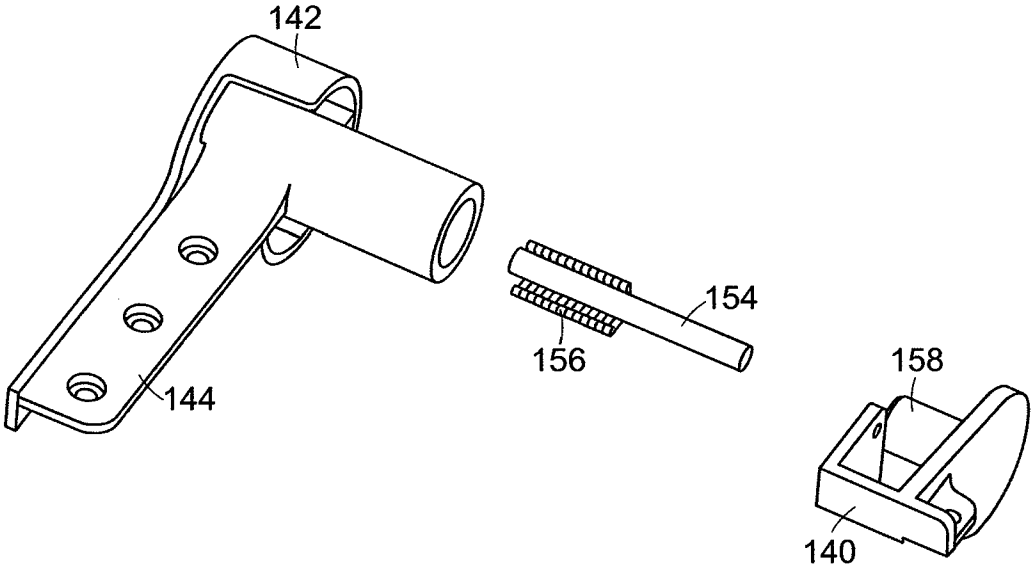


FIG. 10

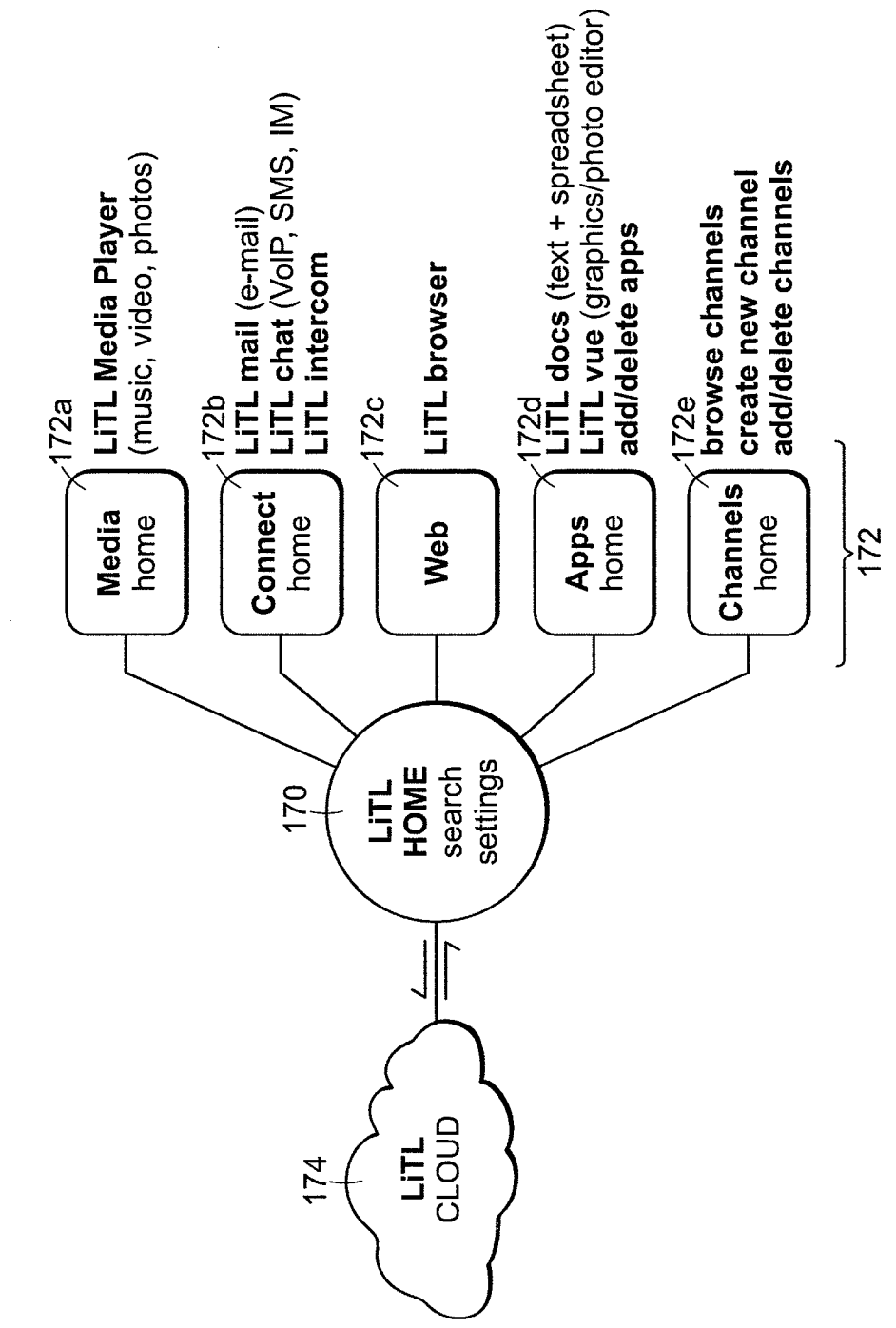

172a
LiTL Media Player
(music, video, photos)
Media
home
172b
LiTL mail (e-mail)
LiTL chat (VoIP, SMS, IM)
LiTL intercom
Connect
home
172c
LiTL browser
Web
172d
LiTL docs (text + spreadsheet)
LiTL vue (graphics/photo editor)
add/delete apps
Apps
home
172e
browse channels
create new channel
add/delete channels
Channels
home
172
170
LiTL
HOME
search
settings
174
LiTL
CLOUD

FIG. 11

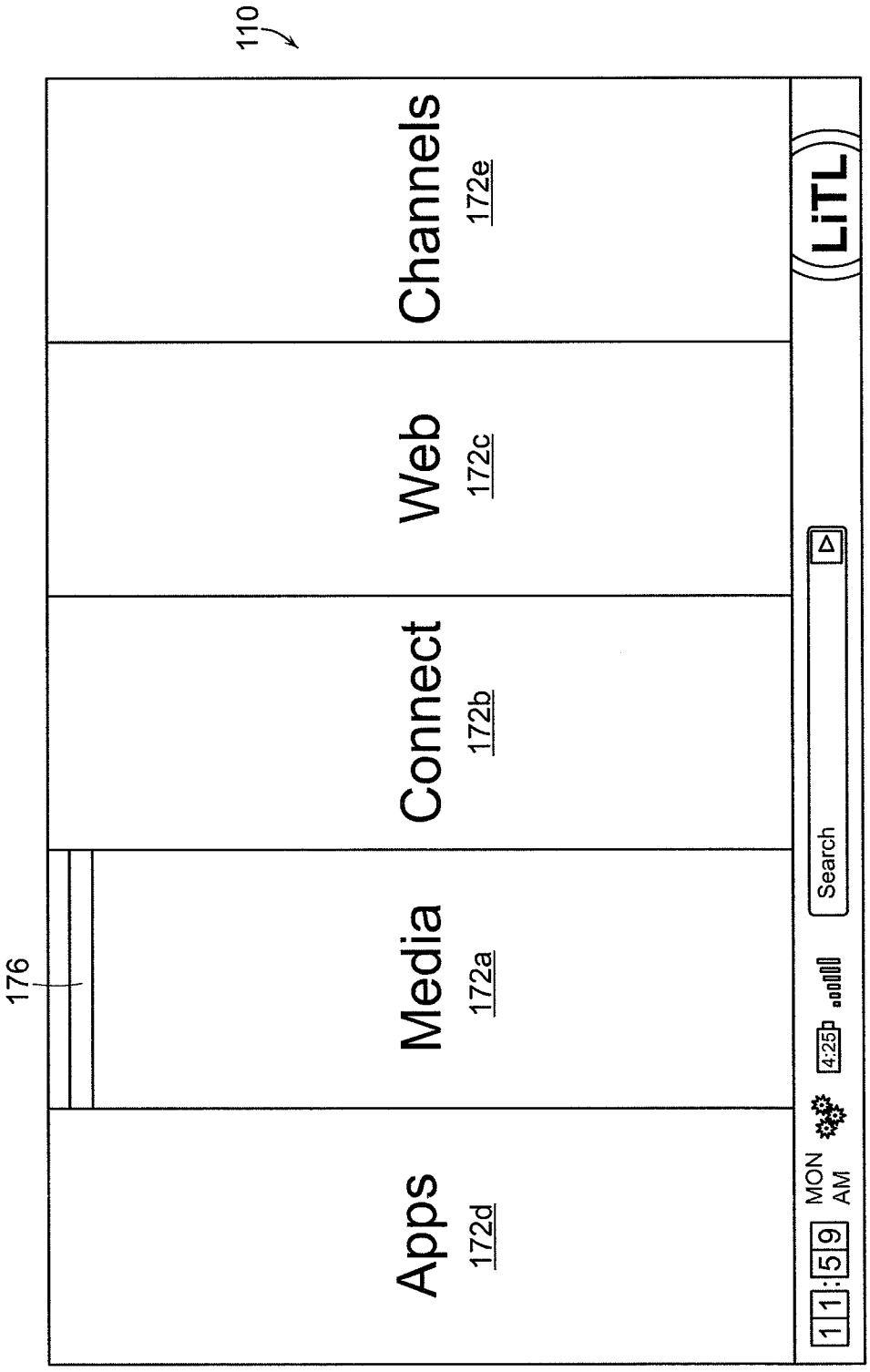

110
176
Apps
172d
Media
172a
Connect
172b
Web
172c
Channels
172e
Search
LiTL
11:59 MON AM
4:25p

FIG. 12

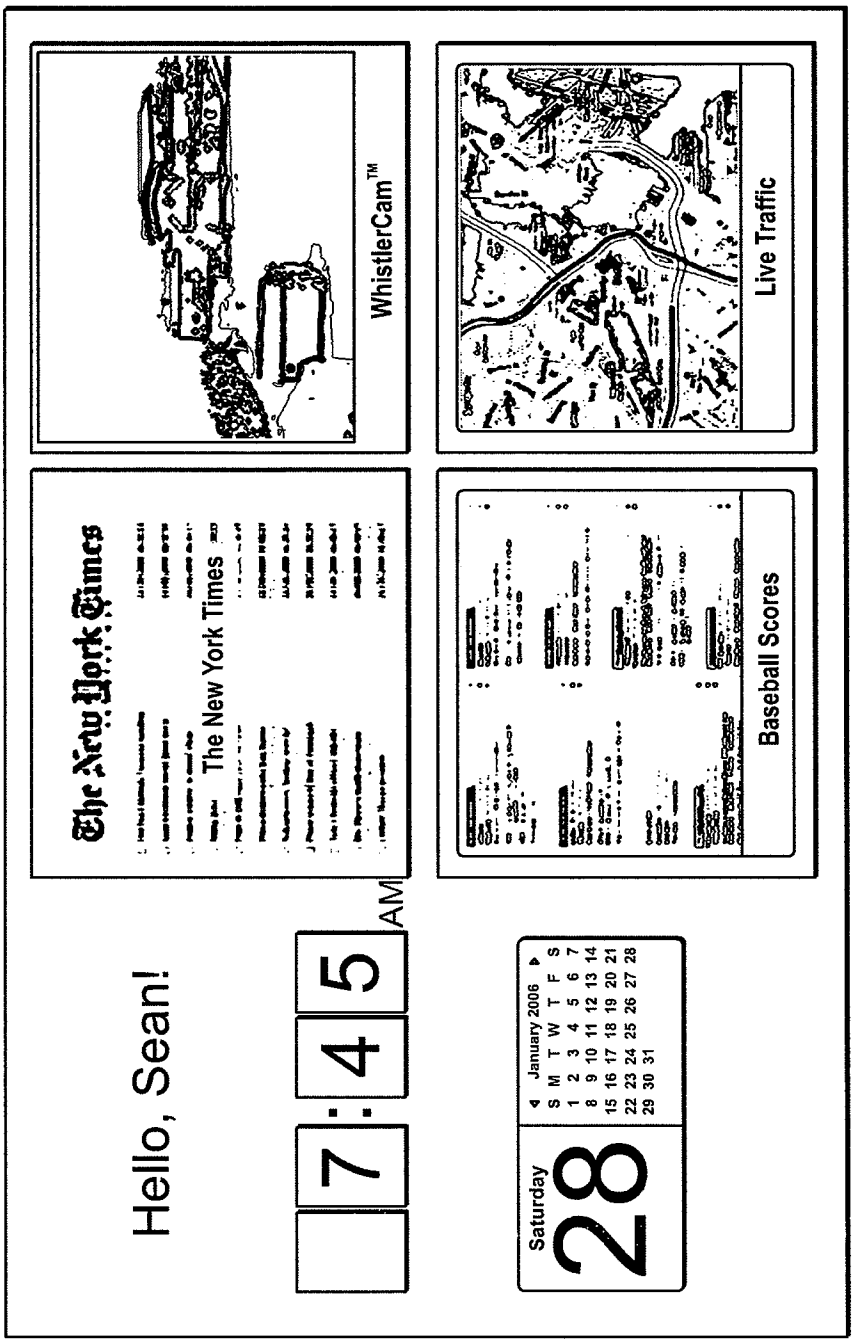

110
Hello, Sean!
7:45 AM
Saturday
28
January 2006
S M T W T F S
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30 31
The New York Times
WhistlerCam™
Live Traffic
Baseball Scores

FIG. 13

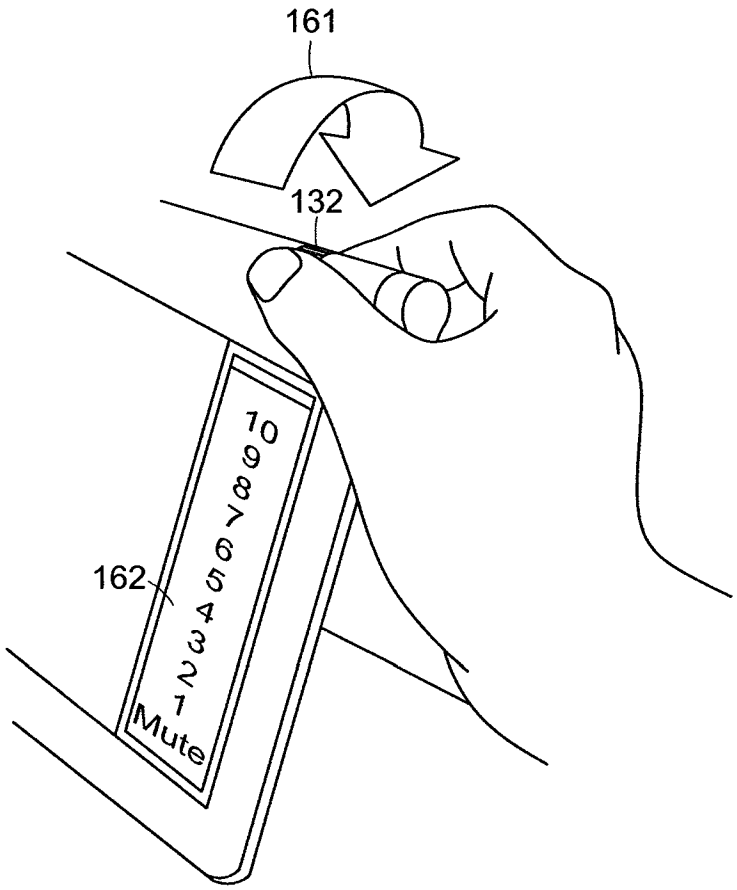


FIG. 14

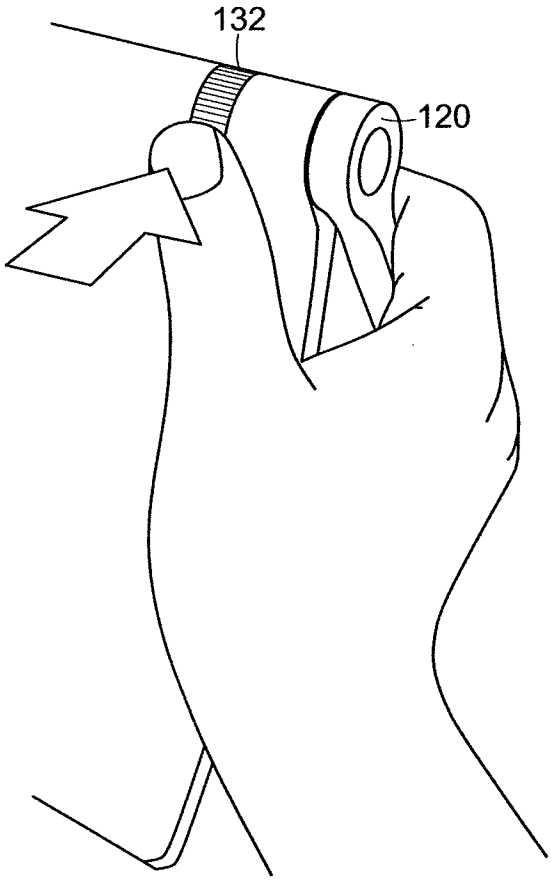


FIG. 15

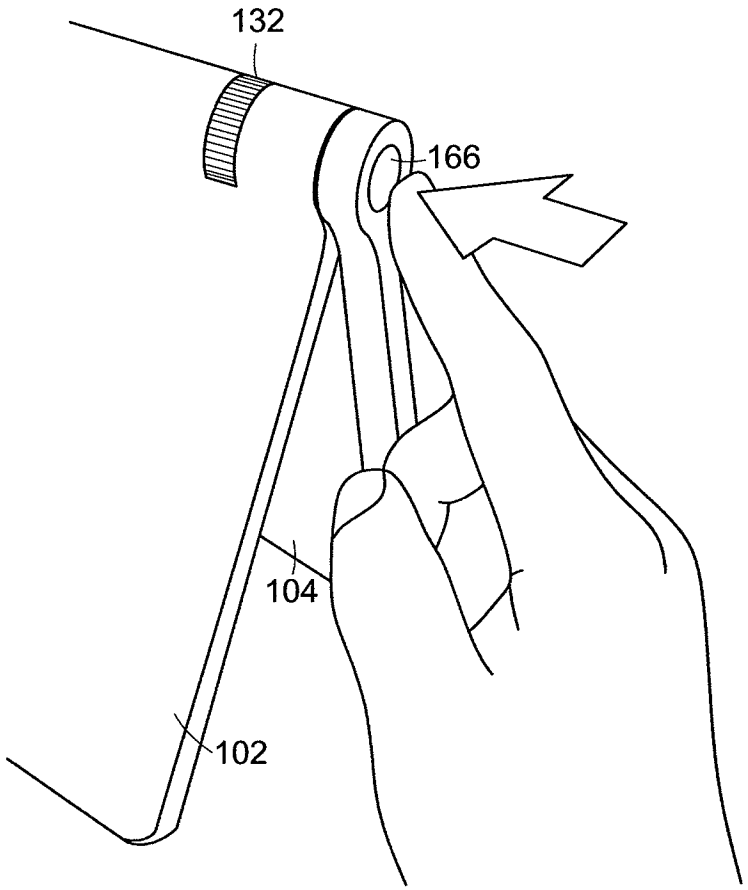


FIG. 16

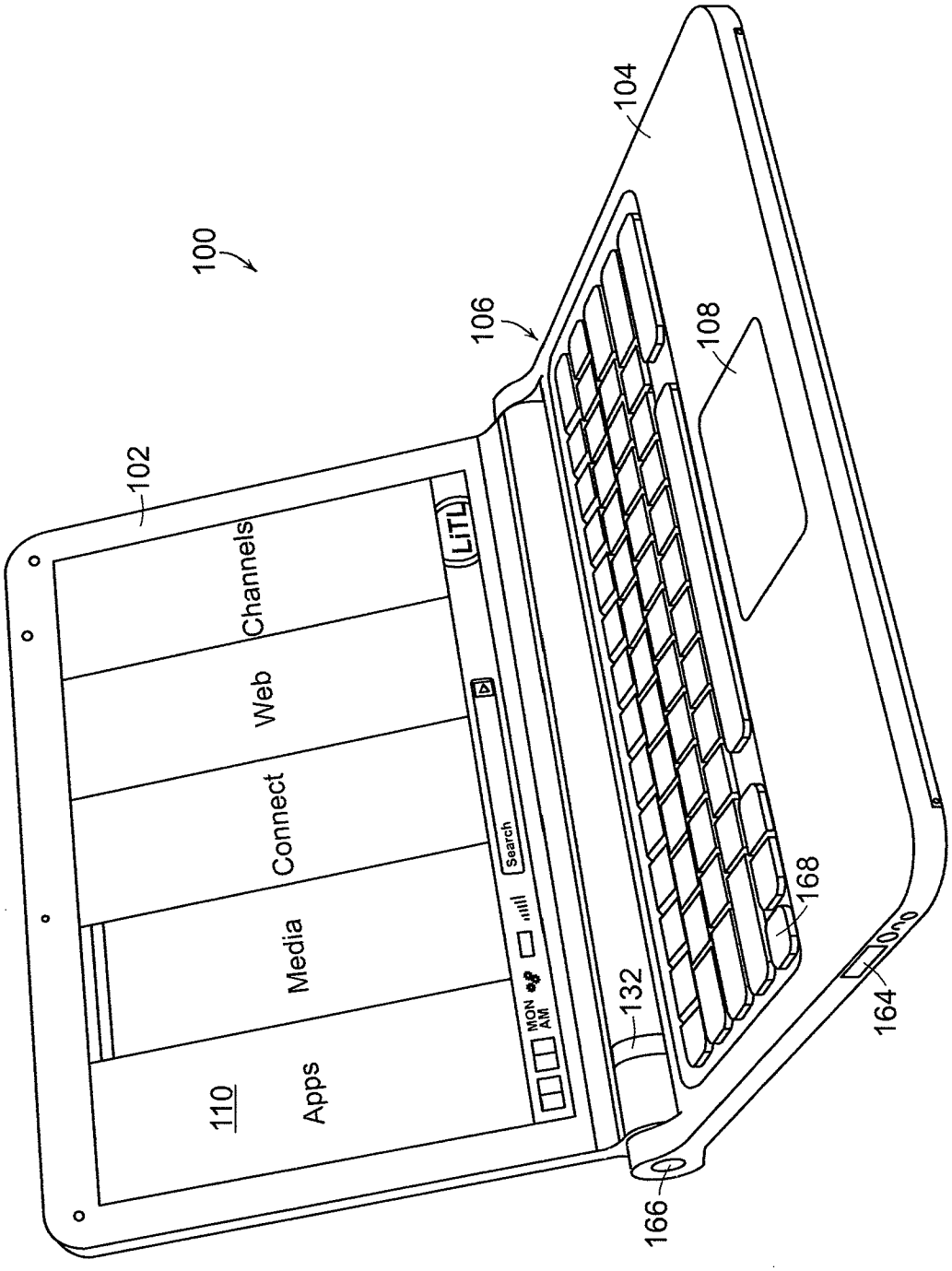

100
102
104
106
108
110
Apps
Media
Connect
Web
Channels
Search
MON
AM
132
164
166
168

FIG. 17

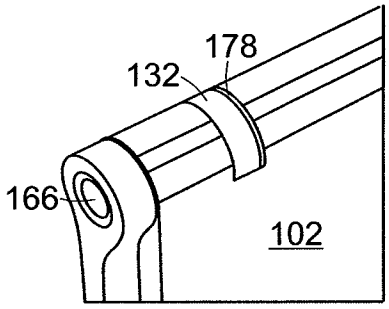


FIG. 18

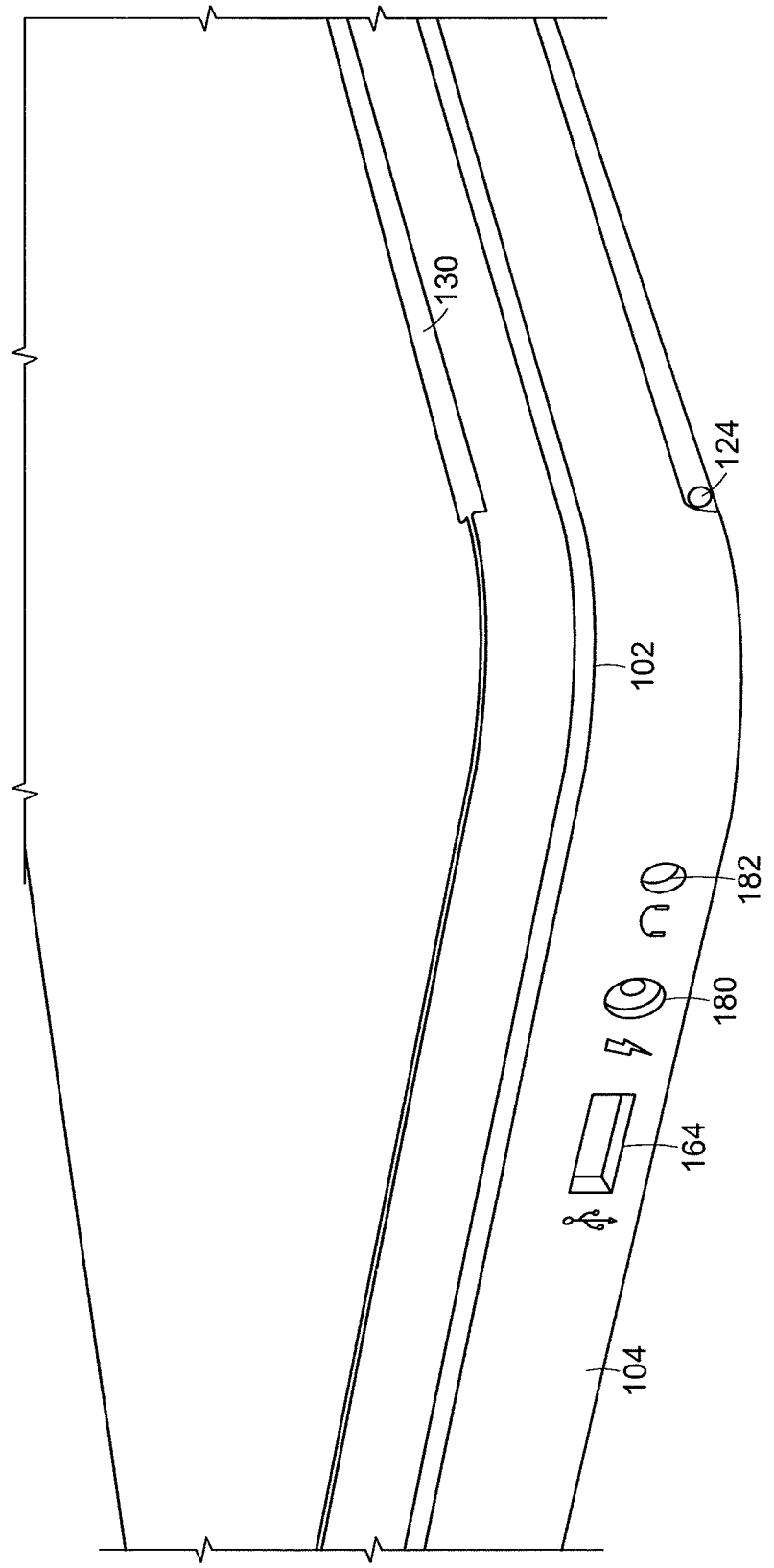


FIG. 19

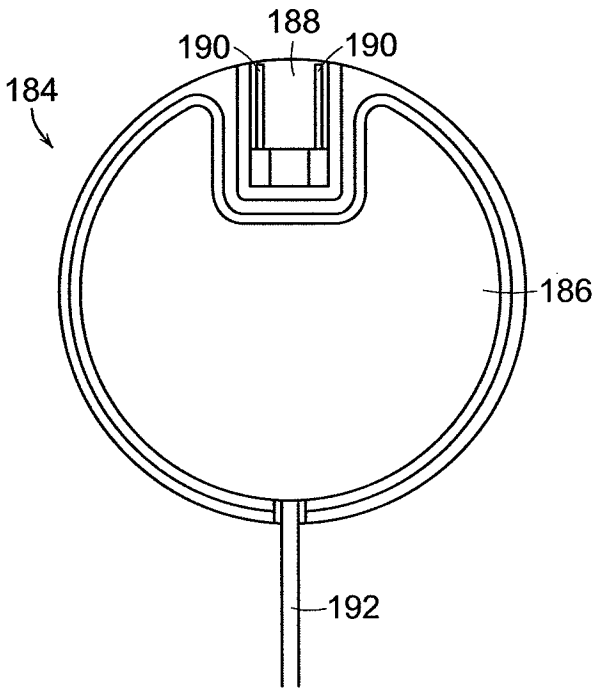


FIG. 20

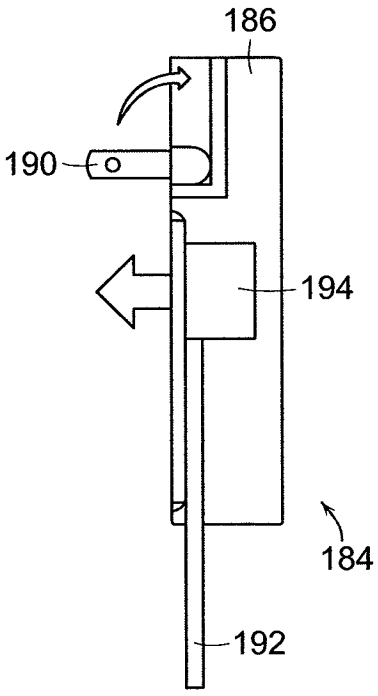


FIG. 21

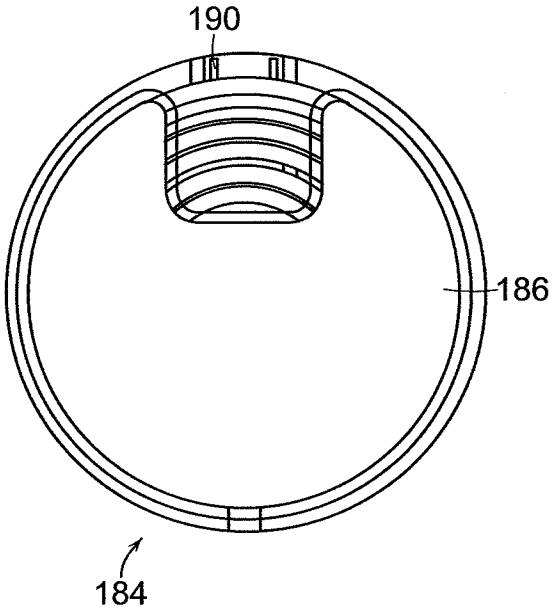


FIG. 22A

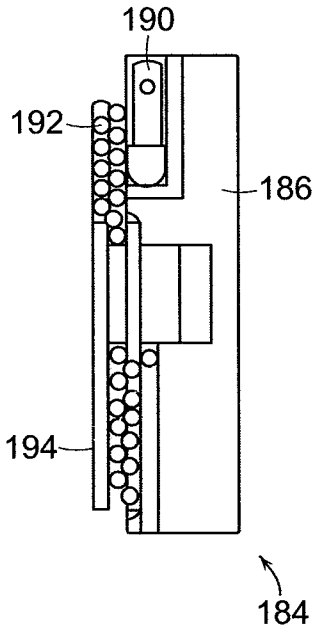


FIG. 22B

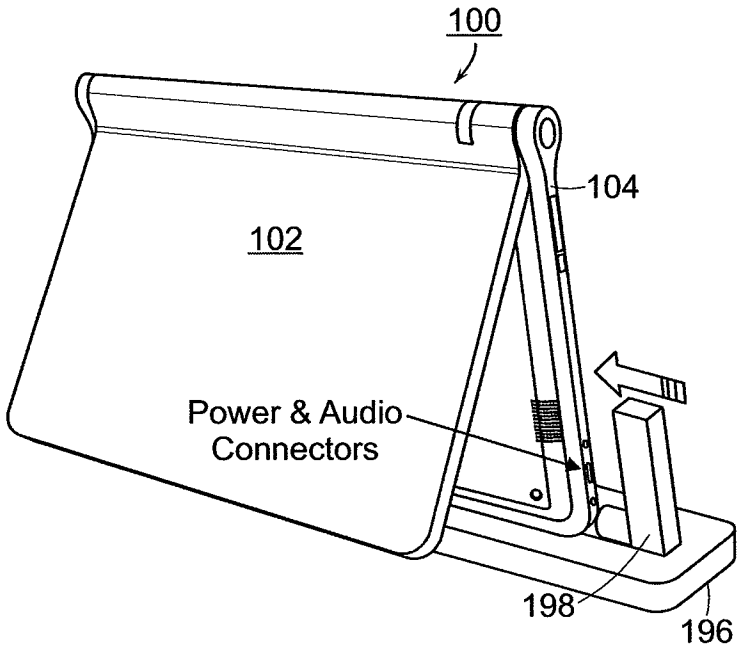


FIG. 23

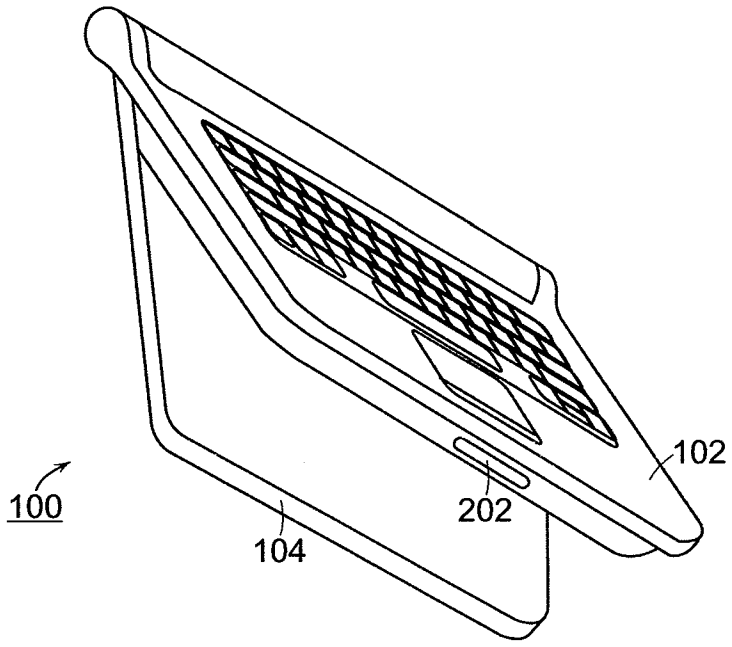


FIG. 24

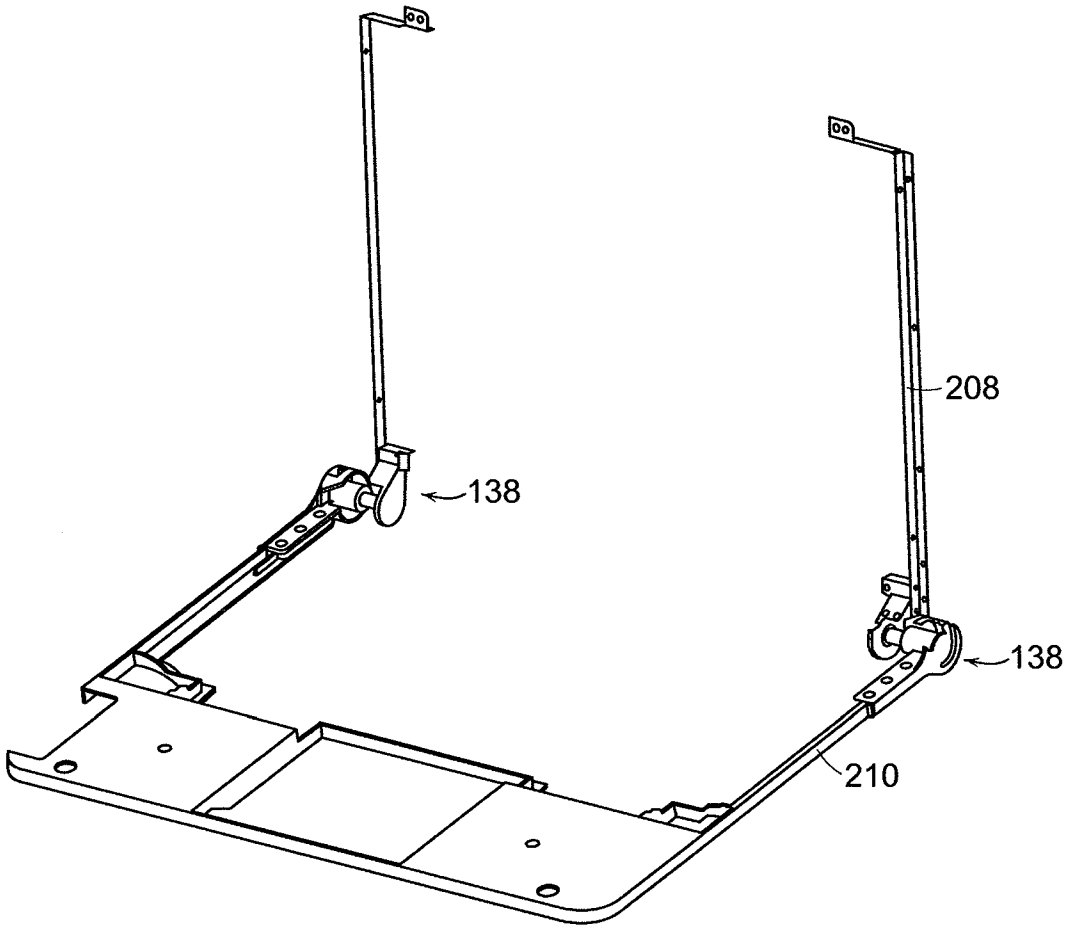


FIG. 25

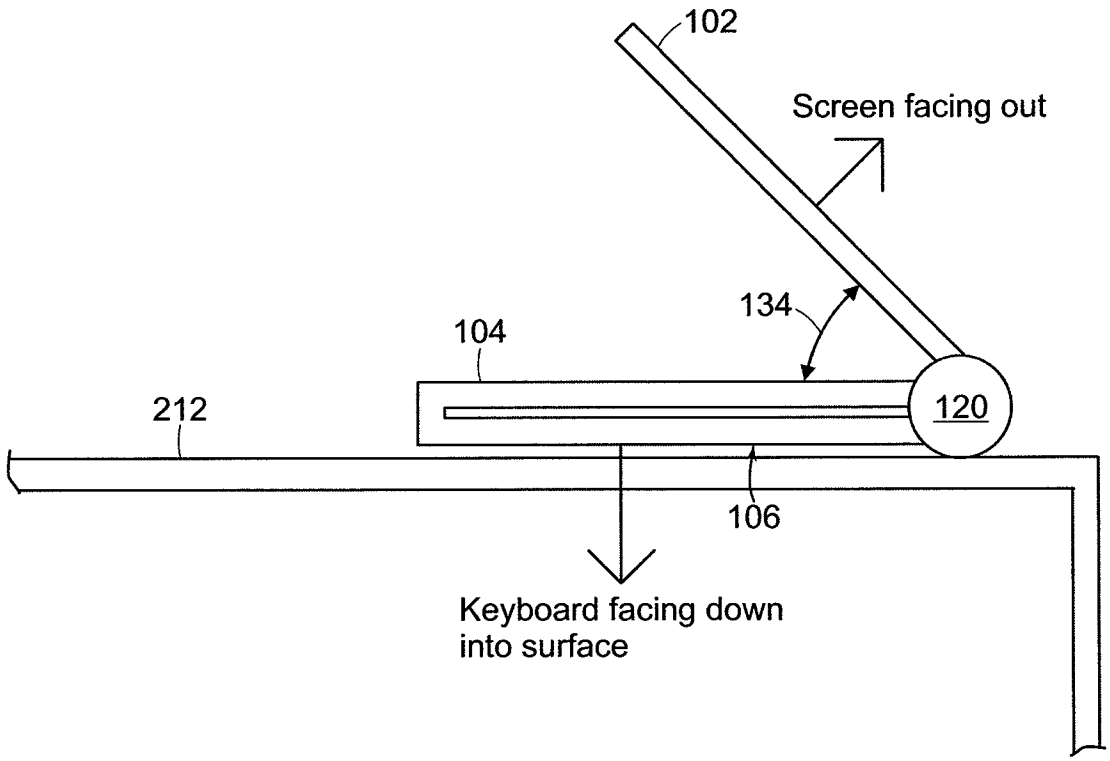

102
Screen facing out
134
104
212
120
106
Keyboard facing down
into surface

FIG. 26

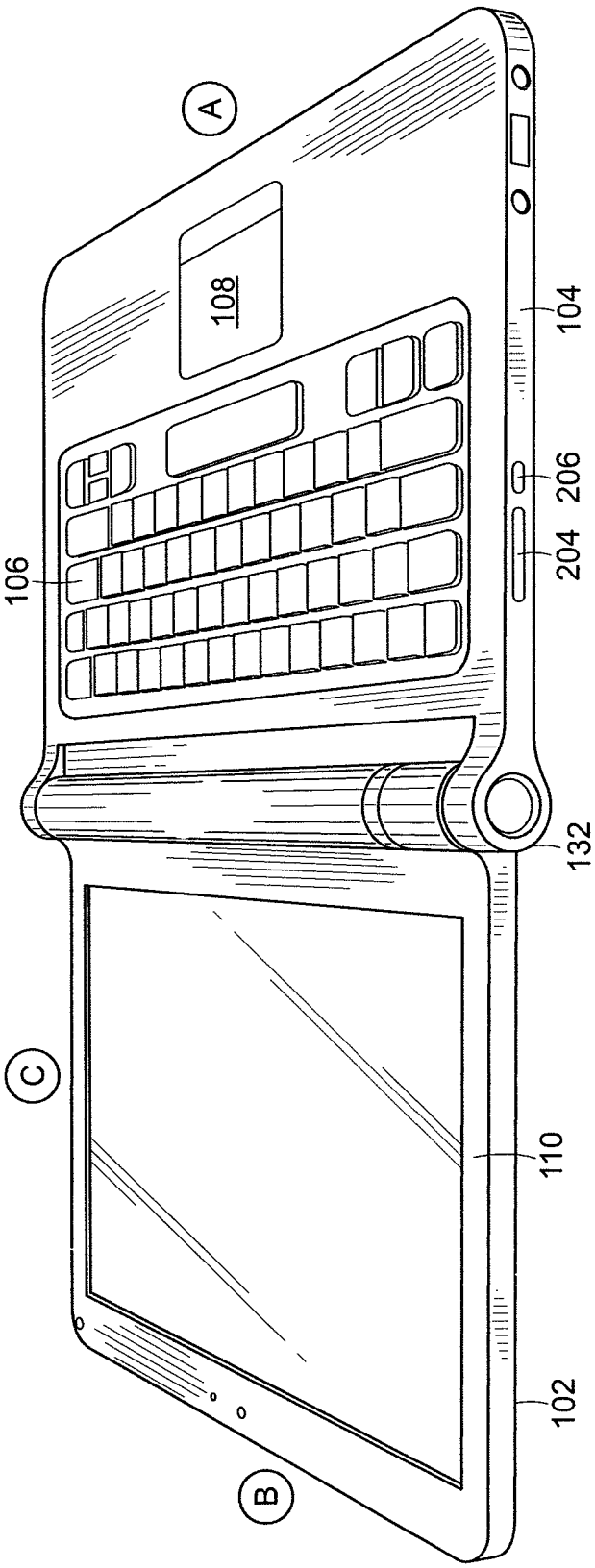


FIG. 27

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6771494 B **[0003] [0004]**
- WO 9524007 A **[0003]**
- US 6266236 B **[0003] [0004] [0029]**
- DE 19952486 **[0003]**

Exhibit 1041

HGF

European Patent Office
80298 MUNICH
Germany

1 June 2016

Your ref:
Our ref: P132767EP / VLJ / SH

Dear Sirs

European Patent Application No 09727165.4
PORTABLE COMPUTER WITH MULTIPLE DISPLAY CONFIGURATIONS
Litl, LLC

We reply herewith to the communication dated 23 November 2015 and enclose:

- amended claims 1-16 to replace the claims currently on file; and
- a version of the amended claims showing the changes made.

Claim 1 has been amended to recite "*a base (104) comprising an integrated keyboard (106);* *an accelerometer to detect a current display mode among the plurality of display modes of the portable computer*" and to include the features of former claim 16. Claim 16 has been deleted for consistency, and the remaining claims renumbered accordingly. Basis for the amendments to claim 1 is provided by page 12 lines 5-17, page 13 lines 21-26, and page 23 lines 3-20 of the Published PCT (PCT/US2009/038599) application.

Novelty and inventive step

D1 discloses "a presentation device" (see, e.g., Col. 1 Lines 3-5) with a "pivotable main screen" that can rotate "at least about 220 Degrees" (see, e.g., Col. 1 Lines 62-57). During a presentation, the main display screen is rotated and the image is automatically rotated by "a pivot angle detection device planted in the joint" that "causes ... the image of the main screen" to be rotated when "a predetermined angle" is reached (see, e.g., Col. 2 Lines 14-23).

In contrast to D1, the "current display mode among the plurality of display modes of the portable computer" is detected by "an accelerometer" (see claim 1). Employing an accelerometer provides information regarding the orientation of the device that is separate from information regarding the position of the hinge (e.g., as measured by the encoder in D1) that enables the portable computer to operate in additional display modes relative to D1 including, for example, the frame mode disclosed in the present application. As described in more detail below, operating in both a frame mode and an easel mode, as claimed, is problematic when relying on information from an encoder regarding the relative position of the main screen and the base, as taught by D1.

The orientation information generated by the accelerometer facilitates both easel and frame modes because the orientation of the screen is different between easel mode and frame mode, while the hinge position is similar. To further illustrate this point, FIG. 5 (easel mode) and FIG. 26 (frame mode) are

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reproduced below side-by-side including an indication of where the top of the displayed content is located:

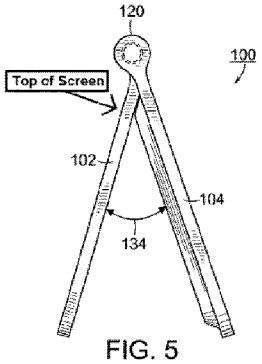


FIG. 5

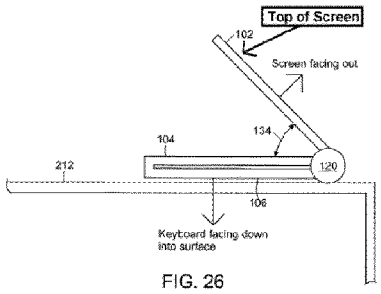


FIG. 26

As illustrated above, the top of the displayed content in easel mode (FIG. 5) is close to the hinge while the top of the displayed content in frame mode (FIG. 26) is away from the hinge. Consequently, a device that only relies on a hinge position switch like reference D1 is incapable of distinguishing between both a frame mode and an easel mode. In particular, D1 states that the image is automatically 180 degrees rotated by a control device that is coupled to the hinge. This would make the screen upside-down if the user attempted to configure the device in the frame mode as described above.

Further, the problem of detecting computer orientation only exists in a computer specifically designed to have multiple modes with the same (or similar) hinge positions. Reference D1 does not disclose anything separate from measuring hinge position because the disclosed computer was only designed to operate in two modes with distinct hinge positions. Consequently, D1 does not disclose the problem of measuring computer orientation, the associated solution of incorporating an accelerometer into the device, or any modes with similar hinge positions (e.g., easel mode and frame mode). Therefore, claim 1 possesses an inventive step over D1.

The Inventors have appreciated that additional display modes for a portable computer with a display may be obtained by gathering device orientation information via an accelerometer. In particular, the Inventors have developed a new display mode (e.g., frame mode) that is facilitated by the use of an accelerometer. In contrast, reference D1 fails to disclose (1) "an accelerometer" (or any sensor) to gather orientation information, (2) "detect[ing] a current display mode" based on the orientation information from the accelerometer, or (3) a "frame mode" where "single main display screen is oriented towards the operator, the base contacts a surface, and the integrated keyboard is directed towards the surface" as recited in claim 1.

The addition of Reference D2 (US 2007/182663) fails to cure the deficiencies of D1 above at least because D2, like D1, discloses manual orientation switching controlled by the user. More specifically, D2 states that "[v]arious display orientations may be possible depending on the orientation of the computer devices" and that "[t]he appropriate image may be triggered by a user via a software interface or a button, switch or dial" (see, e.g., Paragraph [0053]). References D3 (EP 0 588 210) and D4 (US 6,154,359) do not disclose mechanisms for rotating the orientation of content on the display screens.

Even assuming, *arguendo*, that the skilled person were to consider modifying the device of D1 to include a display mode similar to that of Figure 9 of D1, neither D1 nor D4 acknowledge the problem of different display modes with similar hinge angles, and neither D1 nor D4 provides a solution to this problem. Certainly, neither discloses the claimed solution.

Moreover, D4 teaches an arrangement having first and second rotary parts, such that the display part and main body are linked by two rotation axles (see Figure 8). This arrangement appears to be essential to the device of D4. D1 requires a pivot angle detection device, and the use of first and second rotary parts, as taught by D4, would appear to significantly increase the complexity of the pivot angle detection device. Accordingly, this would discourage the skilled person from applying the teaching of D4 to the device of D1.

In view of the above, it is submitted that there is no teaching in the cited documents which would lead the Skilled Person to the invention as claimed by claim 1. Accordingly, claim 1 is inventive.

The dependent claims are novel and inventive at least in view of their dependency.

Formal matters

It will be observed by the Examining Division that independent claim 1 has not been placed into the EPO two-part claim form. In the present case it is not considered possible to demarcate the claimed features into those either disclosed in a closest prior art document and those not disclosed in such a document, without giving rise to a distorted representation of the present invention and prior art. In such cases, the EPO two-part claim form is not to be insisted upon. It is noted that in the previous response reference was made in the background art section of the present application to D1 in such a manner that would enable the skilled person to easily discern the inventive contribution defined by the independent claim.

Conclusion

We trust the amendments are acceptable to the Examiner and look forward to receiving a Communication under Rule 71(3) EPC.

In light of the above, we believe that all of the examiner's objections have been fully addressed and we look forward to receiving a notice of intention to grant in due course. In the event that any matters remain outstanding, the examiner is invited to contact the undersigned by telephone in order that those issues can be speedily resolved. As a formal precautionary measure, in the event that the Examining Division is minded to refuse this application without further written procedure, we hereby request oral proceedings. The applicant wishes to conduct the proceedings via video conferencing using IP technology, therefore please ensure that this facility is available at the time of appointment of the proceedings. If the Examining Division is mindful to refuse such a request, please inform us of the reasons for the refusal in accordance with GL Part E, II, 11.1.1.

The deletion of any subject matter from the present application does not constitute abandonment of that subject matter and is without prejudice to reinstating the same or to filing a divisional application for the same.

Yours faithfully



Vincent Jennings
European Patent Attorney
For and on behalf of HGF Limited
Association No. 145

CLAIMS

1. A portable computer (100) configurable between plurality of display modes including a laptop mode, a frame mode, and an easel mode, the portable computer (100) comprising:

a display component (102) including a display screen (110) configured to display content;

a base (104) comprising an integrated keyboard (106);

an accelerometer to detect a current display mode among the plurality of display modes of the portable computer; and

a hinge assembly configured to rotatably couple the display component (102) to the base (104);

wherein the hinge assembly is configured to permit rotation of the display component (102) and/or the base (104) about a single axis (101) to configure the portable computer (100) between the laptop mode and the easel mode;

wherein the single axis (101) is a longitudinal axis running along an interface between the display component (102) and the base (104); and wherein the display component (102) is rotatable about the longitudinal axis; ~~and~~

wherein in the easel mode, the display component (102) and the base (104) are configured relative to one another such that the display screen (110) and the keyboard (106) face away from each other, with the display screen (110) oriented toward the operator of the portable computer and the keyboard (106) oriented away from the operator of the portable computer; and

wherein in the frame mode, the display screen (110) is disposed at an angle beyond approximately 180 degrees, measured about the longitudinal axis, relative to the base (104), and wherein the display screen (110) is oriented towards the operator, the base contacts a surface (212), and the keyboard (106) is directed towards the surface (212)

.

2. The portable computer (100) of claim 1, further comprising a display orientation module configured to control an orientation of the content displayed on the display screen (110); wherein

HP Inc. - Exhibit 1005 - Page 5459

the orientation of the content displayed on the display screen (110) is configurable among a plurality of orientations relative to the longitudinal axis.

3. The portable computer (100) of claim 2, wherein the plurality of orientations comprises a first orientation relative to the longitudinal axis and a second orientation relative to the longitudinal axis; and

wherein when display orientation module is configured to automatically display the content in the first orientation when the portable computer (100) is configured into the laptop mode and in the second orientation when the portable computer (100) is configured into the easel mode.

4. The portable computer (100) of claim 2, wherein the plurality of display modes further comprises a flat mode in which the display component (102) is disposed at an angle of approximately 180 degrees, measured about the longitudinal axis, relative to the base (104); preferably, wherein the plurality of orientations comprises a first orientation relative to the longitudinal axis, a second orientation relative to the longitudinal axis, and a third orientation relative to the longitudinal axis; and

wherein, in the flat mode, the orientation of the content displayed on the display screen (110) is configurable among the first, second and third orientations responsive to a user input; optionally, wherein the second orientation is 90 degrees relative to the first orientation; and

wherein the third orientation is 180 degrees relative to the first orientation.

5. The portable computer (100) of claim 2, further comprising a mode sensor configured to detect a degree of rotation of the display component (102) relative to the base (104) and to provide information representative of the degree of rotation; and

wherein the display orientation module is configured to automatically adjust the orientation of the content displayed on the display screen (110) responsive to the information from the mode sensor; optionally, wherein the display orientation module is configured to:

automatically display the content in a first orientation relative to the longitudinal axis responsive to the information indicating that the degree of rotation of the display component (102) is less than approximately 180 degrees relative to the base (104); and

automatically display the content in a second orientation relative to the longitudinal axis responsive to the information indicating that the degree of rotation of the display component (102) is greater than approximately 180 degrees relative to the base (104);

wherein the second orientation is at approximately 180 degrees relative to the first orientation.

6. The portable computer (100) of claim 2, further comprising a mode sensor configured to detect a current display mode of the portable computer (100); and

wherein the display orientation module selects the orientation of the content displayed on the display screen (110) from one of the plurality of orientations relative to the longitudinal axis responsive to the current display mode detected by the mode sensor.

7. The portable computer (100) of claim 1, wherein plurality of display modes further comprises a closed mode; and

wherein, in the closed mode, the display screen (110) is disposed substantially against the base (104).

8. The portable computer (100) of claim 7, wherein rotating the display component (102) about the longitudinal axis up to approximately 180 degrees from the closed mode configures the portable computer (100) into the laptop mode; and

wherein rotating the display component (102) about the longitudinal axis beyond approximately 180 degrees from the closed mode configures the portable computer (100) into the easel mode; optionally, wherein the display component (102) is rotatable about the longitudinal axis up to approximately 320 degrees from the closed mode.

9. The portable computer (100) of claim 1, further comprising a scroll wheel (132) disposed at least partially within the base (104) and rotatable about the longitudinal axis, the scroll wheel (132) configured to permit a user to control at least one of operating parameters of the portable computer (100) and the content displayed on the display screen (110).

10. The portable computer (100) of claim 9, further comprising a first navigation button (166;168) disposed on one of the base (104) and the display component (102) and configured to permit the user to manipulate selected content displayed on the display screen (110); optionally, wherein a default operation of the first navigation button (166;168) is selected responsive to the display mode of the portable computer (100).

11. The portable computer (100) of claim 10, wherein the display screen (110) is configured to display at least one of a plurality of modes of content; and

wherein the navigation button (166;168) is configured to permit the user to select for display one of the plurality of modes of content; or wherein the first navigation button (166;168) is user-accessible in each of the laptop mode and the easel mode; or further comprising a second navigation button (166;168);

wherein the first navigation button (166;168) is disposed on a major surface of the base (104); and

wherein the second navigation button (166;168) is disposed on a minor surface of the base (104).

12. The portable computer (100) of claim 9, wherein the scroll wheel (132) is configured to permit the user to select a mode of content for display on the display screen (110); or wherein the scroll wheel (132) is configured to permit the user to control a volume of sound played by the portable computer (100); or further comprising a hinge assembly at least partially housed within the base (104) and configured to rotatably couple the display component (102) to the base (104);

optionally, wherein the scroll wheel (132) is disposed at least partially within the hinge assembly.

13. The portable computer (100) of claim 1, further comprising:

a foot disposed along at least a portion of the base (104) and configured to support the portable computer (100) when in the easel mode.

14. The portable computer (100) of claim 11, wherein the scroll wheel (132) is further configured to permit the user to control the at least one operating parameters of the portable computer (100) and the content displayed on the screen by providing a default operation selected responsive to the display mode of the portable computer (100).

15. The portable computer (100) of claim 1, wherein the portable computer (100) includes a single display screen (110).

~~16. The portable computer (100) of claim 1, wherein the plurality of display modes further comprises a frame mode in which the display screen (110) is disposed at an angle beyond approximately 180 degrees, measured about the longitudinal axis, relative to the base (104), and wherein the display screen (110) is oriented towards the operator, the base contacts a surface (212), and the keyboard (106) is directed towards the surface (212).~~

~~17~~16. The portable computer (100) of claim 1, wherein the portable computer is configured to prevent the portable computer from responding to keyboard input when the portable computer is in the frame mode.

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Application No.	Ref.	Date
09 727 165.4 - 1959	P132767EP	22.11.2016
Applicant: Litl, LLC		

Communication pursuant to Article 94(3) EPC

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(2) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

of 4 months

from the notification of this communication, this period being computed in accordance with Rules 126(2) and 131(2) and (4) EPC. One set of amendments to the description, claims and drawings is to be filed within the said period on separate sheets (R. 50(1) EPC).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Art. 94(4) EPC).

Registered letter

Arranz, José
Primary Examiner
For the Examining Division

Enclosure(s): 5 page/s reasons (Form 2906)
Translation of JPH06242853
WO-9524007-A1, GB-2321982-A, JP-406242853-A & PAJ abstract, US-7164432-B1, US-6493216-B1

The examination is being carried out on the **following application documents**

Description, Pages

1, 3-24	as published	
2	filed in electronic form on	10-01-2011

Claims, Numbers

1-16	filed in electronic form on	01-06-2016

Drawings, Sheets

1/25-25/25	as published

Reference is made to the following documents:

D3 EP 0 588 210 A (HITACHI LTD [JP]) 23 March 1994 (1994-03-23)

D4 US 6 154 359 A (KAMIKAKAI HIDEAKI [JP] ET AL) 28 November 2000 (2000-11-28)

The following documents are cited by the Examiner. A copy of the documents is annexed to the communication and the numbering will be adhered to in the rest of the procedure.

D5 WO 95/24007 A1 (LANE JEFFREY P [US]) 8 September 1995 (1995-09-08)

D6 GB 2 321 982 A (FUJITSU ICL COMPUTERS OY [FI]) 12 August 1998 (1998-08-12)

D7 JP H06 242853 A (HITACHI LTD; HITACHI COMPUTER ENG) 2 September 1994 (1994-09-02)

D8 US 7 164 432 B1 (AMEMIYA RYOJI [JP]) 16 January 2007 (2007-01-16)

D9 US 6 493 216 B1 (LIN WEN-CHENG [TW]) 10 December 2002 (2002-12-10)

1 The applicant's effort to remedy the deficiencies identified in the previous communication is acknowledged. However, the Examining Division is not in a position to issue a communication under Rule 71(3) EPC.

2 The present application does not meet the requirements of Article 52(1) EPC because the subject-matter of claim 1 does not involve an inventive step within the meaning of Article 56 EPC.

2.1 D5 discloses a portable computer configurable between plurality of display modes including a laptop mode, a frame mode, and an easel mode **(page 5, line 5, "...portable computer..." and figures 6,8,9 or 20,25,28)**, the portable computer comprising:

a display component including a display screen configured to display content **(page 5, lines 5-22, "...be a portable computer comprising first module 14 (e.g. a keyboard) and second module 18 (e. g. a display)...")**;

a base comprising an integrated keyboard **(page 5, lines 5-22, "...be a portable computer comprising first module 14 (e.g. a keyboard) and second module 18 (e. g. a display)...")**;

an ~~accelerometer~~ to detect a current display mode among the plurality of display modes of the portable computer **(page 5, lines 23-37, "...position-indicating mechanism 38...")**; and

a hinge assembly configured to rotatably couple the display component to the base **(fig.1-3, page 6, lines 7-24, "...Connector 54 mechanically couples first module 14 and second module 18...")**;

wherein the hinge assembly is configured to permit rotation of the display component and/or the base about a single axis to configure the portable computer between the laptop mode and the easel mode **(Figures 6 and 8)**;

wherein the single axis is a longitudinal axis running along an interface between the display component and the base **(Figures 6 and 8)**; and

wherein the display component is rotatable about the longitudinal axis **(Figures 6 and 8)**;

wherein in the easel mode, the display component and the base are configured relative to one another such that the display screen and the keyboard face away from each other, with the display screen oriented toward the operator of the portable computer and the keyboard oriented away from

the operator of the portable computer **(figure 8 and page 8, lines 9-23, "...In FIG. 8, the rotation of second module 18 exceeds 270 , useful particularly when only visual display 35 need be accessible...")**; and

wherein in the frame mode, the display screen is disposed at an angle beyond approximately 180 degrees, measured about the longitudinal axis, relative to the base, and wherein the display screen is oriented towards the operator, the base contacts a surface, and the keyboard is directed towards the surface **(figure 9 and page 8, lines 9-23, "...FIG. 9, finally, shows second module 18 rotated approximately 360 relative to first module 14 (or vice-versa), exposing visual display 35 for use as, for example, a tablet for pen-based computing...." or figure 28)**.

The subject-matter of claim 1 therefore differs from this known device in that an accelerometer is used to detect a current display mode, whereas in D5 a mercury switch is used for the same purpose.

The problem to be solved by the present invention may therefore be regarded as is providing alternative means for detecting the display's orientation.

The solution proposed in claim 1 of the present application cannot be considered to involve an inventive step (Articles 52(1) and 56 EPC) since the claimed alternative is known, as exemplified in document D8, col.13, lines 30-44, "...According to the configuration described above, the CPU 30 detects the angle of rotation of the display section 3 about the X-axis by the three-axis gyro sensor 61, and rotates the multi-window screen 83 displayed on the liquid crystal panel 7 based on the detected angle of rotation and the rotation angle ranges in the respective upward, downward left and right directions to change the orientation in which the multi-window screen 83 is displayed..." and fig 14. The accelerometer is described in D8 as providing the same advantages as in the present application. The skilled person would therefore regard it as a normal option to include this feature in the device described in D5 in order to solve the problem posed.

As a consequence, the subject-matter of claim 1 lacks an inventive step.

2.2 For the sake of completeness, it is pointed out that documents D6 (figures 1,2, and 4A) or D7 (figures 1,3 and 5) also disclose a portable computer configurable between plurality of display modes including a laptop mode, a frame mode, and an easel mode. The devices disclosed therein merely differ from the subject-matter of claim 1 in the means used for detecting the orientation of the display. Hence, the subject-matter of claim 1 also lacks an inventive step regarding the disclosure of said documents for similar reasons as brought forward under par. 2.1 above.

3 The subject-matter of dependent claims 2-16 is also not allowable, Article 52(1) EPC, because it is not inventive, Article 56 EPC.

3.1 Claim 2: anticipated by D5, page 5, lines 23-37, "...position-indicating mechanism 38...".

3.2 Claims 3,5,6: anticipated by D5, page 5, lines 23-37.

3.3 Claim 4: anticipated by D5, see figure 21.

3.4 Claim 7: anticipated by D5, see figure 19.

3.5 Claim 8: anticipated by D5, see figures 5-9.

3.6 Claims 9-12,14: improving the operability of the computer by adding further input devices in a configuration which is known in the field, i.e, buttons or scroll wheels located in the hinge mechanism (e.g see D3), merely represents an obvious choice for the skilled person. Furthermore, the feature of changing the function assigned to an input device according to the mode of operation of a device is obvious.

3.7 Claim 13: anticipated by D5, see figure 1.

3.8 Claim 15: obvious implementation, e.g. see D9, fig7.

3.9 Claim 16: anticipated by D5, page 6, lines 1-6, "...whether to render keys 36 of first module 14 inoperable when unused..." or D4, see figure 9 and Col.7, lines 15-16, "...and the keyboard 6 may be disabled..."

4 It is not at present apparent which part of the application could serve as a basis for a new, allowable claim. Should the applicant nevertheless regard some particular matter as patentable, an independent claim should be filed taking account of Rule 43(1) EPC. The applicant should also indicate in the letter of reply the difference of the subject-matter of the new claim vis-à-vis the state of the art and the significance thereof.

When filing an amended set of claims, the applicant should also take into account the following remarks:

4.1 Any amended independent claim should be filed in the two-part from (cf. Rule 43(1) EPC).

4.2 The applicant should bring the description into conformity with the amended claims. Care should be taken during revision, especially of the introductory portion and any statements of problem or advantage, not to add subject-matter which extends beyond the content of the application as originally filed (Article 123(2) EPC).

4.3 In order to facilitate the examination of the conformity of the amended application with the requirements of Article 123(2) EPC, the applicant is requested to clearly identify the amendments carried out, irrespective of whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based.

HGF

European Patent Office
80298 MUNICH
Germany

23 March 2017

Our ref: P132767EP / VLJ / LGR

Dear Sirs

European Patent Application No 09727165.4
PORTABLE COMPUTER WITH MULTIPLE DISPLAY CONFIGURATIONS
Litl, LLC

We reply herewith to the communication dated 22 November 2016 and enclose:

- Amended claims 1-16 to replace the claims currently on file; and
- a version of the amended claims showing the changes made.

Claim Amendments and Basis (Article 123(2) EPC)

Claim 1 has been amended to recite "*A portable computer (100) configurable between plurality of display modes including a laptop mode, a frame mode, and an easel mode, the portable computer (100) comprising: [...] a display manager configured to display computer content on the display component and vary the computer content displayed responsive to detecting a transition between at least the laptop and easel modes, wherein the display manager is further configured to enlarge the computer content displayed on the display component responsive to a transition from the laptop mode to the easel mode*". Basis for this amendment may be found in at least page 20, lines 7-17.

Inventive Step (Article 56 EPC)

Document D5 discloses *"[a] modular, reconfigurable system designed to permit coupling and decoupling of devices or components (14, 18) of varying types, including portable computers*" (see, e.g., Abstract). Document D5 does not disclose varying the size of content displayed in response to a transition between laptop and easel modes. Consequently, Document D5 fails to teach "*a display manager configured to display computer content on the display component and vary the computer content displayed responsive to detecting a transition between at least the laptop and easel modes, wherein the display manager is further configured to enlarge the computer content displayed on the display component responsive to a transition from the laptop mode to the easel mode*" as recited in claim 1.

The novel features solve a technical problem of how to improve the usability of a portable computer. There is no teaching in the cited art which would lead the Skilled Person to the solution of the technical problem, and therefore it is submitted that claim 1 is inventive.

Dependent claims 2-16 are inventive at least by virtue of their dependency.

HGF Limited is registered in England and Wales with registered number 8998652. Its registered office is at 1 City Walk, Leeds, LS11 9DX, UK.
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Conclusion

We trust the amendments are acceptable to the Examiner and look forward to receiving a Communication under Rule 71(3) EPC.

In the event that any matters remain outstanding, the examiner is invited to contact the undersigned by telephone in order that those issues can be speedily resolved.

As a formal precautionary measure, in the event that the Examining Division is minded to refuse this application without further written procedure, we hereby request oral proceedings via video conference. Please ensure that an IP technology video conferencing facility is available at the time of any appointment of the proceedings. If the Examining Division is of the view that it would refuse the video conferencing request, please inform us of the reasons for the refusal in accordance with GL Part E, II, 11.1.1. The applicant reserves the right to request appearance at any oral proceedings in person and will notify the EPO if this is the case.

The deletion of any subject matter from the present application does not constitute abandonment of that subject matter and is without prejudice to reinstating the same or to filing a divisional application for the same.

Yours faithfully



Vincent Jennings
European Patent Attorney
For and on behalf of HGF Limited
Association No. 145

Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	09727165.4
Applicant's or representative's reference	P132767EP/VLJ

	Description of document	Original file name	Assigned file name
1	Reply to examination report	P132767EP HGF - EPO - Response to Art 94(3).pdf	EXRE3-1.pdf
2	Amended claims (clean copy)	P132767EP Amended Claims (Clean).pdf	CLMS-1.pdf
3	Amended claims with annotations	P132767EP Amended Claims (Annotated).pdf	CLMS-HWA-1.pdf

	Payment	
1	Mode of payment	Not specified

Annotations

SUBJECT MATTER(HGF Limited; 23.03.2017)
1. Remark(Annotate)
Throughout the entire pendency of this application, the Applicant is not abandoning any of the subject matter of the application as filed. In particular the applicant reserves the right to claim any deleted subject matter by way of divisional application.

Signatures

Place:	**Sheffield, UK**
Date:	**23 March 2017**
Signed by:	**Vincent Jennings 22592**
Association:	**HGF Limited**
Representative name:	**Vincent Jennings**
Capacity:	**(Representative)**

CLAIMS

1. A portable computer (100) configurable between plurality of display modes including a laptop mode, a frame mode, and an easel mode, the portable computer (100) comprising:

a display component (102) including a display screen (110) configured to display content;

a base (104) comprising an integrated keyboard (106);

an accelerometer to detect a current display mode among the plurality of display modes of the portable computer; and

a display manager configured to display computer content on the display component and vary the computer content displayed responsive to detecting a transition between at least the laptop and easel modes, wherein the display manager is further configured to enlarge the computer content displayed on the display component responsive to a transition from the laptop mode to the easel mode;

a hinge assembly configured to rotatably couple the display component (102) to the base (104);

wherein the hinge assembly is configured to permit rotation of the display component (102) and/or the base (104) about a single axis (101) to configure the portable computer (100) between the laptop mode and the easel mode;

wherein the single axis (101) is a longitudinal axis running along an interface between the display component (102) and the base (104); and wherein the display component (102) is rotatable about the longitudinal axis;

wherein in the easel mode, the display component (102) and the base (104) are configured relative to one another such that the display screen (110) and the keyboard (106) face away from each other, with the display screen (110) oriented toward the operator of the portable computer and the keyboard (106) oriented away from the operator of the portable computer; and

wherein in the frame mode, the display screen (110) is disposed at an angle beyond approximately 180 degrees, measured about the longitudinal axis, relative to the base (104), and

HP Inc. - Exhibit 1005 - Page 5474

wherein the display screen (110) is oriented towards the operator, the base contacts a surface (212), and the keyboard (106) is directed towards the surface (212).

2. The portable computer (100) of claim 1, further comprising a display orientation module configured to control an orientation of the content displayed on the display screen (110); wherein the orientation of the content displayed on the display screen (110) is configurable among a plurality of orientations relative to the longitudinal axis.

3. The portable computer (100) of claim 2, wherein the plurality of orientations comprises a first orientation relative to the longitudinal axis and a second orientation relative to the longitudinal axis; and

wherein when display orientation module is configured to automatically display the content in the first orientation when the portable computer (100) is configured into the laptop mode and in the second orientation when the portable computer (100) is configured into the easel mode.

4. The portable computer (100) of claim 2, wherein the plurality of display modes further comprises a flat mode in which the display component (102) is disposed at an angle of approximately 180 degrees, measured about the longitudinal axis, relative to the base (104); preferably, wherein the plurality of orientations comprises a first orientation relative to the longitudinal axis, a second orientation relative to the longitudinal axis, and a third orientation relative to the longitudinal axis; and

wherein, in the flat mode, the orientation of the content displayed on the display screen (110) is configurable among the first, second and third orientations responsive to a user input; optionally, wherein the second orientation is 90 degrees relative to the first orientation; and

wherein the third orientation is 180 degrees relative to the first orientation.

5. The portable computer (100) of claim 2, further comprising a mode sensor configured to detect a degree of rotation of the display component (102) relative to the base (104) and to provide information representative of the degree of rotation; and

wherein the display orientation module is configured to automatically adjust the orientation of the content displayed on the display screen (110) responsive to the information from the mode sensor; optionally, wherein the display orientation module is configured to:

automatically display the content in a first orientation relative to the longitudinal axis responsive to the information indicating that the degree of rotation of the display component (102) is less than approximately 180 degrees relative to the base (104); and

automatically display the content in a second orientation relative to the longitudinal axis responsive to the information indicating that the degree of rotation of the display component (102) is greater than approximately 180 degrees relative to the base (104);

wherein the second orientation is at approximately 180 degrees relative to the first orientation.

6. The portable computer (100) of claim 2, further comprising a mode sensor configured to detect a current display mode of the portable computer (100); and

wherein the display orientation module selects the orientation of the content displayed on the display screen (110) from one of the plurality of orientations relative to the longitudinal axis responsive to the current display mode detected by the mode sensor.

7. The portable computer (100) of claim 1, wherein plurality of display modes further comprises a closed mode; and

wherein, in the closed mode, the display screen (110) is disposed substantially against the base (104).

8. The portable computer (100) of claim 7, wherein rotating the display component (102) about the longitudinal axis up to approximately 180 degrees from the closed mode configures the portable computer (100) into the laptop mode; and

wherein rotating the display component (102) about the longitudinal axis beyond approximately 180 degrees from the closed mode configures the portable computer (100) into the easel mode; optionally, wherein the display component (102) is rotatable about the longitudinal axis up to approximately 320 degrees from the closed mode.

9. The portable computer (100) of claim 1, further comprising a scroll wheel (132) disposed at least partially within the base (104) and rotatable about the longitudinal axis, the scroll wheel (132) configured to permit a user to control at least one of operating parameters of the portable computer (100) and the content displayed on the display screen (110).

10. The portable computer (100) of claim 9, further comprising a first navigation button (166;168) disposed on one of the base (104) and the display component (102) and configured to permit the user to manipulate selected content displayed on the display screen (110); optionally, wherein a default operation of the first navigation button (166;168) is selected responsive to the display mode of the portable computer (100).

11. The portable computer (100) of claim 10, wherein the display screen (110) is configured to display at least one of a plurality of modes of content; and

wherein the navigation button (166;168) is configured to permit the user to select for display one of the plurality of modes of content; or wherein the first navigation button (166;168) is user-accessible in each of the laptop mode and the easel mode; or further comprising a second navigation button (166;168);

wherein the first navigation button (166;168) is disposed on a major surface of the base (104); and

wherein the second navigation button (166;168) is disposed on a minor surface of the base (104).

12. The portable computer (100) of claim 9, wherein the scroll wheel (132) is configured to permit the user to select a mode of content for display on the display screen (110); or wherein the scroll wheel (132) is configured to permit the user to control a volume of sound played by the portable computer (100); or further comprising a hinge assembly at least partially housed within the base (104) and configured to rotatably couple the display component (102) to the base (104); optionally, wherein the scroll wheel (132) is disposed at least partially within the hinge assembly.

13. The portable computer (100) of claim 1, further comprising:

a foot disposed along at least a portion of the base (104) and configured to support the portable computer (100) when in the easel mode.

14. The portable computer (100) of claim 11, wherein the scroll wheel (132) is further configured to permit the user to control the at least one operating parameters of the portable computer (100) and the content displayed on the screen by providing a default operation selected responsive to the display mode of the portable computer (100).

15. The portable computer (100) of claim 1, wherein the portable computer (100) includes a single display screen (110).

16. The portable computer (100) of claim 1, wherein the portable computer is configured to prevent the portable computer from responding to keyboard input when the portable computer is in the frame mode.

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Questions about this communication ?
Contact Customer Services at www.epo.org/contact

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Date
01-09-2017

Reference	Application No./Patent No.
P132767EP	09727165.4 - 1879 / 2283407
Applicant/Proprietor	
Litl, LLC	

Summons to attend oral proceedings pursuant to Rule 115(1) EPC

You are hereby summoned to attend oral proceedings arranged in connection with the above-mentioned European patent application.

The matters to be discussed are set out in the communication accompanying this summons (EPO Form 2906).

The oral proceedings, which will not be public, will take place before the Examining Division

on 08.03.18 at 09.00 hrs as a video-conference

No changes to the date of the oral proceedings can be made, except on serious grounds (see OJ EPO 1/2009, 68). If you do not appear as summoned, the oral proceedings may continue without you (R. 115(2) EPC, see also OJ EPO 10/2008, 471).

Your attention is drawn to Rule 4 EPC, regarding the language of the oral proceedings, and to the Special edition No. 3 OJ EPO 2007, L.1., concerning the filing of authorisations for company employees and lawyers acting as representatives before the EPO.

The final date for making written submissions and/or amendments (R. 116 EPC) is 08.02.18.

During the video-conference the examining division will be located in Room S0.14 at the EPO Patentlaan 3-9, Rijswijk (NL).

In this respect, you are informed that the EPO video-conference studios employ IP technology (SIP or H.323, Videocoding CIF H.261, H.263, H.264, Audiocoding G.711, G.722, max. transmission rate 1024 Kbit/s). Your video-conference equipment should meet a minimum transmission rate of at least 256 Kbit/s, but at least 384 Kbit/s is preferred.

Concerning establishing the required video-conference link you are further informed of the following:

- conference room video IP address: 69079112@cvc.epo.org
- conference room telefax number: (0031) 70 340 9119
- conference room telephone number: (0031) 70 340 9112
- telephone number in case of connection difficulties: (0031) 70 340 4444

The applicant or representative is encouraged to set up a connection to a demonstration system well before the oral proceedings take place. For this purpose please connect to the demo system under "demo01@cvc.epo.org" at any time.

Registered letter with advice of delivery to EPO postal service: 29.08.17

Please supply the EPO as soon as possible with the following information concerning your videoconference studio:

- type and name of VICO equipment
- telephone and fax number of the studio including country and area code
- dialling number to reach the studio including country and area code
- transmission speed in Kbit/s
- name of contact person with telephone number and email address

1st Examiner:
Arranz de la Iglesia

2nd Examiner:
De Meyer A

Chairman:
Baldan M

For the Examining Division

Annexes:
Confirmation of receipt (Form 2936)
Communication (EPO Form 2906)

The examination is being carried out on the **following application documents**

Description, Pages

1, 3-24	as published	
2	filed in electronic form on	10-01-2011

Claims, Numbers

1-16	filed in electronic form on	23-03-2017

Drawings, Sheets

1/25-25/25	as published

Reference is made to the following documents:

D3 EP 0 588 210 A (HITACHI LTD [JP]) 23 March 1994 (1994-03-23)

D5 WO 95/24007 A1 (LANE JEFFREY P [US]) 8 September 1995 (1995-09-08)

D8 US 7 164 432 B1 (AMEMIYA RYOJI [JP]) 16 January 2007 (2007-01-16)

D9 US 6 493 216 B1 (LIN WEN-CHENG [TW]) 10 December 2002 (2002-12-10)

1 The applicant's effort to remedy the deficiencies identified in the previous communication is acknowledged. However, the Examining Division is not in a position to issue a communication under Rule 71(3) EPC. In view of the current state of the proceedings, Oral Proceedings are considered appropriate to discuss the objections concerning the application

2 The amendment filed with the letter dated 23.03.2017 introduces subject-matter which extends beyond the content of the application as filed, contrary to Article 123(2) EPC. The amendment concerned is the following:

2.1 Claim 1 introduces the feature of "configured to enlarge the computer content displayed on the display". The original application merely provides a basis for the following (see page 20): "*when the portable computer 100 is configured into the easel mode, the display may automatically adjust to "full screen view" (i.e., the displayed image or video is displayed on the full screen size, rather than in a window) to allow for comfortable viewing"*. The introduced feature "enlarging content" is not equivalent to the disclosed feature of "full screen view" as it is much broader. The term "enlarging" implies further implementations, as for example zooming displayed objects, which are not covered by the originally disclosed feature of "full screen view". The original application does not provide a basis for such a generalisation.

2.2 Notwithstanding the above-mentioned Article 123(2) objections, an opinion regarding the presence of an inventive step is given subsequently. Although an objection under Article 123(2) EPC generally prevents carrying out a detailed examination, for reasons of procedural efficiency, the Examining Division will consider for the rest of this communication as if the added subject-matter objection is overcome by the applicant.

3 The present application does not meet the requirements of Article 52(1) EPC because the subject-matter of claim 1 does not involve an inventive step within the meaning of Article 56 EPC.

3.1 D5 discloses a portable computer configurable between plurality of display modes including a laptop mode, a frame mode, and an easel mode **(page 5, line 5, "...portable computer..." and figures 6,8,9 or 20,25,28)**, the portable computer comprising:

a display component including a display screen configured to display content **(page 5, lines 5-22, "...be a portable computer comprising first module 14 (e.g. a keyboard) and second module 18 (e. g. a display)...")**;

a base comprising an integrated keyboard **(page 5, lines 5-22, "...be a portable computer comprising first module 14 (e.g. a keyboard) and second module 18 (e. g. a display)...")**;

an ~~accelerometer~~ to detect a current display mode among the plurality of display modes of the portable computer **(page 5, lines 23-37, "...position-indicating mechanism 38...")**; and

a display manager configured to display computer content on the display component and vary the computer content displayed responsive to detecting a transition between at least the laptop and easel modes **(page 5, line 35 - page 6, line 6, "...weather the information to appear on visual display 35 should be in "landscape" or "portrait" position as the visual display 35 is spatially configured, the direction in which to move a curser of second module 18 when a visual display...")**, ~~wherein the display manager is further configured to enlarge the computer content displayed on the display component responsive to a transition from the laptop mode to the easel mode;~~

a hinge assembly configured to rotatably couple the display component to the base **(fig.1-3, page 6, lines 7-24, "...Connector 54 mechanically couples first module 14 and second module 18...")**;

wherein the hinge assembly is configured to permit rotation of the display component and/or the base about a single axis to configure the portable computer between the laptop mode and the easel mode **(Figures 6 and 8)**;

wherein the single axis is a longitudinal axis running along an interface between the display component and the base **(Figures 6 and 8)**; and

wherein the display component is rotatable about the longitudinal axis **(Figures 6 and 8)**;

wherein in the easel mode, the display component and the base are configured relative to one another such that the display screen and the keyboard face away from each other, with the display screen oriented toward the operator of the portable computer and the keyboard oriented away from the operator of the portable computer **(figure 8 and page 8, lines 9-23, "...In FIG. 8, the rotation of second module 18 exceeds 270 , useful particularly when only visual display 35 need be accessible...")**; and

wherein in the frame mode, the display screen is disposed at an angle beyond approximately 180 degrees, measured about the longitudinal axis, relative to the base, and wherein the display screen is oriented towards the operator, the base contacts a surface, and the keyboard is directed towards the surface **(figure 9 and page 8, lines 9-23, "...FIG. 9, finally, shows second module 18 rotated approximately 360 relative to first module 14 (or vice-versa), exposing visual display 35 for use as, for example, a tablet for pen-based computing...." or figure 28).**

The subject-matter of claim 1 therefore differs from this known device in that

(i) an accelerometer is used to detect a current display mode, whereas in D5 a mercury switch is used for the same purpose and

(ii) the display manager is further configured to enlarge the computer content displayed on the display component responsive to a transition from the laptop mode to the easel mode.

These differences are completely independent and result merely in a juxtaposition of functionally independent components (see the Guidelines Part G-VII,7). Therefore, they will be dealt with separately.

Feature (i):

The problem to be solved may be regarded as is providing alternative means for detecting the display's orientation.

The solution proposed in claim 1 of the present application cannot be considered to involve an inventive step (Articles 52(1) and 56 EPC) since the claimed alternative is known, as exemplified in document D8, col.13, lines 30-44, "...According to the configuration described above, the CPU 30 detects the angle of rotation of the display section 3 about the X-axis by the three-axis gyro sensor 61, and rotates the multi-window screen 83 displayed on the liquid crystal panel 7 based on the detected angle of rotation and the rotation angle ranges in the respective upward, downward left and right directions to change the orientation in which the multi-window screen 83 is displayed..." and fig 14. The accelerometer is described in D8 as providing the same advantages as in the present application. The skilled person would therefore regard it as a normal option to include this feature in the device described in D5 in order to solve the problem posed.

Feature (ii):

D5 discloses a computer having a plurality of display modes. The display mode may be adapted according to the detected configuration mode of the device.

The problem to be solved therefore merely resides in the provision of a further rendering mode to be used in the easel mode.

The solution proposed in claim 1 of the present application cannot be considered to involve an inventive step (Articles 52(1) and 56 EPC). The choice of associating any known and commonly used display mode, including the claimed "full screen view", to any one of the configuration modes of the device does not involve any inventive activity from the skilled person. The skilled person would regard it a normal design procedure to implement such a display mode in the easel mode.

As a consequence, the subject-matter of claim 1 lacks an inventive step.

4 The subject-matter of dependent claims 2-16 is also not allowable, Article 52(1) EPC, because it is not inventive, Article 56 EPC.

4.1 Claim 2: anticipated by D5, page 5, lines 23-37, "...position-indicating mechanism 38...".

4.2 Claims 3,5,6: anticipated by D5, page 5, lines 23-37.

4.3 Claim 4: anticipated by D5, see figure 21.

4.4 Claim 7: anticipated by D5, see figure 19.

4.5 Claim 8: anticipated by D5, see figures 5-9.

4.6 Claims 9-12,14: improving the operability of the computer by adding further input devices in a configuration which is known in the field, i.e, buttons or scroll wheels located in the hinge mechanism (e.g see D3), merely represents an obvious choice for the skilled person. Furthermore, the feature of changing the function assigned to an input device according to the mode of operation of a device is obvious.

4.7 Claim 13: anticipated by D5, see figure 1.

4.8 Claim 15: obvious implementation, e.g. see D9, fig7.

4.9 Claim 16: anticipated by D5, page 6, lines 1-6, "...whether to render keys 36 of first module 14 inoperable when unused..." or D4, see figure 9 and Col.7, lines 15-16, "...and the keyboard 6 may be disabled...".

5 Considering the objections raised above, and the fact that the whole application as filed appears to contain no additional subject-matter which might form the basis of an allowable claim, refusal of the application under Article 97(2) EPC is to be expected.

5.1 Should the applicant nevertheless regard some particular matter as allowable, an independent claim could be submitted.

The applicant should indicate in the letter of reply:

(1) the difference of the subject-matter of any new claim vis-à-vis the state of the art and the technical significance thereof,

(2) the technical problem solved by this difference,

(3) how this technical problem is solved in a non-obvious manner by the features of the independent claim(s).

5.2 The attention of the applicant is drawn to the fact that the application may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC).

5.3 In order to facilitate the examination of the conformity of the amended application with the requirements of Article 123(2) EPC, the applicant **should clearly identify the amendments** carried out, irrespective of whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based (see Guidelines H-III,2.1). If the applicant regards it as appropriate these indications should be submitted e.g. on a marked-up copy of the relevant parts of the application as filed.

5.4 The Examining Division is of the opinion that Oral Proceedings would be appropriate in order to ensure an efficient procedure of this patent application. Should the applicant wish to present argumentation or amendments for the Division's consideration in the hope that the need for Oral Proceedings be obviated then this should be done prior to the date set in the summons (Rule 116 EPC) which this annex accompanies. The Applicant should at all times be aware that such amendments will be allowed into the procedure at the Examining Division's discretion (Rule 137(3) EPC).

5.5 Whilst the examining division is aware of the need for economy and the costs linked to the presence of parties at Oral Proceedings, as well as the costs borne by the EPO, it is their view that this is the most appropriate course of action in the present case. Should the applicant so wish, an appealable decision on the file as it stands may be requested. Such a decision is given in standard form, referring to the previous communications including objections to which the applicant has had opportunity to comment and to the request, which must be made in writing (see Guidelines C-V, 15 and E-IX, 4.4). In the event of timely request and issuance of such a decision, the Oral Proceedings

would no longer take place. The applicant should realise that filing further amendments or argumentation in response to the summons to oral proceedings may preclude the examining division from acceding to such a request.

5.6 The attention of the applicant is finally drawn to the Notice in the Official Journal OJ EPO 2013, 603 according to which handwritten amendments to the European patent application, even during oral proceedings, are no longer accepted (Rule 50(1) EPC, Rule 49(8) EPC).

European Patent Office
80298 Munich
Germany

7 March 2018

BY CMS

Our ref: P132767EP / VLJ / LGR

Dear Sirs

European Patent Application No 09727165.4
PORTABLE COMPUTER WITH MULTIPLE DISPLAY CONFIGURATIONS
Litl, LLC

Further to our 8 February 2018 Submissions, we request the Examining Division exercise their discretion and permit entry of the attached new Main and First Auxiliary Requests.

We request that the previously submitted requests currently on file be demoted, such that the Main through Third Auxiliary Requests filed 8 February become the Second through Fifth Auxiliary Requests. The table below sets out the status of the requests after these changes.

Request	Comment
Main	As filed herewith
First Auxiliary	As filed herewith
Second Auxiliary	Main Request of 8 February submissions
Third Auxiliary	First Auxiliary of 8 February submissions
Fourth Auxiliary	Second Auxiliary of 8 February submissions
Fifth Auxiliary	Third Auxiliary of 8 February submissions

Main Request

In relation to the Main Request, we enclose:

- Amended claims 1 to 15 to replace the claims currently on file; and
- a version of the amended claims showing the changes made.

Amendment and Basis, Article 123(2) EPC

Claim 1 has been amended to remove the feature added in our 23 March 2017 submissions, and to include the following features.

"*[A] navigation hardware accessible in each of the plurality of display modes, the navigation hardware configured to permit a user to control at least one of operating parameters of the portable computer (100) and the content displayed on the display screen (110).*" Basis for this feature is provided by

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original claim 15, and page 15, lines 19-24 of the description, indicate that a scroll wheel as an example of navigation hardware.

"*[A] first navigation button (166;168) disposed on one of the base (104) and the display component (102), wherein the first navigation button is configured to change an action associated with the navigation hardware, wherein the action is changed according to the detected display mode.*" Basis for this amendment is provided by former claims 10 and 11, and these features are described in page 15, line 19 to page 16, line 14 and page 18, line 21 to page 20, line 6. In particular, page 18, lines 22 to 23 describe the navigation button changing the action of the scroll wheel.

Former claim 14 has been deleted, and the subsequent claims renumbered consecutively.

Dependent claims 9 to 12 have been amended for consistency with amended claim 1.

Novelty and Inventive Step, Article 51(2) EPC

Amended claim 1 includes the feature of "*a navigation hardware accessible in each of the plurality of display modes, the navigation hardware configured to permit a user to control at least one of operating parameters of the portable computer (100) and the content displayed on the display screen (110); and a first navigation button (166;168) disposed on one of the base (104) and the display component (102), wherein the first navigation button is configured to change an action associated with the navigation hardware, wherein the action is changed according to the detected display mode;*"

None of the cited documents teaches or suggests these features, and so claim 1 is novel

The above features of claim 1 address the problem of improving the ease of use of a device that is configurable between a plurality of display modes. None of the cited documents teaches the claimed solution to this problem, and so claim 1 is submitted to be inventive. Dependent claims 2 to 15 are novel and inventive at least by virtue of dependency.

First Auxiliary Request

In relation to the First Auxiliary Request, we enclose:

- Amended claims 1 to 15 to replace the claims currently on file; and
- a version of the amended claims showing the changes made.

Amendment and Basis, Article 123(2) EPC

The claims of the First Auxiliary Request correspond with those of the Main Request, except "action" in claim 1 has been replaced with "default action." Basis for this change is provided bt page 18, lines 23 to 26 of the description.

Novelty and Inventive Step, Article 51(2) EPC

Claim 1 of the First Auxiliary Request is similar to that of the Main Request. The comments in relation to Article 52(1) EPC in the Main Request apply to the First Auxiliary Request, *mutatis mutandis*.

Second to Fifth Auxiliary Requests

The comments in our 8 February submissions relating to the former Main to Third Auxiliary Requests apply to the renumbered Second to Fifth Auxiliary Requests, respectively.

Conclusion

We trust the amendments are acceptable to the Examiner and look forward to receiving a Communication under Rule 71(3) EPC.

In the event that any matters remain outstanding, the examiner is invited to contact the undersigned by telephone in order that those issues can be speedily resolved.

The deletion of any subject matter from the present application does not constitute abandonment of that subject matter and is without prejudice to reinstating the same or to filing a divisional application for the same.

Yours faithfully



Vincent Jennings
European Patent Attorney
For and on behalf of HGF Limited
Association No. 145

CLAIMS

1. A portable computer (100) configurable between plurality of display modes including a laptop mode, a frame mode, and an easel mode, the portable computer (100) comprising:

a display component (102) including a display screen (110) configured to display content;

a base (104) comprising an integrated keyboard (106);

an accelerometer to detect a current display mode among the plurality of display modes of the portable computer; and

~~a display manager configured to display computer content on the display component and vary the computer content displayed responsive to detecting a transition between at least the laptop and easel modes, wherein the display manager is further configured to enlarge the computer content displayed on the display component responsive to a transition from the laptop mode to the easel mode;~~

a hinge assembly configured to rotatably couple the display component (102) to the base (104);

wherein the hinge assembly is configured to permit rotation of the display component (102) and/or the base (104) about a single axis (101) to configure the portable computer (100) between the laptop mode and the easel mode. and;

wherein the single axis (101) is a longitudinal axis running along an interface between the display component (102) and the base (104); and wherein the display component (102) is rotatable about the longitudinal axis;

the portable computer further comprising:

a navigation hardware accessible in each of the plurality of display modes, the navigation hardware configured to permit a user to control at least one of operating parameters of the portable computer (100) and the content displayed on the display screen (110); and

a first navigation button (166;168) disposed on one of the base (104) and the display component (102), wherein the first navigation button is configured to change a default action

associated with the navigation hardware, wherein the action is changed according to the detected display mode;

wherein in the easel mode, the display component (102) and the base (104) are configured relative to one another such that the display screen (110) and the keyboard (106) face away from each other, with the display screen (110) oriented toward the operator of the portable computer and the keyboard (106) oriented away from the operator of the portable computer; and

wherein in the frame mode, the display screen (110) is disposed at an angle beyond approximately 180 degrees, measured about the longitudinal axis, relative to the base (104), and wherein the display screen (110) is oriented towards the operator, the base contacts a surface (212), and the keyboard (106) is directed towards the surface (212).

2. The portable computer (100) of claim 1, further comprising a display orientation module configured to control an orientation of the content displayed on the display screen (110); wherein the orientation of the content displayed on the display screen (110) is configurable among a plurality of orientations relative to the longitudinal axis.

3. The portable computer (100) of claim 2, wherein the plurality of orientations comprises a first orientation relative to the longitudinal axis and a second orientation relative to the longitudinal axis; and

wherein when display orientation module is configured to automatically display the content in the first orientation when the portable computer (100) is configured into the laptop mode and in the second orientation when the portable computer (100) is configured into the easel mode.

4. The portable computer (100) of claim 2, wherein the plurality of display modes further comprises a flat mode in which the display component (102) is disposed at an angle of approximately 180 degrees, measured about the longitudinal axis, relative to the base (104);

preferably, wherein the plurality of orientations comprises a first orientation relative to the longitudinal axis, a second orientation relative to the longitudinal axis, and a third orientation relative to the longitudinal axis; and

wherein, in the flat mode, the orientation of the content displayed on the display screen (110) is configurable among the first, second and third orientations responsive to a user input; optionally, wherein the second orientation is 90 degrees relative to the first orientation; and

wherein the third orientation is 180 degrees relative to the first orientation.

5. The portable computer (100) of claim 2, further comprising a mode sensor configured to detect a degree of rotation of the display component (102) relative to the base (104) and to provide information representative of the degree of rotation; and

wherein the display orientation module is configured to automatically adjust the orientation of the content displayed on the display screen (110) responsive to the information from the mode sensor; optionally, wherein the display orientation module is configured to:

automatically display the content in a first orientation relative to the longitudinal axis responsive to the information indicating that the degree of rotation of the display component (102) is less than approximately 180 degrees relative to the base (104); and

automatically display the content in a second orientation relative to the longitudinal axis responsive to the information indicating that the degree of rotation of the display component (102) is greater than approximately 180 degrees relative to the base (104);

wherein the second orientation is at approximately 180 degrees relative to the first orientation.

6. The portable computer (100) of claim 2, further comprising a mode sensor configured to detect a current display mode of the portable computer (100); and

wherein the display orientation module selects the orientation of the content displayed on the display screen (110) from one of the plurality of orientations relative to the longitudinal axis responsive to the current display mode detected by the mode sensor.

7. The portable computer (100) of claim 1, wherein plurality of display modes further comprises a closed mode; and

wherein, in the closed mode, the display screen (110) is disposed substantially against the base (104).

8. The portable computer (100) of claim 7, wherein rotating the display component (102) about the longitudinal axis up to approximately 180 degrees from the closed mode configures the portable computer (100) into the laptop mode; and

wherein rotating the display component (102) about the longitudinal axis beyond approximately 180 degrees from the closed mode configures the portable computer (100) into the easel mode; optionally, wherein the display component (102) is rotatable about the longitudinal axis up to approximately 320 degrees from the closed mode.

9. The portable computer (100) of claim 1, ~~further~~ wherein the navigation hardware is ~~comprising~~ a scroll wheel (132) disposed at least partially within the base (104) and rotatable about the longitudinal axis, the scroll wheel (132) configured to permit a user to control at least one of operating parameters of the portable computer (100) and the content displayed on the display screen (110).

10. The portable computer (100) of claim 9, wherein ~~further comprising a~~the first navigation button (166;168) ~~disposed on one of the base (104) and the display component (102) and~~is configured to permit the user to manipulate selected content displayed on the display screen

(110)~~; optionally, wherein a default operation of the first navigation button (166;168) is selected responsive to the display mode of the portable computer (100).~~ .

11. The portable computer (100) of claim 10, wherein the display screen (110) is configured to display at least one of a plurality of modes of content; and

wherein the first navigation button (166;168) is configured to permit the user to select for display one of the plurality of modes of content; ~~or wherein the first navigation button (166;168) is user-accessible in each of the laptop mode and the easel mode;~~ or further comprising a second navigation button (166;168);

wherein the first navigation button (166;168) is disposed on a major surface of the base (104); and

wherein the second navigation button (166;168) is disposed on a minor surface of the base (104).

12. The portable computer (100) of claim 9, wherein the scroll wheel (132) is configured to permit the user to select a mode of content for display on the display screen (110); or wherein the scroll wheel (132) is configured to permit the user to control a volume of sound played by the portable computer (100); or wherein the ~~further comprising a~~ hinge assembly is at least partially housed within the base (104) and configured to rotatably couple the display component (102) to the base (104); optionally, wherein the scroll wheel (132) is disposed at least partially within the hinge assembly.

13. The portable computer (100) of claim 1, further comprising:

a foot disposed along at least a portion of the base (104) and configured to support the portable computer (100) when in the easel mode.

~~14. The portable computer (100) of claim 11, wherein the scroll wheel (132) is further configured to permit the user to control the at least one operating parameters of the portable computer (100) and the content displayed on the screen by providing a default operation selected responsive to the display mode of the portable computer (100).~~

1415. The portable computer (100) of claim 1, wherein the portable computer (100) includes a single display screen (110).

1516. The portable computer (100) of claim 1, wherein the portable computer is configured to prevent the portable computer from responding to keyboard input when the portable computer is in the frame mode.

HP Inc. - Exhibit 1005 - Page 5496

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Application No.: 09 727 165.4

19.09.2018
Date

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Enclosure(s):

Form 2906

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Application No.	Ref.	Date
09 727 165.4 - 1221	P132767EP	19.04.2018
Applicant: Litl, LLC		

Communication under Rule 71(3) EPC

1. Intention to grant

You are informed that the examining division intends to grant a European patent on the basis of the above application, with the text and drawings and the related bibliographic data as indicated below.

A copy of the relevant documents is enclosed.

1.1 Main Request

In the text for the Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

Description, Pages

1, 3-24	as published	
2	filed in electronic form on	10-01-2011

Claims, Numbers

1-15	filed in electronic form on	07-03-2018

Drawings, Sheets

1/25-25/25	as published

With the following amendments to the above-mentioned documents proposed by the division

Description, Pages 1, 2, 4, 15-18
Claims, Numbers 1, 5, 6, 11

Comments

DESCRIPTION
Page 1: Mention of relevant prior art in the description (Rule 42(1) EPC)
Pages 2, 4, 15-18: Description adapted to amended claims (Art. 84 EPC)
CLAIMS
Pages 25, 27, 28, CLAIMS 1, 5, 6, 11: Scope of claim unclear - clarified (Art. 84 EPC)

See also the comments in enclosed EPO Form 2906.

1.2 Bibliographic data

The title of the invention in the three official languages of the European Patent Office, the international patent classification, the designated contracting states, the registered name(s) of the applicant(s) and the other bibliographic data are shown on **EPO Form 2056** (enclosed).

2. Invitation

You are invited, **within a non-extendable period of four months** of notification of this communication,

2.1 to EITHER approve the text communicated above and verify the bibliographic data (Rule 71(5) EPC)

(1) by filing a translation of the claim(s) in the other two official languages of the EPO

		Fee code	EUR
(2a)	by paying the fee for grant including the fee for publication:	**007**	925.00
	minus any amount already paid (Rule 71a(5) EPC):		0.00
		Total amount:	925.00
(3)	by paying additional claims fees under Rule 71(4) EPC; number of claims fees payable: 0	**016**	0.00
	minus any amount already paid (Rule 71a(5) EPC):		0.00
		Total amount:	0.00

Important: If the translations of the claims and fees have already been filed and paid respectively in reply to a previous communication under Rule 71(3) EPC, e.g. in the case of resumption of examination after approval (see Guidelines C-V, 6), **agreement as to the text to be granted** (Rule 71a(1) EPC) must be expressed within the same time limit (e.g. by approving the text and verifying the bibliographic data, by confirming that grant proceedings can go ahead with the documents on file and/or by stating which translations of the claims already on file are to be used).

Note 1: See "Notes concerning fee payments" below.
Note 2: Any overpaid "minus" amounts will be refunded when the decision to grant (EPO Form 2006A) has been issued.
Note 3: For the calculation of the grant fee under Article 2(2), No. 7, RFees (old fee structure), the

number of pages is determined on the basis of a clean copy of the application documents, in which text deleted as a result of any amendments by the examining division is not shown. Such clean copy is made available via on-line file inspection only.

2.2 OR, in the case of disapproval, to request reasoned amendments or corrections to the text communicated above or keep to the latest text submitted by you (Rule 71(6) EPC).

In this case the translations of the claims and fee payments mentioned under point 2.1 above are NOT due.

The terms "amendment(s)" and "correction(s)" refer only to amendments or corrections of the application documents and not of other documents (e.g. bibliographic data, the designation of the inventor, etc.).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the examining division requesting that you correct this deficiency (Rule 137(4) EPC).

2.3 Bibliographic data

Where you request a change or correction of bibliographic data in response to the Rule 71(3) communication, this will **not** cause the sending of a further communication under Rule 71(3) EPC. You will still have to pay the fees and file translations in reply to the Rule 71(3) communication in the case of 2.1 above, unless you also file a reasoned request for amendments or corrections in response to the Rule 71(3) communication (see case 2.2 above).

3. Loss of rights

If neither of the two possible actions above (see points 2.1 or 2.2) is performed in due time, the European patent application will be deemed to be withdrawn (Rule 71(7) EPC).

4. Further procedure

4.1 In the case of point 2.1 above

4.1.1 The decision to grant the European patent will be issued, and the **mention of the grant** of the patent will be published in the European Patent Bulletin, if the requirements concerning the translation of the claims and the payment of all fees are fulfilled and there is agreement as to the text to be granted (Rule 71a(1) EPC).

Note on payment of the renewal fee:
If a renewal fee becomes due before the next possible date for publication of the mention of the grant of the European patent, publication will be effected only after the renewal fee and any additional fee have been paid (Rule 71a(4) EPC).

Under Article 86(2) EPC, the obligation to pay renewal fees to the European Patent Office terminates with the payment of the renewal fee due in respect of the year in which the mention of the grant of the European patent is published.

Note on payment of the designation fee(s):
If the designation fee(s) become(s) due after the communication under Rule 71(3) EPC, the mention of the grant of the European patent will not be published until these fees have been paid (Rule 71a(3) EPC).

4.1.2 After publication, the **European patent specification** can be downloaded free of charge from the EPO publication server https://data.epo.org/publication-server.

4.1.3 Filing of translations in the contracting states

As regards translation requirements prescribed by the contracting states under Article 65(1) EPC, please consult the website of the European Patent Office
www.epo.org →Law & practice →Legal texts, National law relating to the EPC
www.epo.org →Law & practice →All Legal texts →London Agreement

In the case of a valid extension or validation

As regards translation requirements prescribed by the extension or validation states, please consult the website of the European Patent Office
www.epo.org →Law & practice →Legal texts, National law relating to the EPC

Failure to supply a prescribed translation in a contracting state, or in an extension or validation state may result in the patent being deemed to be void *ab initio* in the state concerned (Art. 65(3) EPC).

4.2 In the case of 2.2 above

If the present communication under Rule 71(3) EPC is based on an auxiliary request and, within the time limit, you maintain the main request or a higher ranking request which is not allowable, the application will be refused (Art. 97(2) EPC).

If the examining division gives its consent to the requested amendments or corrections, it will issue a new communication under Rule 71(3) EPC; otherwise, it shall resume the examination proceedings (Rule 71(6) EPC).

5. Filing of a divisional application

Any divisional application relating to this European patent application must be filed directly with the European Patent Office in Munich, The Hague or Berlin and will be in the language of the proceedings for the present application, or if the latter was not in an official language of the EPO, the divisional application may be filed in the language of the present application as filed (see Article 76(1) and Rule 36(2) EPC). Any such divisional application must be filed while the present application is still pending (Rule 36(1) EPC; Guidelines A-IV, 1.1.1).

6. Notes concerning fee payments

6.1 Making payments

For payments made via deposit account, please note that as from 1 December 2017 debit orders will only be carried out if filed in an electronically processable format (xml), using an accepted means of filing as laid down in the Arrangements for deposit accounts (ADA), published in the Supplementary publication in the Official Journal.

All relevant information related to the modes of payment of fees to the EPO can be retrieved from the EPO website at "**Making Payments**".

6.2 Information concerning fee amounts

Procedural fees are usually adjusted every two years, on even years, with effect from 1 April. Therefore, before making a payment, parties should verify the amounts actually due on the date of payment using the applicable version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, available on the EPO website (**www.epo.org**) at **www.epo.org/schedule-of-fees**. The "Schedule of fees" table allows the viewing, downloading and searching of individual fee amounts, both current and previous.

6.3 Note to users of the automatic debiting procedure

The fee for grant, including the fee for publication, and any additional claims fees due under Rule 71(4) EPC will be debited automatically on the date of filing of the translations of the claims, or on the last day of the period of this communication. However, if the designation fee(s) become(s) due as set out in Rule 71a(3) EPC and/or a renewal fee becomes due as set out in Rule 71a(4) EPC, these should be paid separately by another permitted way of payment in order not to delay the publication of the mention of the grant. The same applies in these circumstances to the payment of extension and validation fees. The same applies in these circumstances to the payment of extension and validation fees.

Note: If a waiver is expressed in response to a Rule 71(3) communication (see OJ EPO 2015, A52), the fee for grant, including the fee for publication/printing, and any additional claims fees will not be debited automatically. These fees must be paid separately by another means of payment allowed under the Rules relating to Fees.

Examining Division:

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1st Examiner:	Arranz, José

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Enclosures: Text intended for grant

EPO Form 2056
EPO Form 2906

Registered letter
EPO Form 2004C 12.17CXP

The applicant's representative, Mr. Jennings, was informed in a telephone conversation held on the 02-03-2018 about possible amendments that may be introduced to the claims in the order to overcome the objections raised in the communication annexed to the summons to oral proceedings.

Exhibit 1042

(12) UK Patent Application (19) GB (11) 2 321 982 (13) A

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(21) Application No 9702544.9

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(51) INT CL[6]
G06F 1/16

(52) UK CL (Edition P)
G4A ADT

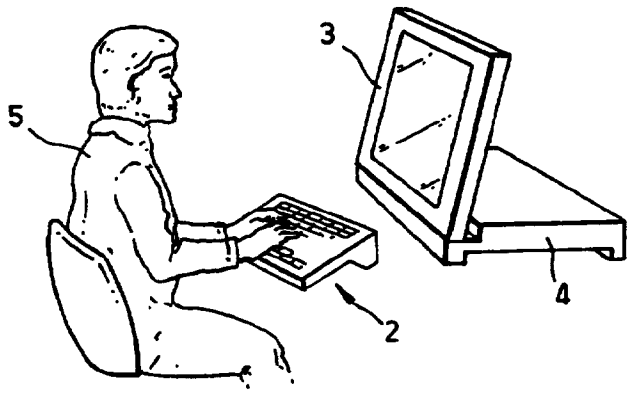
(56) Documents Cited
EP 0394879 A1 **US 5544005 A** **US 4903221 A**

(58) Field of Search
UK CL (Edition O) **G4A ADT**
INT CL[6] **G06F 1/16**
On-line: WPI

(54) Abstract Title
Positioning notebook computer screen to facilitate use with external keyboard

(57) When using an external keyboard with a notebook computer, the integral keyboard prevents the screen from being located at the optimum distance from the user. So that the external keyboard can be placed nearer to the notebook's screen, said screen may be capable of rotating through 270° about its hinge from the closed position, allowing the notebook to be placed with its integral keyboard face down on a work surface thereby permitting location of the external keyboard nearer the screen. Alternatively, with the screen open to an angle of 270° the notebook can be stood on its ends in an "A" shaped configuration. In this mode the screen display needs inverting. In a further mode the screen is detachable and may be relocated at the end of the integral keyboard which is nearest the user. Alternatively, the screen can rotate about an axis perpendicular to its hinge.

Fig.2.



GB 2 321 982 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig.1.

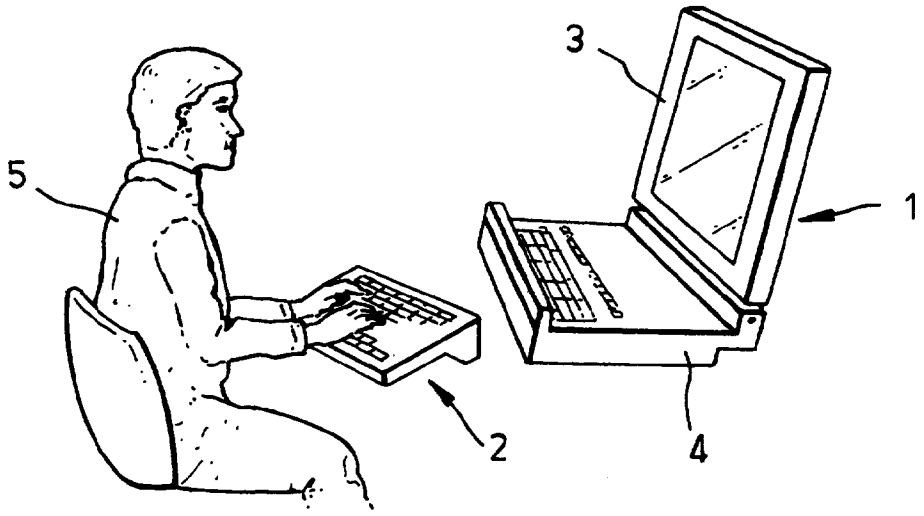


Fig.2.

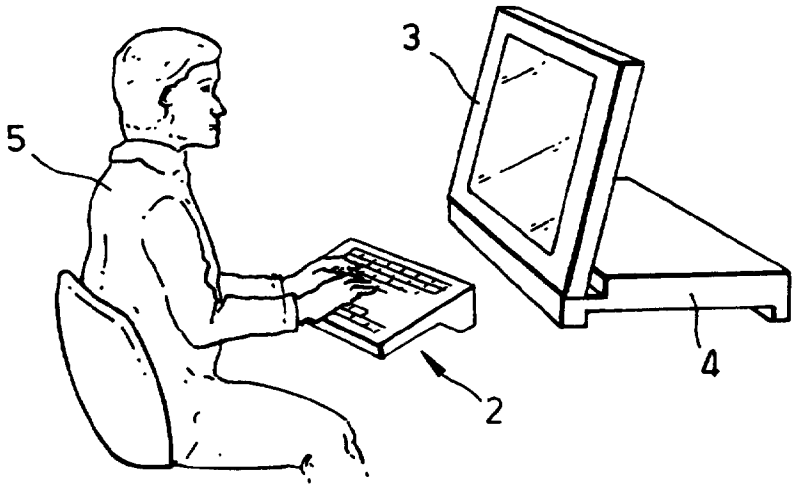


Fig.3.

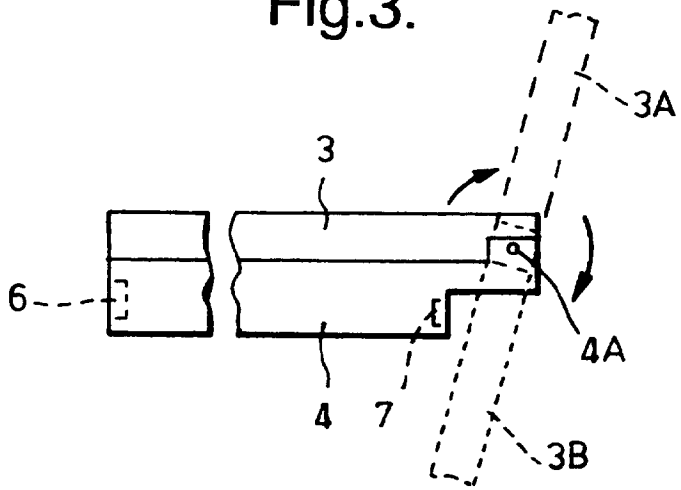


Fig.4.

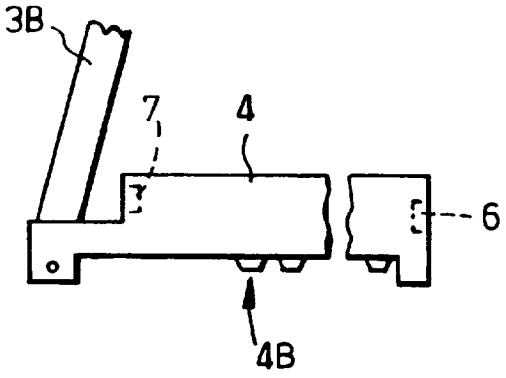


Fig.4A.

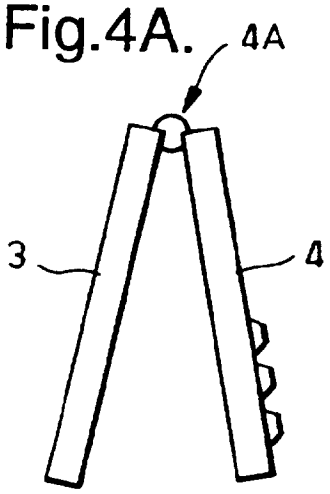
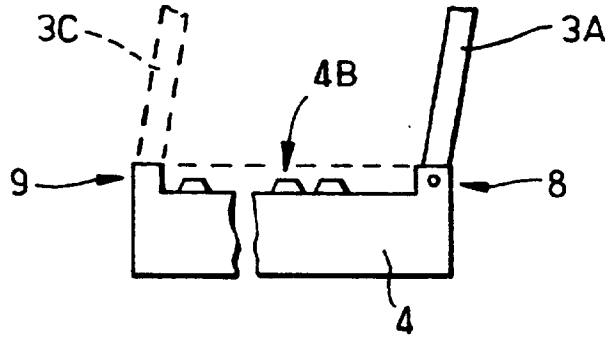


Fig.5.



NOTEBOOK COMPUTERS

This invention relates to notebook computers and in particular to notebook computers which, in addition to being usable in the portable, or free-standing, mode, facilitate use in a primary workstation arrangement at a workplace.

The technological advances in notebook screen technology, in particular the increased screen sizes which have become possible, mean that a notebook's own screen can be used as a primary display at a workstation, instead of for example a CRT monitor or another form of substantially non-portable display. However, the keyboard and mouse solutions of the notebook do not meet the current requirements for primary workstation input devices. When a notebook screen is used in a primary workstation context, external input devices must be used. Thus for example, the notebook computer is opened up in order to be able to view its screen and a separate primary workstation keyboard is employed as illustrated schematically in Figure 1. The keyboard may be connected to the notebook and/or other elements comprising the primary workstation by, for example, cables, infrared links, or the like. However, when the separate keyboard is disposed in front of the notebook in this manner, the distance between the user and the notebook screen is longer than is desirable for optimum viewing of the screen.

It is an object of the present invention to provide a means of achieving the optimum view distance between a notebook screen and a user employing a separate keyboard.

According to one aspect of the present invention there is provided a notebook computer comprising a body portion with a screen portion operatively connected thereto, wherein the screen portion is positionable relative to the body portion

such that it can be used in conjunction with a separate keyboard disposed at a distance from the screen portion corresponding to the optimum viewing distance for a user of the separate keyboard and closer to the screen portion than the depth of the body portion.

According to another aspect of the present invention there is provided a notebook computer comprising a body portion with a screen portion operatively connected thereto, wherein the screen portion is pivotable between a first position in which the notebook computer is closed, a second position in which the screen portion has been rotated through an angle of the order of 90° relative to the first position, and a third position in which the screen has been rotated through an angle of the order of 270° relative to the first position.

According to yet another aspect of the present invention there is provided a notebook computer comprising a body portion with a screen portion operatively connected thereto, wherein the screen is disconnectibly mounted to a back edge of the body portion and pivotable thereat between a first position in which the notebook computer is closed and a second position in which the screen has been rotated through an angle of the order of 90° relative to the first position, and wherein the screen is alternatively mountable to a front edge of the body portion in an orientation such that it extends substantially parallel to the second position.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 illustrates, schematically a conventional notebook computer being used in combination with a separate keyboard;

Figure 2 illustrates schematically a notebook computer according to one embodiment of the present invention being used in combination with a separate keyboard;

Figure 3 illustrates highly schematically and not to scale a partial end view of a notebook computer according to the one embodiment of the present invention with the screen in the closed position; the normal (portable) open position (dashed lines) and the fully open position (dotted lines);

Figure 4 illustrates the notebook of Figure 3 with the screen in the fully open position and orientated for use (integral keyboard facing downwards) with an external keyboard;

Figure 4A illustrates another possible arrangement of the notebook of Figure 3, and

Figure 5 illustrates highly schematically and not to scale an end view of another embodiment of the invention in which the screen is normally hinged to the back of the computer body but is movable from that position to an alternative position (dashed lines) at the front of the computer body for use with an external keyboard.

Referring firstly to Figure 1, which illustrates a conventional notebook computer 1 being used with a primary workstation keyboard 2, the screen 3 of the notebook computer 1 is being used as the primary workstation display. In this set-up, the body 4 of the notebook computer can prevent the keyboard 2 being positioned close enough to the screen so that the user 5 is at the optimum viewing distance from the screen. The screen 3 is hinged to the back edge of body 4 in such a manner that when the notebook computer is opened for use there is an angle between them that will be referred to as of the order of 90°, although in practice it can be somewhat greater and will be such as to provide an optimum view of the screen.

In order to enable the keyboard 2 to be positioned closer to the screen 3 than previously possible, that is closer to the screen than the distance between the front and back edges of

the body ie its depth, it is proposed to arrange that the relative positions of the screen 3 and the body 4 of the notebook computer be changeable. One possible means of achieving this is to provide a hinge arrangement between the screen 3 and the body 4 at the back edge thereof that enables the notebook computer to be opened to such an extent that there is an angle between them which will be referred to as of the order of 270°, although in practice it can be somewhat greater in order to provide an optimum view of the screen. Such an arrangement is illustrated in Figure 2, in which the notebook computer has been opened up to the order of 270° and the body has been positioned on a work top with the integral keyboard facing downwards. Figure 3 illustrates very schematically, in order to indicate the principle, a partial end view of a notebook computer having a screen able to pivot about an axis 4A and open to such an extent, and indicating the closed position of the screen 3 relative to the body 4 in a solid line, the normal of the order of 90° viewing position of the screen in a dashed line 3A, and the order of 270° viewing position of the screen in a dotted line 3B. To enable the screen to be viewed with the image the right way up in the order of 270° orientation the body 4 must be disposed with the integral keyboard 4B downwards, as indicated in Figure 4.

In the order of 270° orientation illustrated in Figure 3 the image on the screen is the wrong way up when the body is disposed with the integral keyboard uppermost. If the image could be reversed (top to bottom) this order of 270° orientation could also be employed by, for example, disposing the body 4 at a higher level than the keyboard 2, for example, on some form of shelf, and with the integral keyboard uppermost. In such a case the orientation would be somewhat less than 270° for optimum viewing. Such an arrangement might be preferable in certain circumstances, particularly in connection with CD Roms or floppy disks, the drives for which may not operate in an upside down

configuration, as well as possibly being difficult to use when upside down. Instead of disposing the body on a shelf and angling the screen as appropriate, the opened out notebook computer could just be stood up as illustrated schematically in Figure 4A, in which the angle will be greater than 270° and the image will need reversing, top to bottom. Locking means could be provided to ensure that this angle is maintained.

In the arrangements illustrated in Figures 2, 3 and 4, a docking connection 6 can be disposed at the front of the body 4 in order to be accessible when the order of 270° orientation is employed (Figure 4), the docking connection being required when the screen is to be used as a primary workstation display. Connections 7 which are required when the notebook computer is to be used in the normal order of 90° orientation can be disposed at the back of the body as illustrated, these include parallel and serial ports. Locking means (not shown) are preferably provided in order to lock the screen into the desired orientation (90 or 270°).

An alternative possibility which permits the screen 3 and external keyboard 2 to be positioned closer together, and with the body the right way up, is to arrange that the screen 3 and body 4 are operatively connectible to one another both at the front and back edges of the body 4, as illustrated in Figure 5. At the back of the body is a hinge arrangement 8 permitting the screen to be closed down onto the keyboard 4B (as indicated by the dotted line) and disposed at the order of 90° orientation 3A (solid lines), and also to be disconnected therefrom, whereas at the front of the body there is an alternative hinge or other connection arrangement 9 permitting the screen to be operatively connected thereat and disposed in an orientation 3C equivalent to the order of 270° orientation referred to above, but which is actually an order of 90° orientation and parallel to orientation 3A, but which will be closer to the external keyboard, as indicated

by the dotted lines. In this arrangement the docking and other connections will not be covered by the screen in any orientation thereof and can thus be disposed in positions determined by other criteria.

A variant of the Figure 5 arrangement is as follows. As will be appreciated, such as from Figure 1, the screen portion 3 can be attached to the body portion 4 by means of two hinge arrangements. The screen portion is disconnectibly mounted to the back edge of the body portion, but instead of the alternative mounting position being at the front edge of the portion as in Figure 5, in a variant the alternative mounting position is also at the back edge, but with the left and right hinge connection positions interchanged, so that the picture side of the screen portion is then at the back, ie when regarding Figure 5 the image on the screen portion (in position 3A) is viewed from the right, rather than the left. If the wire connection between the screen and body portions is, say, in the middle of the bottom side of the screen, it need not be disconnected, rather "twisted" through 180°. If the wire connection is through one hinge and both hinge and wire are pivotable through 180°, the other hinge being disconnectible, the screen portion can readily be turned around. A separate support for the other hinge can be provided for such a variant. Alternatively, there can be a single hinge which is centrally disposed at the bottom side of the screen portion and with the wire connection extending through it, the whole hinge/wire arrangement being pivotable through 180° to present the image on the opposite side of the screen portion to the usual notebook configuration.

The arrangements proposed by the invention thus permit the screen of a notebook computer to be used as a primary workstation display, saving the cost of purchasing a CRT monitor or other display for the workstation, whilst allowing an external keyboard to be positioned close enough to the screen for optimum viewing thereof by a keyboard user.

CLAIMS

1. A notebook computer comprising a body portion with a screen portion operatively connected thereto, wherein the screen portion is positionable relative to the body portion such that it can be used in conjunction with a separate keyboard disposed at a distance from the screen portion corresponding to the optimum viewing distance for a user of the separate keyboard and closer to the screen portion than the depth of the body portion.

2. A notebook computer as claimed in Claim 1, wherein the screen portion is pivotable between a first position in which the notebook computer is closed, a second position in which the screen portion has been rotated through an angle of the order of 90° relative to the first position, and a third position in which the screen portion has been rotated through an angle of the order of 270° relative to the first position.

3. A notebook computer as claimed in Claim 2, wherein the screen portion is pivotably connected to a back edge of the body portion, wherein a docking connection is disposed at a front edge of the body portion, the depth of the body portion corresponding to the distance between the front and back edges of the body portion, and wherein in use with the external keyboard the screen portion is disposed in the third position.

4. A notebook computer as claimed in Claim 3, and wherein in use the body portion is disposed upside down on a work surface.

5. A notebook computer is claimed in Claim 3, including means for reversing the image top-to-bottom on the screen.

6. A notebook computer as claimed in Claim 1, wherein the screen portion is disconnectively mounted to a back edge of the body portion and pivotable thereat between a first position in which the notebook computer is closed and a second position in which the screen portion has been rotated through an angle of the order of 90° relative to the first position, and wherein the screen portion is alternatively mountable to a front edge of the body portion in an orientation such that it extends substantially parallel to the second position, the depth of the body portion corresponding to the distance between the front and back edges.

7. A notebook computer comprising a body portion with a screen portion operatively connected thereto, wherein the screen portion is pivotable between a first position in which the notebook computer is closed, a second position in which the screen portion has been rotated through an angle of the order of 90° relative to the first position, and a third position in which the screen has been rotated through an angle of the order of 270° relative to the first position.

8. A notebook computer comprising a body portion with a screen portion operatively connected thereto, wherein the screen is disconnectibly mounted to a back edge of the body portion and pivotable thereat between a first position in which the notebook computer is closed and a second position in which the screen has been rotated through an angle of the order of 90° relative to the first position, and wherein the screen is alternatively mountable to a front edge of the body portion in an orientation such that it extends substantially parallel to the second position.

9. A notebook computer substantially as herein described with reference to and as illustrated in any one of Figures 2 to 5 of the accompanying drawings.

The Patent Office

9

Application No: GB 9702544.9 **Examiner:** Matthew Gillard
Claims searched: All **Date of search:** 13 April 1997

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.O): G4A ADT

Int Cl (Ed.6): G06F 1/16

Other: On-line: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	EP 0394879 A1	(SANYO). See figs 3, 4 & 11.	1 at least
X	US 5544005	(I. B. M.). See fig 1.	1 at least
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HP Inc. - Exhibit 1005 - Page 5516

Exhibit 1034

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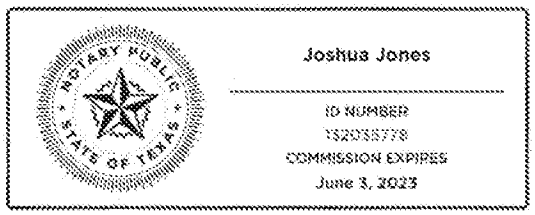
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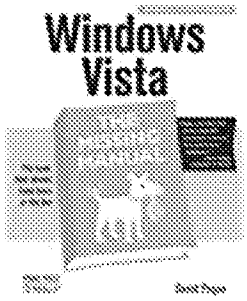
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Book Description

Windows Vista is Microsoft's most important software release in more than a decade. It offers users an abundance of new and upgraded features that were more than five years in the making: a gorgeous, glass-like visual overhaul; superior searching and organization tools; a multimedia and collaboration suite; and above all, a massive, top-to-bottom security-shield overhaul. There's scarcely a single feature of the older versions of Windows that hasn't been tweaked, overhauled, or replaced entirely.

But when users first encounter this beautiful new operating system, there's gonna be a whole lotta head-scratchin', starting with trying to figure out which of the five versions of Vista is installed on the PC (Home, Premium, Business, Enterprise, Ultimate).

Thankfully, *Windows Vista: The Missing Manual* offers coverage of all five versions. Like its predecessors, this book from New York Times columnist, bestselling author, and Missing Manuals creator David Pogue illuminates its subject with technical insight, plenty of wit, and hardnosed objectivity for beginners, veteran standalone PC users, and those who know their way around a network. Readers will learn how to:

- Navigate Vista's elegant new desktop
- Locate anything on your hard drive quickly with the fast, powerful, and fully integrated search function
- Use the Media Center to record TV and radio, present photos, play music, and record any of the above to DVD
- Chat, videoconference, and surf the Web with the vastly improved Internet Explorer 7 tabbed browser
- Build a network for file sharing, set up workgroups, and connect from the road
- Protect your PC and network with Vista's beefed up security
- And much more.

This jargon-free guide explains Vista's features clearly and thoroughly, revealing which work well and which don't. It's the book that should have been in the box!

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ISBN-10: 0596528272
ISBN-13: 978-0596528270
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★★★★★ **An Essential "Missing Manual" Title on Windows Vista**, January 12, 2007
Reviewer: Dale F. Farris "Iwado" (Groves, TX USA) - See all my reviews

Author David Pogue, now well known for his acclaimed "Missing Manual" series from O'Reilly, once again stuns us with his latest title, Windows Vista: The Missing Manual. The latest in this marvelous series of "Missing Manual" guides will surely get the attention of potential buyers when they peruse the abundance of computer books now filling the shelves. More importantly, Vista is a major new operating system from Microsoft, not just another security update, and this makes this title even more important.

With Microsoft's latest operating system, Windows Vista, this lack of a manual has created an opportunity for others to fill the gap. To the rescue comes this wonderful guide to Windows Vista that easily can serve as the manual that should have accompanied the software. Filled with hundreds of screen shots, this guide includes numerous step-by-step instructions for using almost every Windows Vista feature, including those you may not even have quite understood, let alone mastered.

Author Pogue has organized this book into eight parts, including The Windows Vista Desktop, Vista Software, Vista Online, Pictures, Movies, and Media Center, Hardware and Peripherals, PC Health, The Vista Network, and the Appendixes.

In this Missing Manual title, the author also discusses concerns regarding upgrading, versus a clean install of Windows Vista, and the all important issue of whether to even consider loading Vista on an existing machine, versus purchasing a brand new machine with Vista already installed. Readers will also be glad to know that the author includes comments on all the five (5) versions of Vista that will be available. These include Vista Home Basic, Vista Home Premium, Vista Business, Vista Enterprise, and Vista Ultimate.

This important book is designed to accommodate readers at every technical level, except system administrators. Computer network operators will want to supplement this book aimed more at desktop users with other more technical books on supporting Vista that will soon fill the shelves.

The primary discussions are written for advanced-beginner or intermediate PC users. If you are a first-time Windows user, the special sidebar articles called "Up To Speed" provide the introductory information you need to understand the topic at hand. If you are an advanced users, keep your eye out for similar shaded boxes called "Power Users' Clinic" that offer more technical tips, tricks, and shortcuts for the veteran PC fan.

14 of 17 people found the following review helpful:

★★★★★ **Pogue takes you by the hand through the tough journey of adapting to Vista**, February 25, 2007
Reviewer: MANUEL J HERNANDEZ "http://askmanny.com" (Orlando, FL) - See all my reviews

Windows has never been the most usable Operating System. From day one, it's been playing a catching up game with Apple Operating Systems and Vista is no exception. The thing is, this time, Vista takes a quantum leap comparable to the one that Microsoft took with Windows 95 vs. the previous incarnations of their OS, which spells a lot of trouble and confusion for new users and users who take the leap.

David Pogue in "Windows Vista (Missing Manual)" acknowledges the learning curve Vista will entail and the confusion resulting from things that changed places, got renamed or simply dissapeared, leaving both, new and experienced Windows users at a loss. At the same time, his voice and tone keep you engaged in spite of the length of the book (827 pages), resulting in a book that serves as a general go-to reference for specific things and doubts, as well as a guide to take you through the thick and thin of Windows Vista until you become as experienced as you want to get and you are enjoying all the cool features Vista brings to the screen for PC users.

Although I have not got yet the computing juice Vista demands nor the guts to take the leap away from XP, having read it, I recommend the book to anyone considering to upgrade to Vista or anybody getting a computer with Vista pre-installed.

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☆☆☆☆☆ **A must-have for Vista users**, March 28, 2007
Reviewer: Joseph R. Stomp (Sacramento, CA USA) - See all my reviews

I previously bought the Missing Manual for Windows XP and found it to be a font of knowledge. So far the Vista version hasn't disappointed me. You really need this book to make sense out of Vista [Do not rely on the Windows Help!] Profusely illustrated with many examples and a good index to find subjects. And there is a website where you can check for corrections, updates etc. A must-have book, and the Amazon price is pretty good.

2 of 2 people found the following review helpful:

☆☆☆☆☆ **The Only Book Most Windows Vista Users Need**, March 25, 2007
Reviewer: Fred Greene - See all my reviews

The title sends the message of my review. Every Windows Vista User should purchase this book at the same time Windows Vista is purchased, or, immediately after the purchase of Windows Vista. The book covers everything that most users want to know and should know about Windows Vista. Significantly this book is written for easy reader understanding and for pleasant reading.

Read it a learn things technical you should know without plowing through unnecessary technical language. If you really want to get technical, then, after you read this book to become a competent and comfortable Windows Vista user, purchase Windows Vista Inside Out by Ed Bott, Carl Siechert, and Craig Stinson. Windows Vista Inside Out is great book if you really wish to get technical and look at Windows Vista in-depth.

6 of 7 people found the following review helpful:

☆☆☆☆☆ **Windows Vista: The Missing Manual**, March 3, 2007
Reviewer: Edward Laskowski - See all my reviews

Windows Vista: The Missing Manual An excellent book.
Clear and to-the-point, this book provides a comprehensive coverage of Windows Vista. It covers all five versions of Vista.All the many utilities, Media Center features, new security features, and the Internet Explorer 7 are covered; also how to make your own audio CDs and DVD movies. There is an extensive discussion on installation in the Appendix. At a hefty 826 pages it makes a thoroughly detailed reference.

11 of 11 people found the following review helpful:

☆☆☆☆☆ **"Windows Vista: The Missing Manual" A Review By: John Inzer**, March 2, 2007
Reviewer: John Inzer (Georgia USA) - See all my reviews

Generally, I am not a fan of manuals...they
can be boring, vague and for the most part
you even wonder if the writer has actually
seen the product being discussed.

Enter: "Windows Vista: The Missing Manual"
Written by: David Pogue
Published by: Pogue Press - O'Reilly.

Vista truly is a new experience and all aspects
of the various features are explained in detail
in this comprehensive, easy to read manual.
If you are a first time computer owner or a
veteran from the days of DOS this is a book
you will find yourself referring to over and over.

Everything from the graphically appealing
Windows Aero interface to tips on how to
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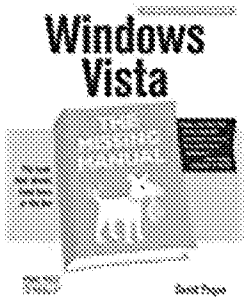
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Book Description

Windows Vista is Microsoft's most important software release in more than a decade. It offers users an abundance of new and upgraded features that were more than five years in the making: a gorgeous, glass-like visual overhaul; superior searching and organization tools; a multimedia and collaboration suite; and above all, a massive, top-to-bottom security-shield overhaul. There's scarcely a single feature of the older versions of Windows that hasn't been tweaked, overhauled, or replaced entirely.

But when users first encounter this beautiful new operating system, there's gonna be a whole lotta head-scratchin', starting with trying to figure out which of the five versions of Vista is installed on the PC (Home, Premium, Business, Enterprise, Ultimate).

Thankfully, *Windows Vista: The Missing Manual* offers coverage of all five versions. Like its predecessors, this book from New York Times columnist, bestselling author, and Missing Manuals creator David Pogue illuminates its subject with technical insight, plenty of wit, and hardnosed objectivity for beginners, veteran standalone PC users, and those who know their way around a network. Readers will learn how to:

- Navigate Vista's elegant new desktop
- Locate anything on your hard drive quickly with the fast, powerful, and fully integrated search function
- Use the Media Center to record TV and radio, present photos, play music, and record any of the above to DVD
- Chat, videoconference, and surf the Web with the vastly improved Internet Explorer 7 tabbed browser
- Build a network for file sharing, set up workgroups, and connect from the road
- Protect your PC and network with Vista's beefed up security
- And much more.

This jargon-free guide explains Vista's features clearly and thoroughly, revealing which work well and which don't. It's the book that should have been in the box!

Product Details

Paperback: 848 pages
Publisher: O'Reilly Media, Inc. (December 27, 2006)
Language: English
ISBN-10: 0596528272
ISBN-13: 978-0596528270
Product Dimensions: 8.9 x 7 x 1.4 inches
Shipping Weight: 3.5 pounds (View shipping rates and policies)
Average Customer Review: based on 14 reviews.

Amazon.com Sales Rank: #458 in Books (See Top Sellers in Books)
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★★★★★ **Pogue takes you by the hand through the tough journey of adapting to Vista.** February 25, 2007
Reviewer: MANUEL J HERNANDEZ "http://askmanny.com" (Orlando, FL) - See all my reviews

Windows has never been the most usable Operating System. From day one, it's been playing a catching up game with Apple Operating Systems and Vista is no exception. The thing is, this time, Vista takes a quantum leap comparable to the one that Microsoft took with Windows 95 vs. the previous incarnations of their OS, which spells a lot of trouble and confusion for new users and users who take the leap.

David Pogue in "Windows Vista (Missing Manual)" acknowledges the learning curve Vista will entail and the confusion resulting from things that changed places, got renamed or simply dissapeared, leaving both, new and experienced Windows users at a loss. At the same time, his voice and tone keep you engaged in spite of the length of the book (827 pages), resulting in a book that serves as a general go-to reference for specific things and doubts, as well as a guide to take you through the thick and thin of Windows Vista until you become as experienced as you want to get and you are enjoying all the cool features Vista brings to the screen for PC users.

Although I have not got yet the computing juice Vista demands nor the guts to take the leap away from XP, having read it, I recommend the book to anyone considering to upgrade to Vista or anybody getting a computer with Vista pre-installed.

43 of 45 people found the following review helpful:

★★★★★ **An Essential "Missing Manual" Title on Windows Vista**, January 12, 2007
Reviewer: Dale F. Farris "leado" (Groves, TX USA) - See all my reviews

Author David Pogue, now well known for his acclaimed "Missing Manual" series from O'Reilly, once again stuns us with his latest title, Windows Vista: The Missing Manual. The latest in this marvelous series of "Missing Manual" guides will surely get the attention of potential buyers when they peruse the abundance of computer books now filling the shelves. More importantly, Vista is a major new operating system from Microsoft, not just another security update, and this makes this title even more important.

With Microsoft's latest operating system, Windows Vista, this lack of a manual has created an opportunity for others to fill the gap. To the rescue comes this wonderful guide to Windows Vista that easily can serve as the manual that should have accompanied the software. Filled with hundreds of screen shots, this guide includes numerous step-by-step instructions for using almost every Windows Vista feature, including those you may not even have quite understood, let alone mastered.

Author Pogue has organized this book into eight parts, including The Windows Vista Desktop, Vista Software, Vista Online, Pictures, Movies, and Media Center, Hardware and Peripherals, PC Health, The Vista Network, and the Appendixes.

In this Missing Manual title, the author also discusses concerns regarding upgrading, versus a clean install of Windows Vista, and the all important issue of whether to even consider loading Vista on an existing machine, versus purchasing a brand new machine with Vista already installed. Readers will also be glad to know that the author includes comments on all the five (5) versions of Vista that will be available. These include Vista Home Basic, Vista Home Premium, Vista Business, Vista Enterprise, and Vista Ultimate.

This important book is designed to accommodate readers at every technical level, except system administrators. Computer network operators will want to supplement this book aimed more at desktop users with other more technical books on supporting Vista that will soon fill the shelves.

The primary discussions are written for advanced-beginner or intermediate PC users. If you are a first-time Windows user, the special sidebar articles called "Up To Speed" provide the introductory information you need to understand the topic at hand. If you are an advanced users, keep your eye out for similar shaded boxes called "Power Users' Clinic" that offer more technical tips, tricks, and shortcuts for the veteran PC fan.

Customer Reviews

Average Customer Review: ☆☆☆☆☆

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☆☆☆☆☆ **Good Work, Here....**, April 21, 2007
Reviewer: Charles Senescall (St. Paul, MN USA) - See all my reviews
"Mini-review"

To my mind, the concept of a an Operating System as complex as Vista NOT coming with a manual is absurd. David Pogue's work here is essential -- at 800+ pages, thicker than the Minneapolis phone book, you're pretty much guaranteed an answer to any Vista-related question which might cross your mind. Good work, here. Truly, the book that should have been in the box. Well done.

5 of 6 people found the following review helpful:

☆☆☆☆☆ **A must-have for Vista users**, March 28, 2007
Reviewer: Joseph S. Stomp (Sacramento, CA USA) - See all my reviews
"Mini-review"

I previously bought the Missing Manual for Windows XP and found it to be a font of knowledge. So far the Vista version hasn't disappointed me. You really need this book to make sense out of Vista [Do not rely on the Windows Help!] Profusely illustrated with many examples and a good index to find subjects. And there is a website where you can check for corrections, updates etc. A must-have book, and the Amazon price is pretty good.

9 of 11 people found the following review helpful:

☆☆☆☆☆ **The Only Book Most Windows Vista Users Need**, March 25, 2007
Reviewer: Fred Greene - See all my reviews
"Mini-review"

The title sends the message of my review. Every Windows Vista User should purchase this book at the same time Windows Vista is purchased, or, immediately after the purchase of Windows Vista. The book covers everything that most users want to know and should know about Windows Vista. Significantly this book is written for easy reader understanding and for plesant reading.

Read it a learn things technical you should know without plowing through unnecessary technical language. If you really want to get technical, then, after you read this book to become a competent and comfortable Windows Vista user, purchase Windows Vista Inside Out by Ed Bott, Carl Siechert, and Craig Stinson. Windows Vista Inside Out is great book if you really wish to get technical and look at Windows Vista in-depth.

9 of 11 people found the following review helpful:

☆☆☆☆☆ **Windows Vista: The Missing Manual**, March 3, 2007
Reviewer: Edward Laskowski - See all my reviews
"Mini-review"

Windows Vista: The Missing Manual An excellent book.
Clear and to-the-point, this book provides a comprehensive coverage of Windows Vista. It covers all five versions of Vista.All the many utilities, Media Center features, new security features, and the Internet Explorer 7 are covered; also how to make your own audio CDs and DVD movies. There is an extensive discussion on installation in the Appendix. At a hefty 826 pages it makes a thoroughly detailed reference.

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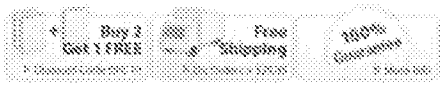
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Windows Vista: The Missing Manual
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Windows Vista: The Missing Manual

By David Pogue
First Edition: December 2006
Pages: 848 (More details)
(Average of 4 Customer Reviews)



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Book description

Windows Vista: The Missing Manual offers complete and comprehensive coverage of all five versions of Vista. In his inimitable witty style, New York Times columnist and bestselling author David Pogue illuminates this subject with clear technical insight and hard-nosed objectivity. He explains Vista's features clearly and thoroughly, revealing which work well and which don't. Written for beginners, veteran stand-alone PC users, and those who know their way around a network, this jargon-free guide is the book that should have been in the box!

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Book:
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Book details

Title: Windows Vista: The Missing Manual
First Edition: December 2006
Series: The Missing Manuals
ISBN 10: 0-596-52827-2
ISBN 13: 978-0-596-52827-0
Pages: 848
Average Customer Reviews: (Based on 4 Reviews)

Featured customer reviews

A User Friendly Introduction to Vista Rating:
2007-02-13 13:59:02 Jan J [Reply | View]
I found the book very easy to understand and "User Friendly." It is well written with lots of good screen shots for clarification of specific features, tasks and events.

The book covered the variety of features that are available in the various Vista editions.

While there were features I thought needed more detailed coverage, such as the difference in the User Administrator and "Secret" Administrator, as well as the loss of Restore Points, Shadow Copies and all but current PC backups and convenience of Boot backups

from XP, it was quite user friendly and informative.

As a Microsoft software instructor for two Community Colleges, and owner of my own business that deals in software training, data and computer services, it is a Windows Vista information resource I can feel comfortable and confident in recommending to my students and clients.

Jan :)

The right book to accompany any shiny new installation of Vista Rating: ★★★★★
2007-02-09 11:49:37 Greg [Reply | View]
Even though David Pogue's "Missing Manual" series isn't necessarily marketed toward programmers or system administrators, I still found the text very useful and a great addition to my O-Reilly library. For me, this book represents a condensation of the bits an pieces of "Vista info" that are floating around the new OS release.

I have to admit that I was on the fence about Vista when I received this book. I ran into trouble finding a good reliable source of raw information, so I decided to research for myself instead of reading more pro/con columns. To that end I used this as more of a reference book in order to find out how much Vista had changed from XP. To my surprise I found everything I wanted to know, and even some things I had forgot long ago.

This is a book I would recommend to my Mom as well as any of my friends or co-workers looking to discover more about Vista. Pogue writes in such a way that any beginner can understand, and any power-user can appreciate.

Windows Vista: The Missing Manual Rating: ★★★★★
2007-01-15 19:55:06 Anonymous Reader [Reply | View]
When Windows XP came along, I searched for a book that would open the XP doors in a powerful yet easy to digest manual. With a little help from a few of our members, I found it,...Windows XP The Missing Manual The Book That Should Have Been In The Box, by New York Times computer columnist, David Pogue... It was superb!
Not to outdone by Windows Vista, Pogue has collaborated with several other popular computer columnists that include another of my all-time favorites, Preston Gralla, to complete The Missing Manual for Vista. It is very truly the book that should have been in the box! If you are even thinking about Vista, this is without question a must have. It is the best thing out there to familiarize you easily with the new operating system. This dynamite 827 Page, 27 chapter, 4indexes manual does not miss a trick. It contains everything you need to know, use and learn in Vista without missing a trick. Every page is replete with screen captures of Vista and simple, step-by-step instructions on understanding and mastering its many features.
Without question, this is the book to get. It is easily the most informative book on Vista. Vista is covered from A to Z, from the very basics to complete networking. It is written in an easy to understand style that will not leave even computer neophytes behind, truly everyman=s manual and likely the only one you may ever need or want on Vista. You should also be aware that Microsoft does not include a single written page in the Vista box. Unless you are a psychic, this book is essential!
The book includes tips and tricks for each of Vista's new programs: Photo Gallery, Internet Explorer 7, Mail, Media CenterDVD Maker, the Sidebar, speech recognition, games, Windows Meeting Space, and more.

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Important Missing Manual Title Helps Prepare for Windows Vista Rating: ★★★★★
2007-01-12 10:03:58 Dale Ferris [Reply | View]
By Dale Ferris, Reviews Coordinator
Golden Triangle PC Club
January 2007

Do you yearn for the days when you bought software that included a well designed user manual? We have for so long lived without a manual with new software, that when a rare vendor does supply one, we are thrilled at what we now perceive as "extra value" provided with the program.

Author David Pogue, now well known for his acclaimed "Missing Manual" series from O'Reilly, once again stuns us with his latest title, Windows Vista: The Missing Manual.

The latest in this marvelous series of "Missing Manual" guides will surely get the attention of potential buyers when they peruse the abundance of computer books now filling the shelves. More importantly, Vista is a major new operating system from Microsoft, not just another security update, and this makes this title even more important.

These "Missing Manual" guidebooks are designed to be authoritative, superbly written guides to popular computer products that don't come with pre-printed manuals (which is just about all of them). Each one features a hand-crafted index, cross-references to specific page numbers (not just "See Chapter"), and the always user friendly RepKover, a detached-spine binding that lets the book lie perfectly flat without the assistance of weights, like staplers or cinder blocks.

This "Missing Manual" series is now a joint venture between Pogue Press and O'Reilly & Associates. With O'Reilly's already established reputation for solid, substantial computer books that are a cut above all the rest, and the wonderful attention to new users that characterize all these "Missing Manual" works, the venture should prove very successful for these publishers.

As with any operating system you buy these days, you get no user guide with the software. Instead, you are expected to read the online help system built into the software. While this decision is understandable, as a means of keeping down the costs of the software, for many users of the software, using electronic help files is just not enough help.

With Microsoft's latest operating system, Windows Vista, this lack of a manual has created an opportunity for others to fill the gap. To the rescue comes this wonderful guide to Windows Vista that easily can serve as the manual that should have accompanied the software. Filled with hundreds of screen shots, this guide includes numerous step-by-step instructions for using almost every Windows Vista feature, including those you may not even have quite understood, let alone mastered.

Author Pogue has organized this book into eight parts, including The Windows Vista Desktop, Vista Software, Vista Online, Pictures, Movies, and Media Center; Hardware and Peripherals, PC Health, The Vista Network, and the Appendixes.

In this Missing Manual title, the author also discusses concerns regarding upgrading, versus a clean install of Windows Vista, and the all important issue of whether to even consider loading Vista on an existing machine, versus purchasing a brand new machine with Vista already installed. Readers will also be glad to know that the author includes comments on all the five (5) versions of Vista that will be available. These include Vista Home Basic, Vista Home Premium, Vista Business, Vista Enterprise, and Vista Ultimate.

Table of Contents

The twenty-seven (27) chapters include the following titles.

Part 1: The Vista Desktop
Welcome Center, Desktop, and the Start Menu
Explorer, Windows, and the Taskbar
Searching and Organizing Your Files
Interior Decorating Vista
Getting Help

Part 2: Vista Software
Programs, Documents, and Gadgets
The Freebie Software
The Control Panel

Part 3: Vista Online
Hooking Up to the Internet
Internet Security
Internet Explorer 7
Windows Mail

Part 4: Pictures, Movies, and Media Center
Windows Photo Gallery
Windows Media Player
Movie Maker and DVD Maker
Media Center

Part 5: Hardware and Peripherals
Fax, Print, and Scan
Hardware
Laptops, Tablets, and Palmtops

Appendix, Windows and Printshop

Part 6: PC Health
Maintenance and Speed Tweaks
The Disk Chapter
Backups and Troubleshooting

Part 7: The Vista Network
Accounts (and Logging On)
Setting Up a Workgroup Network
Network Domains
Network Sharing and Collaboration
Vista by Remote Control

Part 8: Appendixes
Appendix A: Installing Windows Vista
Appendix B: Fun with the Registry
Appendix C: Where'd It Go?
Appendix D: The Master Keyboard Shortcut List

Target Readers

This important book is designed to accommodate readers of every technical level, except system administrators. Computer network operators will want to supplement this book almost more at desktop users with other more technical books on supporting Vista that will soon fill the shelves.

The primary discussions are written for advanced-beginner or intermediate PC users. If you are a first-time Windows user, the special sidebar articles called "Up To Speed" provide the introductory information you need to understand the topic at hand. If you are an advanced user, keep your eye out for similar shaded boxes called "Power Users' Clinic" that offer more technical tips, tricks, and shortcuts for the veteran PC fan.

Book Contents

848 pages; acknowledgements; introduction; figures; tips; power user clinics; FAQs; appendixes; index; cover colophon

Author

David Pogue

About the Author

David Pogue, creator of the Missing Manual series, is the author or co-author of 25 computer, humor, and music books. These include the Computer Press Association award-winning "PalmPilot: The Ultimate Guide," 2nd Edition, six books in the "...for Dummies" series, six books in the "Missing Manual" series, as well as the "Mac OS 9: The Missing Manual." David is the weekly computer columnist for the New York Times, and in his other life, David is a former Broadway show conductor, a magician, pianist, and occasional book reviewer for the New York Times. He and his wife Jennifer Pogue, MD, live in Connecticut with their young son and daughter.

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Media reviews

"Lots of shiny software ahead. Most prominently, the new Windows operating system Vista, so you'll want to bone up now before you make the big transition. Well, a good start just hit the shelves: Windows Vista: The Missing Manual by David Pogue (O'Reilly Media). Pogue, by the way, is the digital bigwig at The New York Times. We think he's really a Mac guy, but so what?--he knows all the pitfalls, pratfalls, and significant stuff hidden in Vista. Heck, without this book you could spend a year just searching for a Start button. Besides, it's always nice to have someone with a sense of humor lead the way when your galloping into unknown territory. Tally ho, Pogue!"
-- Derek Fell, SingBat Magazine: The Monthly Review of Cool Tools

"As long as I'm recommending additional reading on Windows Vista, I'd say you should consider a new book from my competitor, David Pogue, at the New York Times. He's written a book, "Windows Vista, the Missing Manual.""
-- Dean Takahashi, The TechTalk Blog

"There are a lot of good books, but I keep returning to the Missing Manual series because they are inexpensive, easy to read and full of cool tricks and tips."
-- Bob Brooks, The South Bay Apple Mac User Group

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Exhibit 1035

COOLTHINGS (https://www.coolthings.com)

Litl Webbook Beats ChromeOS, Becomes First Cloud Computer

NOVEMBER 16, 2009





(https://netdna.coolthings.com/wp-content/uploads/2009/11/litl1.jpg)

Looks like someone beat Google's ChromeOS to a pure "cloud-based netbook." An upstart company from Boston recently introduced the Litl, which rightfully makes the claim of being the world's very first "webbook" (yes, that's a new category they coined themselves).

Sporting guts no better (actually, it's worse) than your standard EeePC or AspireOne, the smallish computer takes the stripping down even further. There's no hard disk, with an onboard 2GB of flash memory acting as the only integrated storage.



(https://netdna.coolthings.com/wp-content/uploads/2009/11/litl2.jpg)

The Litl looks to use the cloud for saving data, access to which is naturally bundled with the machine's overall price. While the company protests at being called a netbook, it's tough to deny given the specs: 1.6GHz Intel Atom CPU, 1GB of RAM, Wi-Fi, webcam, mic and speakers. Oh yeah, there's an HDMI out too, but the details reveal nothing about the GPU, so how well you can use that remains a question mark.

Physically, it looks exciting, toting a 12.1-inch display that can open past 180 degrees, allowing you to prop it on a table like an overpowered LCD frame (in case you just want to watch a streaming video or a slideshow). There's no complicated OS running inside, either. Like Google's much-talked about ChromeOS, everything happens within the confines of a browser, for which the company designed a good amount of apps on their own.

If you have no need past web apps (assuming it can run the gamut of Ajax, Flash, HTML5 and such), feeds and other online content, the Litl sounds like an excellent machine to swipe the plastic for. That is, until you hear about the price: $700 (with an optional remote for $19).

Honestly, the reason I want a "web-only" netbook is because I can (presumably) buy it for cheap. This thing, though, is just $300 shy of the cheapest MacBook. I guess we'll have to wait for the first ChromeOS PC then. Sigh.

[Litl (http://litl.com/)]



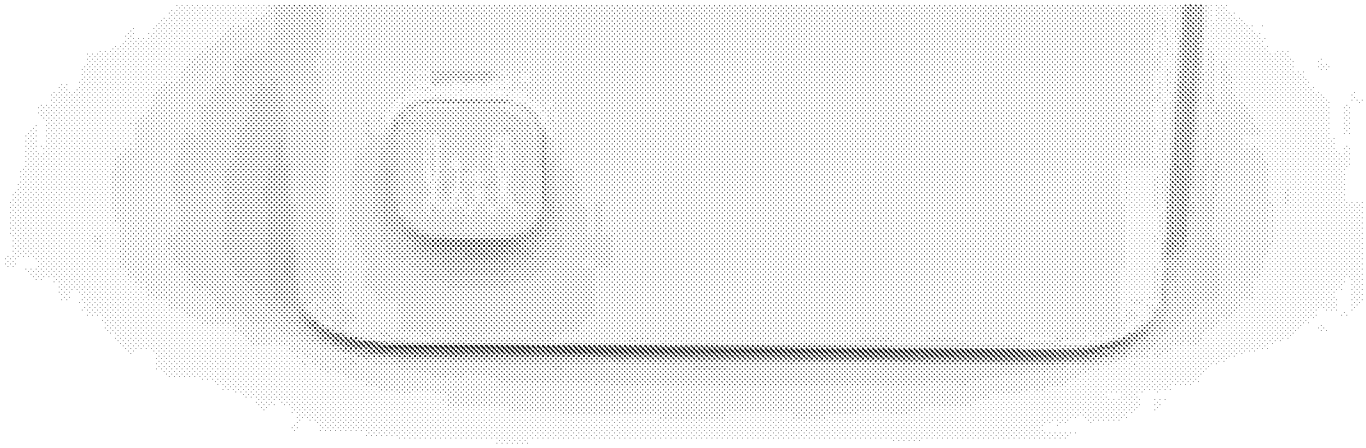
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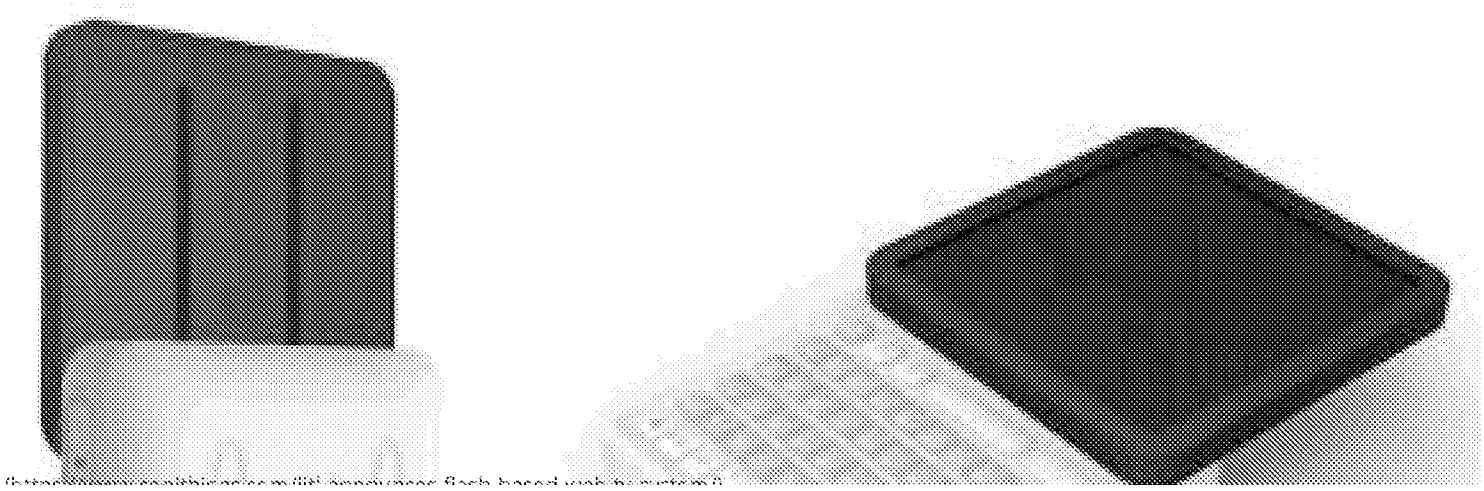
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MAY 14, 2010

2 RESPONSES



November 16, 2009 (https://www.coolthings.com/litl-webbook-beats-chromeos-becomes-first-cloud-computer/#comment-2117)

litl_phil (http://litl.com)

Reply (/litl-webbook-beats-chromeos-becomes-first-cloud-computer/?replytocom=2117#respond)

Hi Noel,

You're quite right about us being the first cloud-based webbook. The alternatives are all vaporware at present.

About the price: firstly, you're wrong about our hardware being on the level of those cheapie netbooks. We have the best lcd on the market for its size – it's amazingly bright (you can watch it in sunshine) and the viewing angle is so wide you can view this thing from almost anywhere in the room. Our casing and keyboard are both high quality also. We've only cut hardware where we don't need it. We didn't need a high powered cpu and our users won't need local storage in the device.

Secondly, we're a premium product and quite up front about being a designer item for the home. We've put a lot of work and money into both the UI and the industrial design, and it shows. Just look at it. This is a stylish, high quality device. You get what you pay for.

The other point to note is our webbook is part of a bigger picture: we're building a new platform for our users to access web content, with customized applications (our channels) that turn multiple interfaces for selected webapps and streaming content into one interface – ours. We want utmost simplicity.

Our user experience will keep getting richer with time via our update system which upgrades and maintains your software while you sleep. New channels and features will continue to appear on your litl webbook.

Finally, our platform is being built to keep friends and families in touch using our device linking and sharing features.

There's a lot to litl. Check out litl.com



November 19, 2009 (https://www.coolthings.com/litl-webbook-beats-chromeos-becomes-first-cloud-computer/#comment-2188)

Mark in CA

Reply (/litl-webbook-beats-chromeos-becomes-first-cloud-computer/?replytocom=2188#respond)

The Litl Webbook is based on Ubuntu. The only GPU that makes sense for this machine is the nVidia ION. For a more detailed description of what's under the hood, go here: http://blogs.gnome.org/lucasr/2009/11/04/litl-webbook-some-technical-comments/ (http://blogs.gnome.org/lucasr/2009/11/04/litl-webbook-some-technical-comments/)

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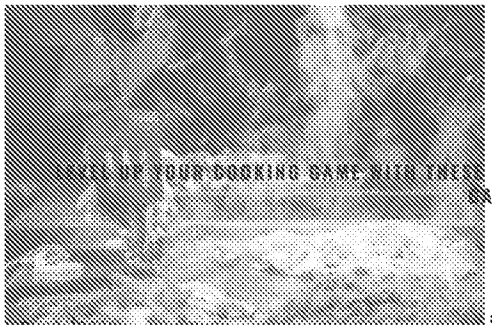
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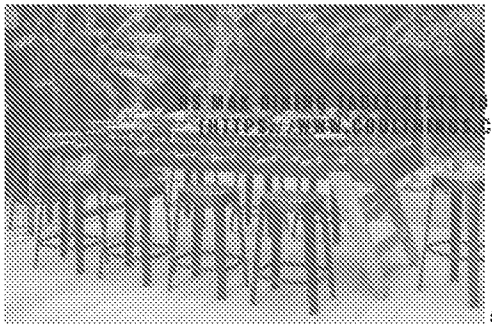
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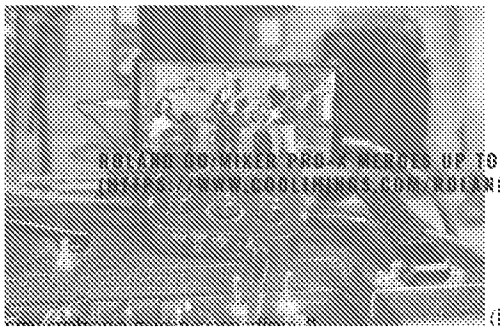
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(https://www.coolthings.com/rs-max-dining-table-foosball-game-seats-10-people-4v4-play/)



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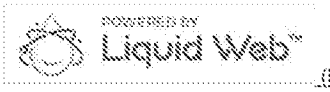
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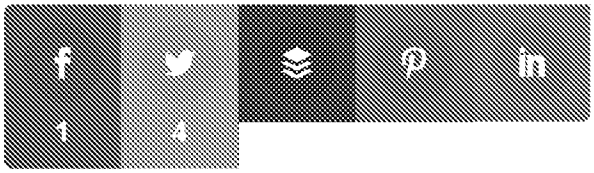
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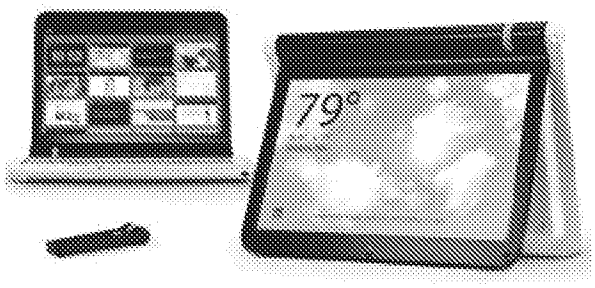
Exhibit 1036



LITL WEBBOOK REVIEW

August 31, 2010 by Kris McDonald 1 Comment



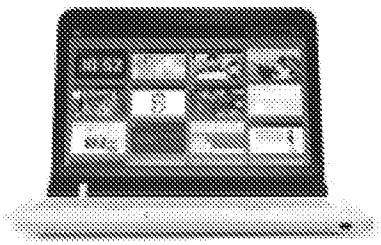


The litl webbook is a very unique little computer. It's about the size of a netbook, but it is half the trouble. I'll admit that I'm not one that wants to use a computer that doesn't do much, but I was intrigued by the litl. I first saw it at an SV Moms Chevy event back in March.

When I first opened it, I thought that I had a dud. It did nothing when I attempted to turn it on. It just presented me with a blank screen. But a quick power cycle fixed that, it quickly installed updates, and I was ready to go.

The litl is designed to be an additional helper in the kitchen, a photo frame, a web TV or a web appliance. That's all it does is web. And it does it fairly well. The litl is running Linux under the hood, but you will never know it. What you see is the customized interface which consists of large buttons called Web Cards. These are bookmarks to the sites that you frequent.

Adding your favorite blogs to a Web Card is really cool. When you save the address it parses it like an RSS reader and shows a slide show of the latest posts on the button. When you click it, you get a quick lists of posts to your left, an easy to read display of the post to your right, and the option to 'go to web page' at the top. You can also click share which brings up a window to email the page to your friends. There is also an option of just viewing the page as a slideshow which scrolls through all of the post images.



The design of the litl makes it the perfect no maintenance computer for a beginner, or a grandparent. There are no updates to worry about. It does all of that automatically when you turn it on. There are zero buttons to push to make sure that you have the latest. It's foolproof.

Specifications:

PROCESSOR

Intel Atom 1.6 gHz

MEMORY

1 GB SDRAM
2GB solid state storage for

operating system and caching

WI-FI

802.11b/g

OPERATING SYSTEM

litl OS

INPUT / OUTPUT

Headphone jack
HDMI 720

USB 2.0 (1)

0.3 megapixel webcam

Full-sized keyboard

2 IR receivers

SCREEN

12.1" widescreen
1280 x 800 resolution

178° viewing cone

Ultra-bright LCD

DIMENSIONS

12.6 x 1.06 x 9.25 inches

BATTERY

3-cell Lithium Ion

Estimated 3 hour use

WEIGHT

3.4 lbs

(remote control optional)



EXTRAS

- Automatic nightly software upgrades, plug-ins, patches, and virus protection for the life of the computer
- Patented hinge to convert to easel mode
- Built-in scroll wheel for easy navigation
- 2 GB solid state storage for operating system and caching
- 2 Internal IR receivers compatible with litl remote
- Full-sized keyboard
- 300k pixel built-in camera

One great feature of the litl is easy photo uploading. You don't have to know anything to get it done. You plug your camera into the USB port, it shows you a slideshow of your photos, and walks you through easily uploading them to the web. Check out this video for more:



Uploading made easy on litl

from litl

02:07

Pros

- Light
- Easy to Use
- No Maintenance

- Unique bendable design to turn it into a display

Cons

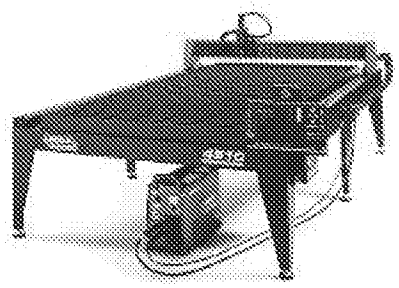
- Since it is based on Linux, there are some drawbacks. The main one being that it cannot run Netflix! I thought it would be very cool to be able to use the litl as an additional "TV" in the kitchen. But Netflix uses Microsoft Silverlight (for some strange reason) and that does not run on the litl. However, Hulu works great!

Summary

I think the litl is perfect for a grandparent who is not that familiar with using a computer, a beginner, or anyone who wants to add a web appliance to any room of their home. There is no learning curve needed to use the litl. If you can click a button, or type in a webpage, you are good to go. Use it to quickly browse the web for recipes, or even watch how to videos on Youtube, check email, upload and view photos or browse the web.

Check out the litl site for even more information. Or view the litl Flickr stream for loads of photos of the litl. The litl maintenance-free computer costs $399.

Ad



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***Disclosure**: The litl Webbook was loaned to me for about a month to do this review. It has since been returned.*

Filed Under: Uncategorized

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Kris McDonald is Chicago mom to 2 sets of twins, wife, photography nut, gadget addict, travel addict, and tech blogger who has worked in IT for over 20 years. She figured out a while ago that she was destined to be really busy (hence the 2 sets of twins), and she has found peace with that. Read More...

« Kenmore Mommy Blogger vs. Foodie Blogger Cookoff

AMD Mom Blogger Summit: A True Techy Mom's Nerd Paradise »

COMMENTS

Reggie Levine — September 2, 2010 at 2:28 am

That is a sharp little computer. Definitely something for my less savvy relatives.

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Exhibit 1027

US 20080211778A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2008/0211778 A1

(43) Pub. Date: Sep. 4, 2008

Ording et al.

(54) SCREEN ROTATION GESTURES ON A PORTABLE MULTIFUNCTION DEVICE

(76) Inventors: **Bas Ording**, San Francisco, CA (US); **Marcel Van Os**, San Francisco, CA (US); **Imran Chaudhri**, San Francisco, CA (US)

Correspondence Address:
MORGAN LEWIS & BOCKIUS LLP/ AI
2 PALO ALTO SQUARE, 3000 EL CAMINO REAL
PALO ALTO, CA 94306 (US)

(21) Appl. No.: **11/960,667**

(22) Filed: **Dec. 19, 2007**

Related U.S. Application Data

(60) Provisional application No. 60/937,993, filed on Jun. 29, 2007, provisional application No. 60/946,970, filed on Jun. 28, 2007, provisional application No. 60/879,469, filed on Jan. 8, 2007, provisional application No. 60/879,253, filed on Jan. 7, 2007.

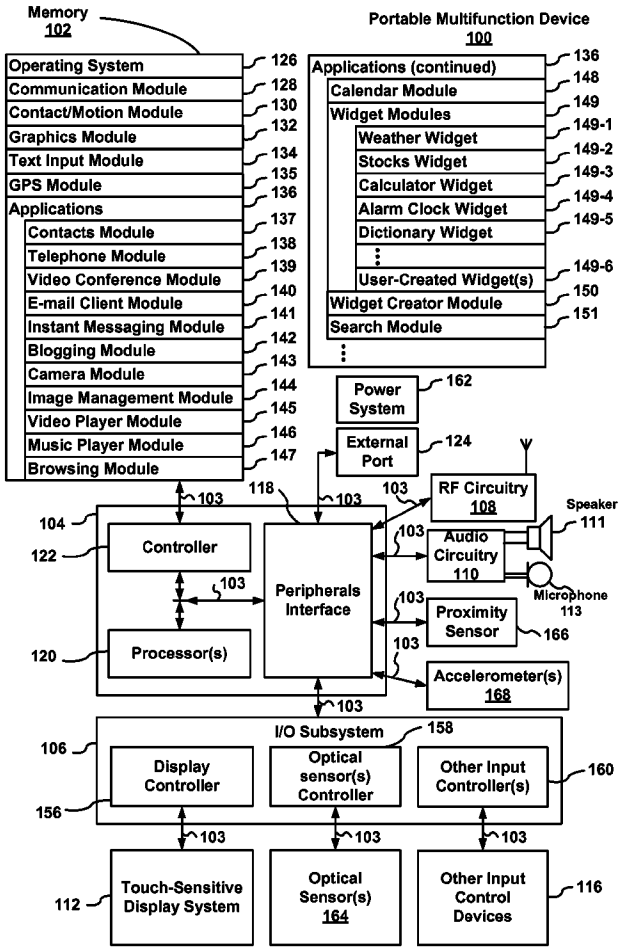
Publication Classification

(51) **Int. Cl.**
G09G 5/00 (2006.01)

(52) **U.S. Cl.** **345/173**

(57) **ABSTRACT**

In accordance with some embodiments, a computer-implemented method performed at a portable multifunction device with a touch screen display includes displaying information on the touch screen display in a portrait orientation. The method also includes detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display, and in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation, displaying the information in a landscape orientation. In some embodiments, the method further includes detecting simultaneous rotation of the two thumbs in a second sense of rotation that is opposite the first sense of rotation, and in response to detecting the simultaneous rotation of the two thumbs in the second sense of rotation, displaying the information in a portrait orientation.



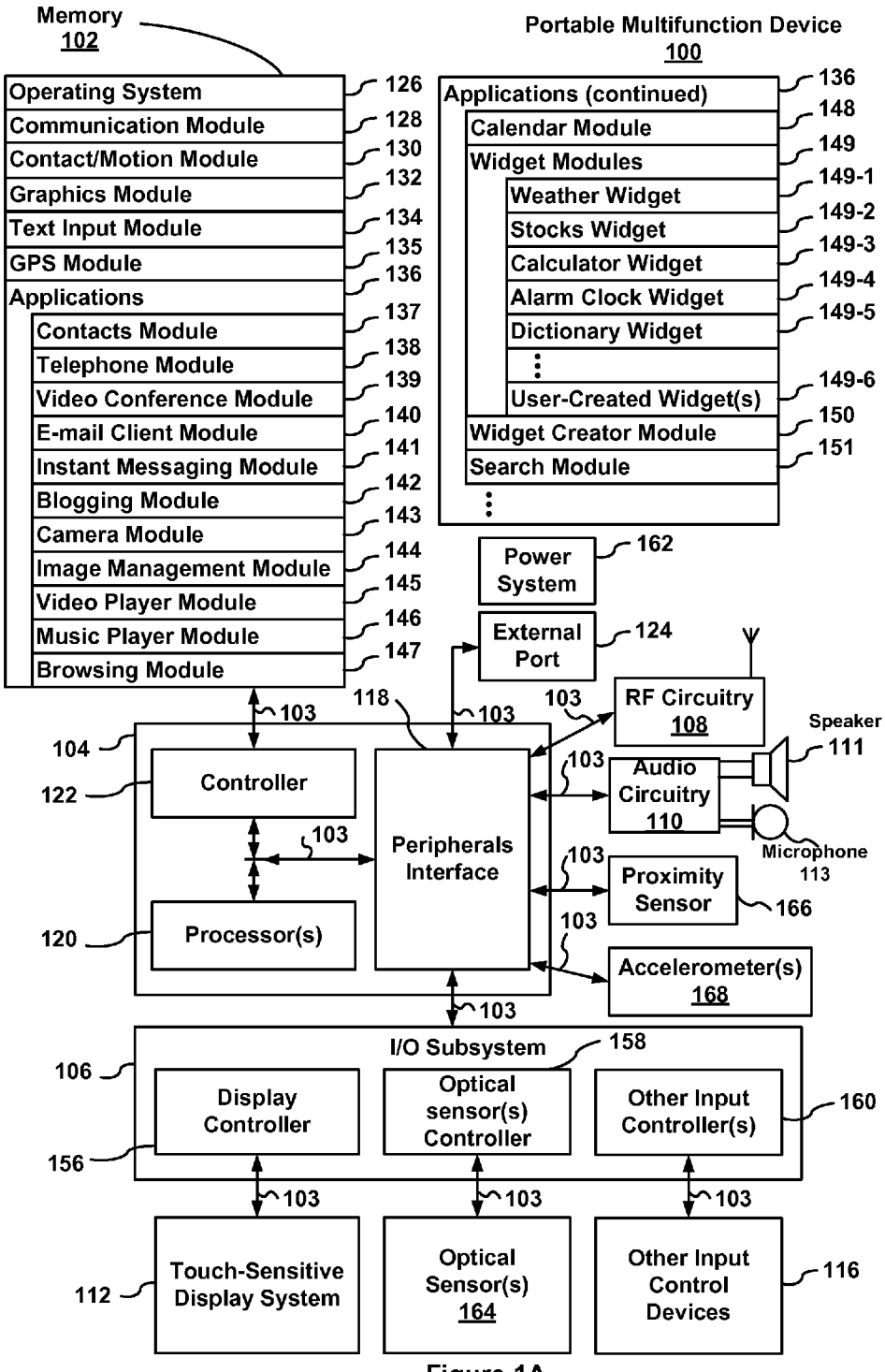

Memory
102
Portable Multifunction Device
100
Operating System
126
Communication Module
128
Contact/Motion Module
130
Graphics Module
132
Text Input Module
134
GPS Module
135
Applications
136
Contacts Module
137
Telephone Module
138
Video Conference Module
139
E-mail Client Module
140
Instant Messaging Module
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Blogging Module
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Camera Module
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Calculator Widget
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Dictionary Widget
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User-Created Widget(s)
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150
Search Module
151
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External Port
124
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108
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111
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110
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166
Accelerometer(s)
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Peripherals Interface
Controller
104
122
Processor(s)
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103
118
I/O Subsystem
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106
Display Controller
Optical sensor(s) Controller
Other Input Controller(s)
160
156
Touch-Sensitive Display System
112
Optical Sensor(s)
164
Other Input Control Devices
116

Figure 1A

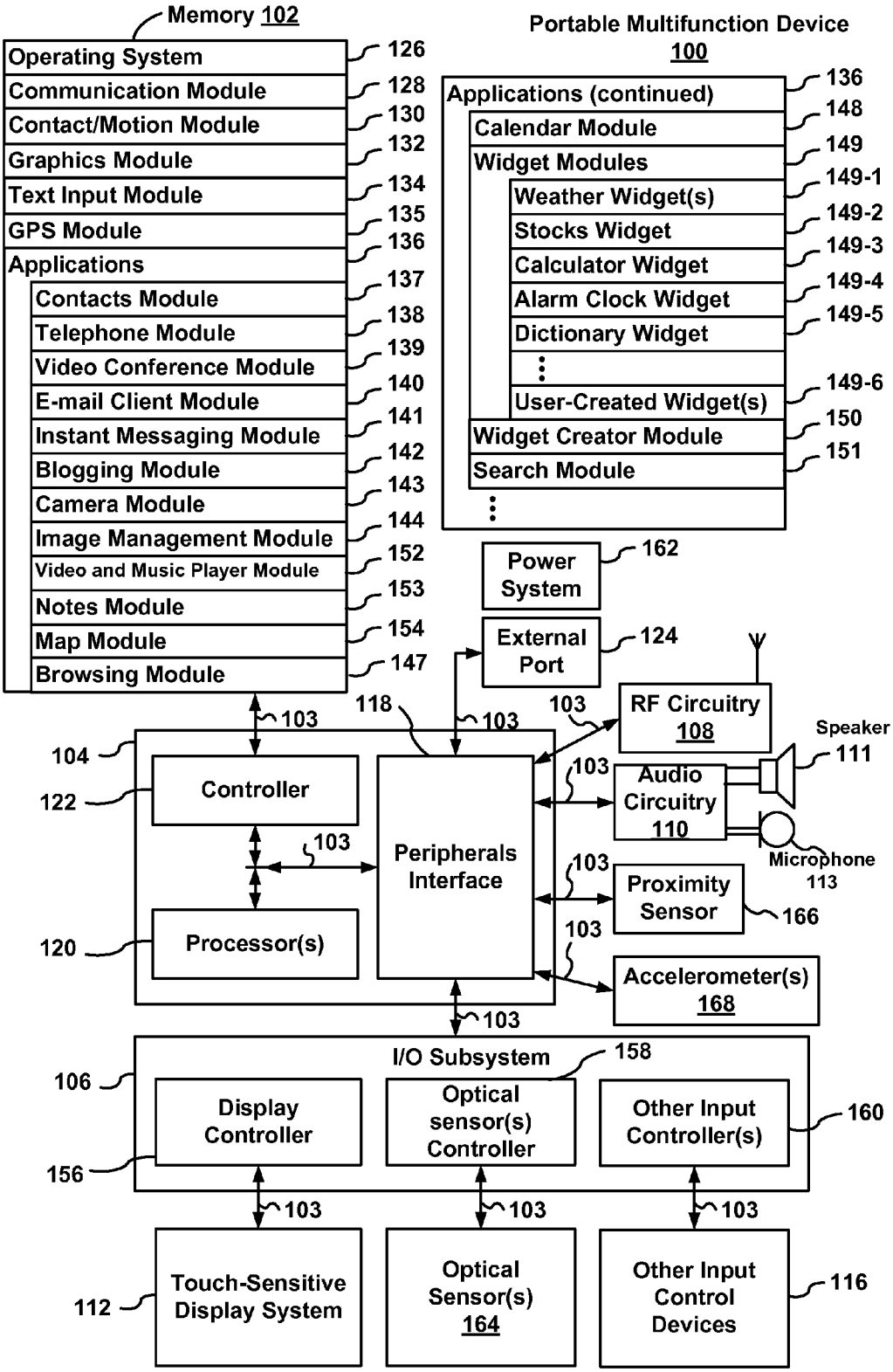

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149-3
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User-Created Widget(s)
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Widget Creator Module
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Proximity Sensor
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122
Controller
Peripherals Interface
120
Processor(s)
I/O Subsystem
158
106
Display Controller
Optical sensor(s) Controller
Other Input Controller(s)
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156
Touch-Sensitive Display System
112
Optical Sensor(s) 164
Other Input Control Devices
116

Figure 1B

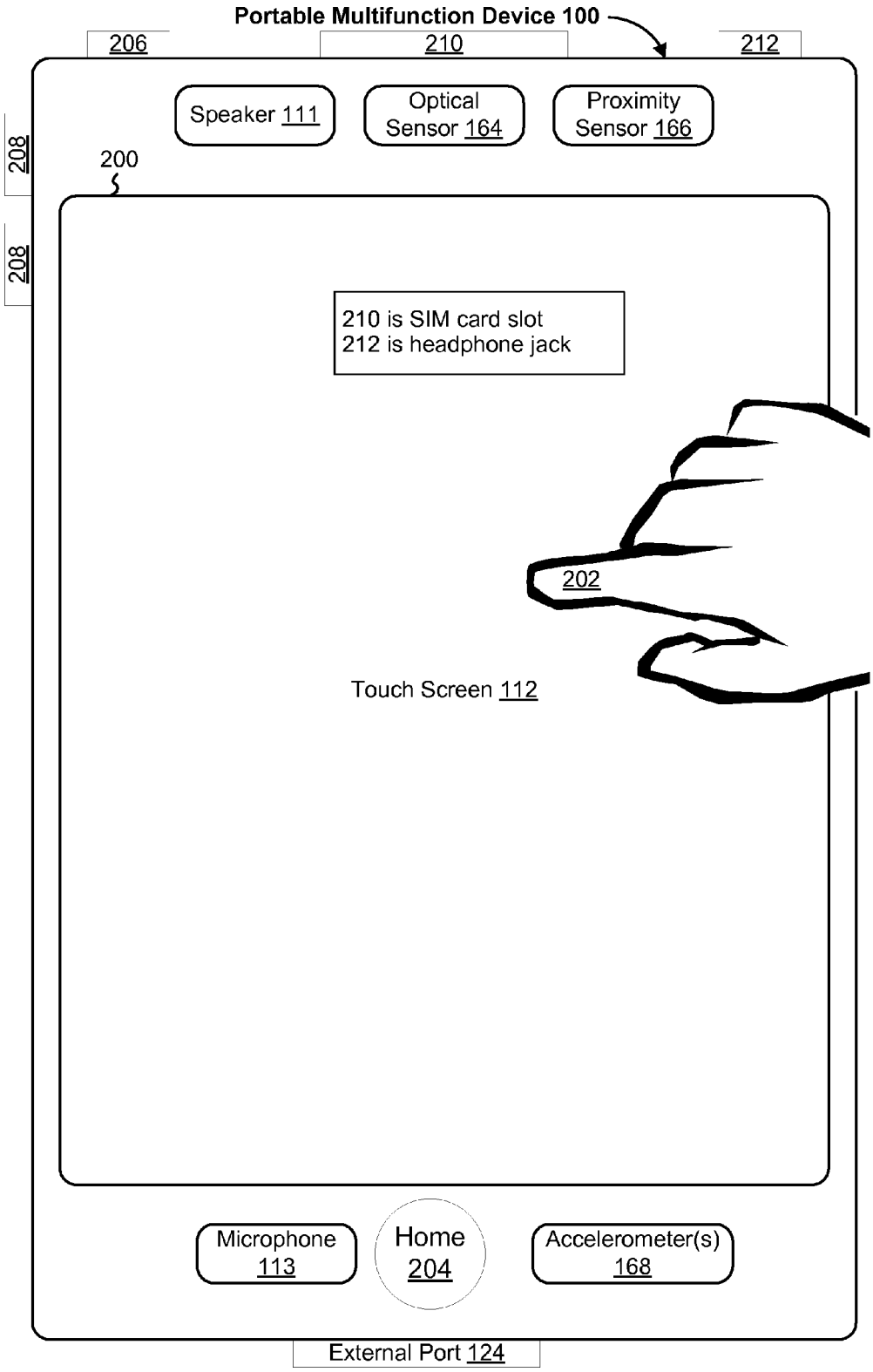

Portable Multifunction Device 100
206
210
212
Speaker 111
Optical Sensor 164
Proximity Sensor 166
208
200
208
210 is SIM card slot
212 is headphone jack
202
Touch Screen 112
Microphone 113
Home 204
Accelerometer(s) 168
External Port 124

Figure 2

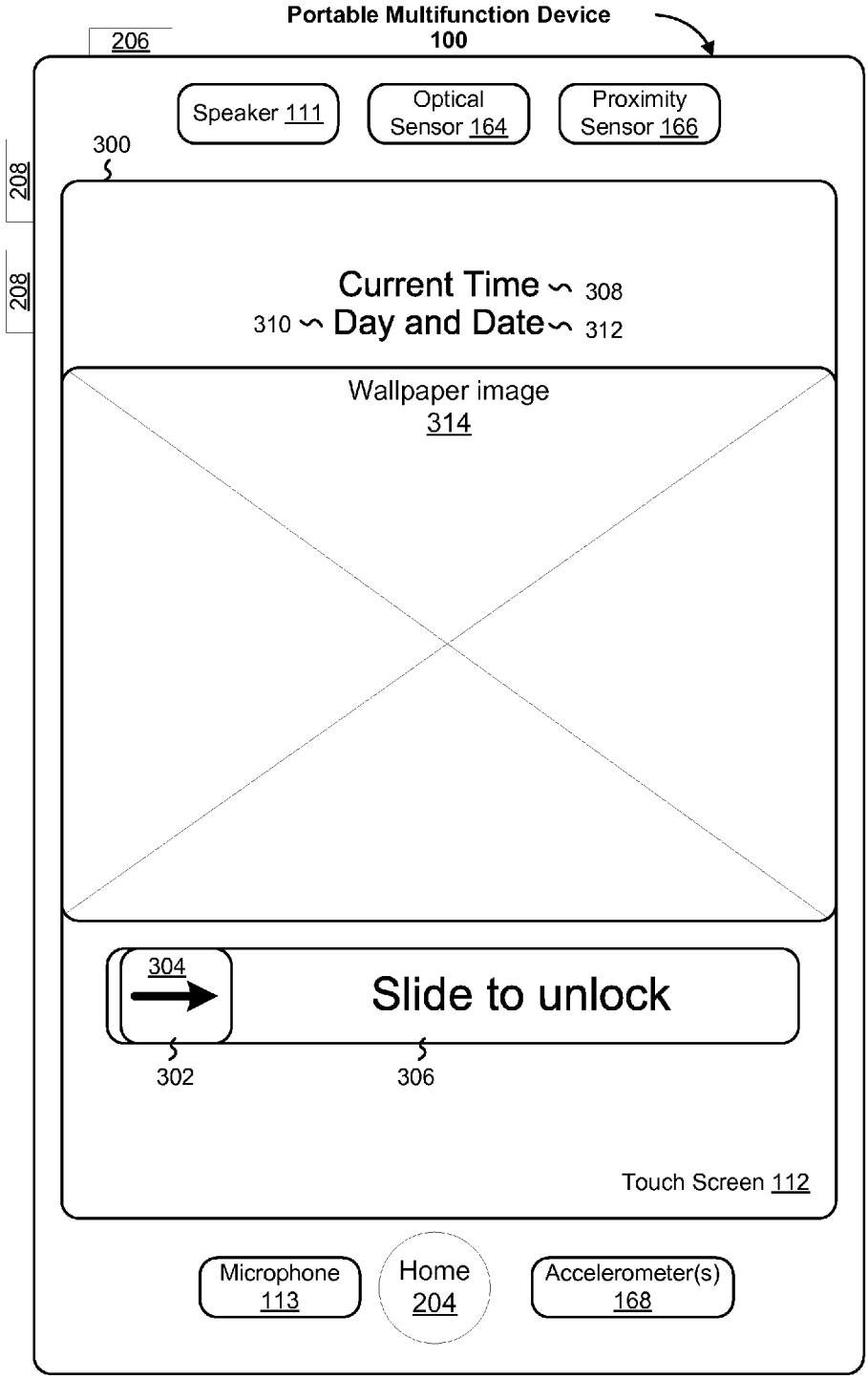

Portable Multifunction Device
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206
Speaker 111
Optical Sensor 164
Proximity Sensor 166
300
208
208
Current Time 308
310 Day and Date 312
Wallpaper image
314
304
Slide to unlock
302
306
Touch Screen 112
Microphone 113
Home 204
Accelerometer(s) 168

Figure 3

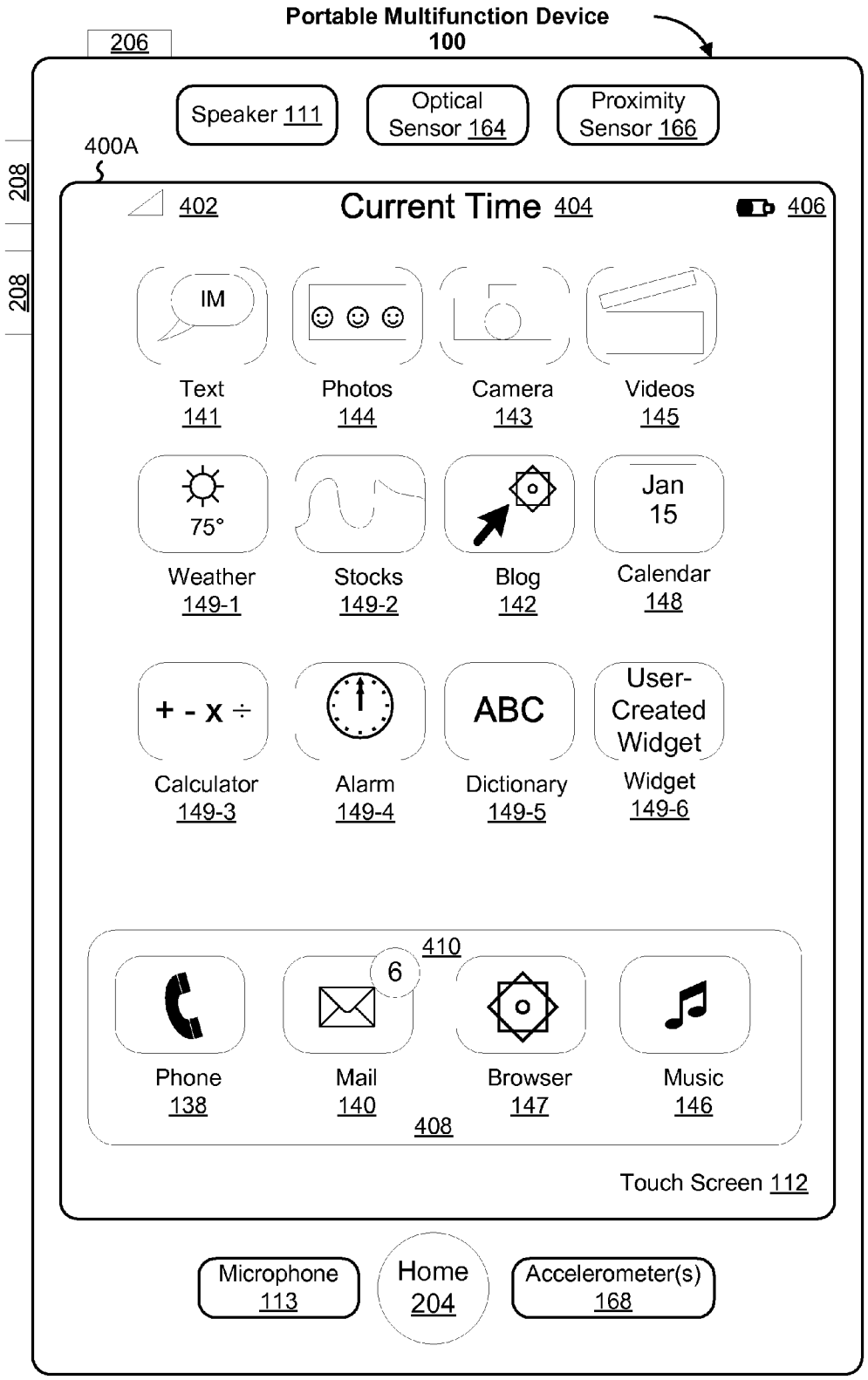

Portable Multifunction Device
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Speaker 111
Optical Sensor 164
Proximity Sensor 166
400A
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402
Current Time 404
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IM
Text 141
Photos 144
Camera 143
Videos 145
75°
Weather 149-1
Stocks 149-2
Blog 142
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Calendar 148
+ - x ÷
Calculator 149-3
Alarm 149-4
ABC
Dictionary 149-5
User-Created Widget
Widget 149-6
410
6
Phone 138
Mail 140
Browser 147
Music 146
408
Touch Screen 112
Microphone 113
Home 204
Accelerometer(s) 168

Figure 4A

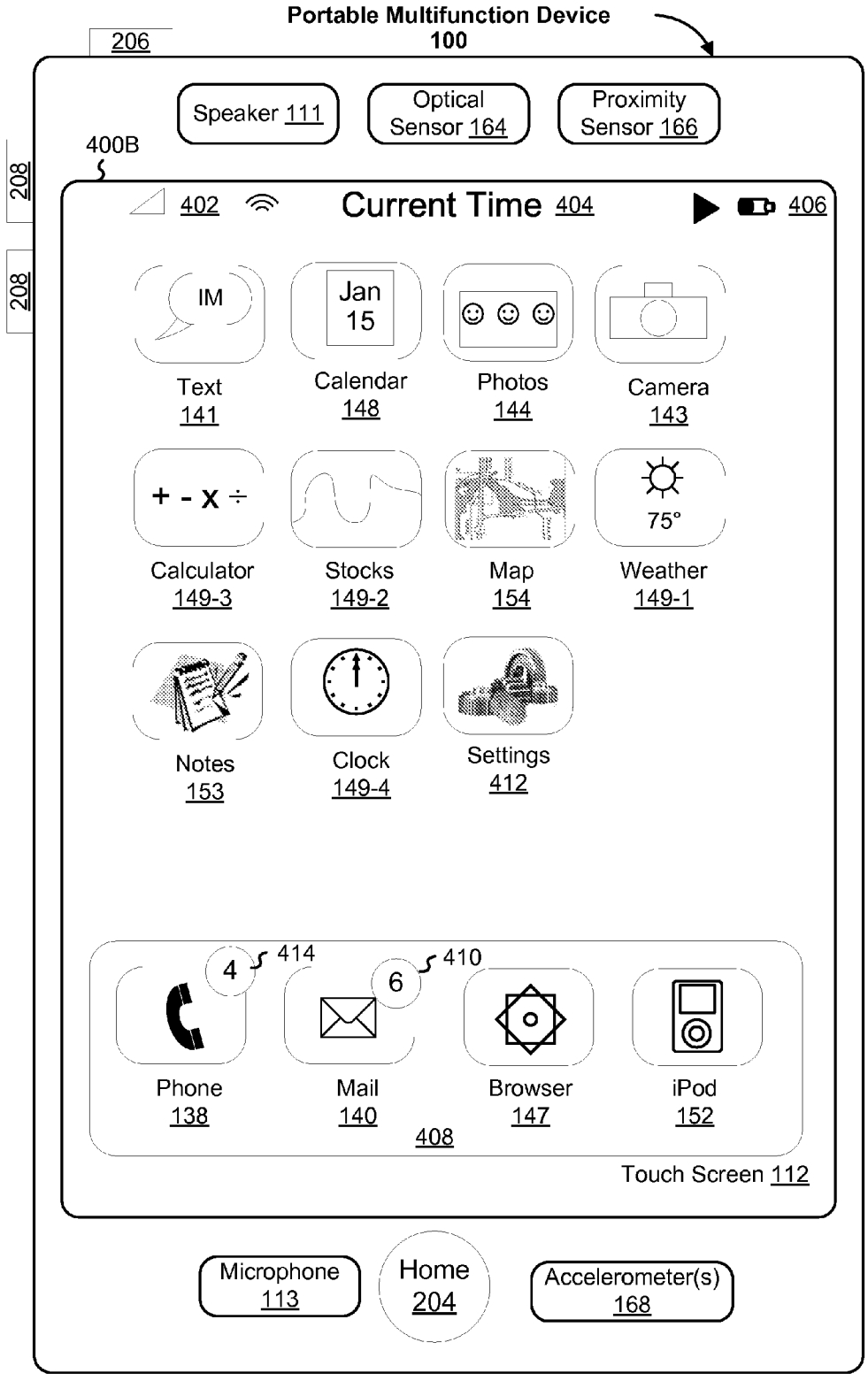

Portable Multifunction Device
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206
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iPod 152
408
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Microphone 113
Home 204
Accelerometer(s) 168

Figure 4B

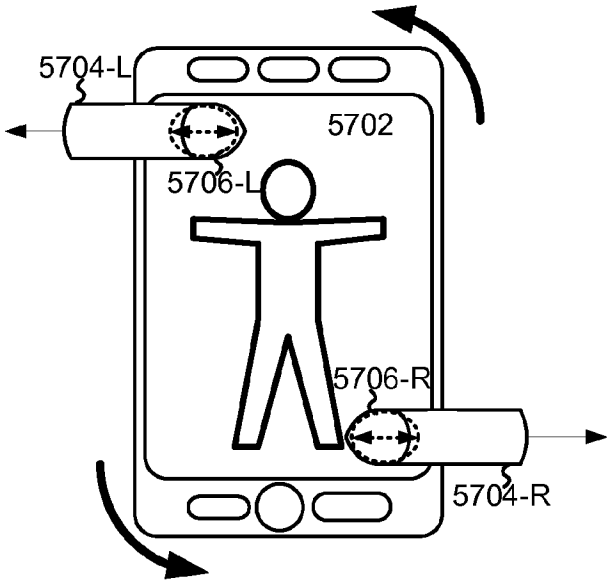


Figure 5A

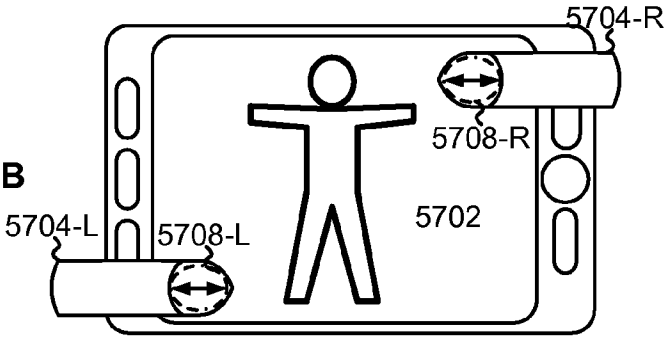


Figure 5B

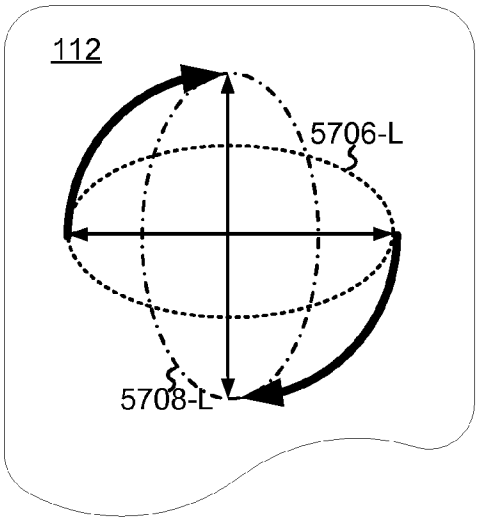


Figure 5C

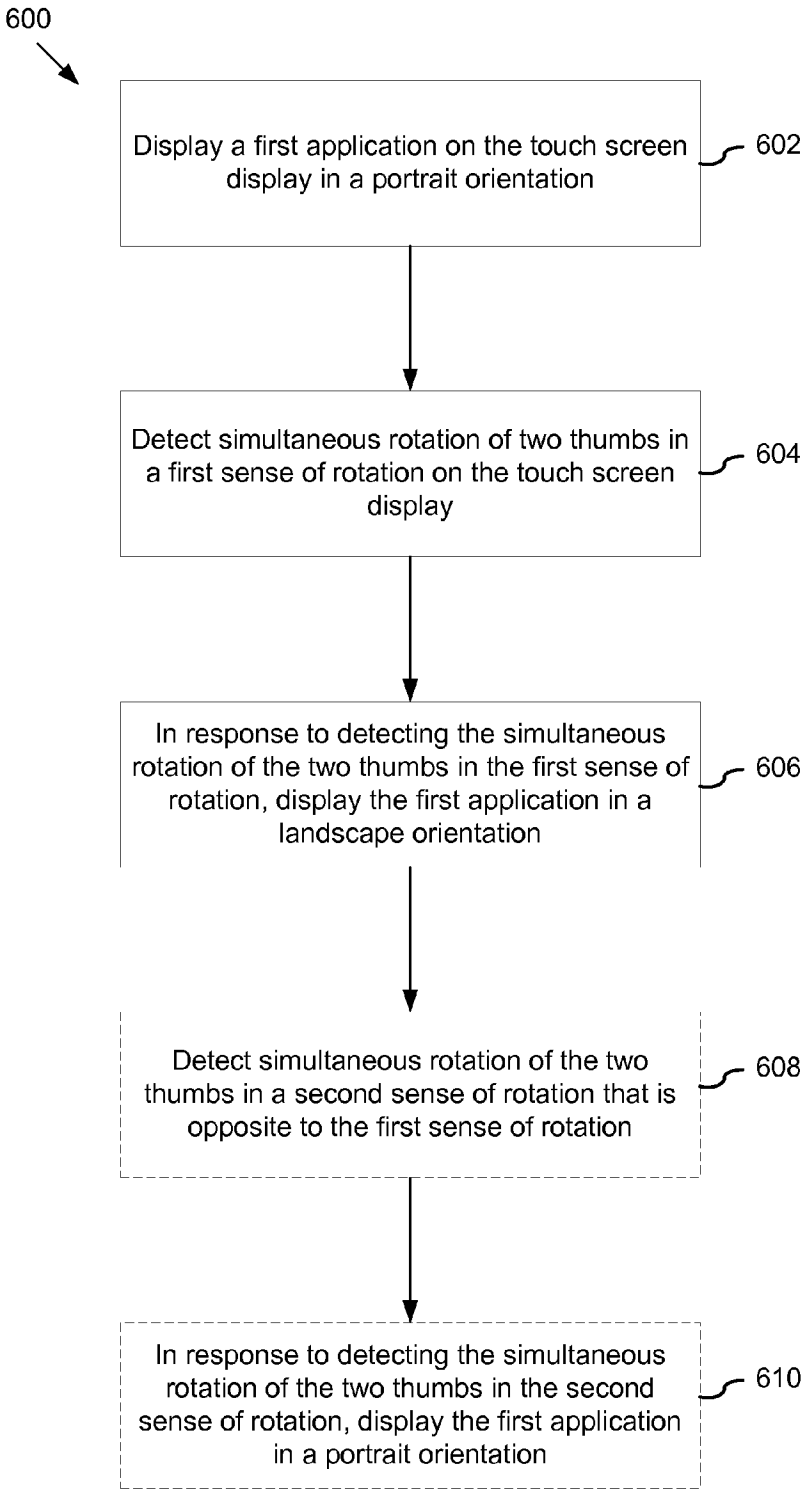

600
Display a first application on the touch screen display in a portrait orientation
602
Detect simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display
604
In response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation, display the first application in a landscape orientation
606
Detect simultaneous rotation of the two thumbs in a second sense of rotation that is opposite to the first sense of rotation
608
In response to detecting the simultaneous rotation of the two thumbs in the second sense of rotation, display the first application in a portrait orientation
610

Figure 6

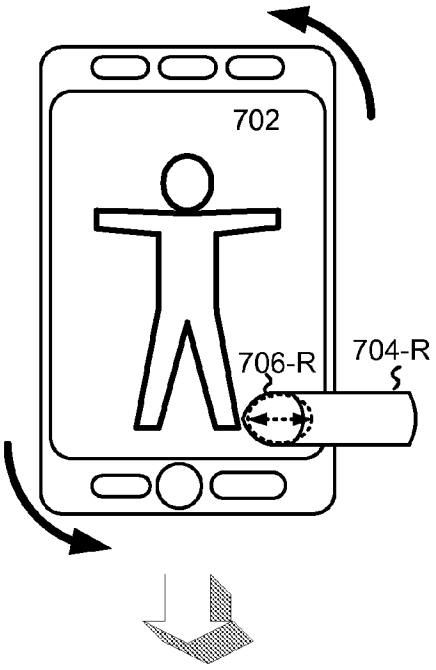


Figure 7A

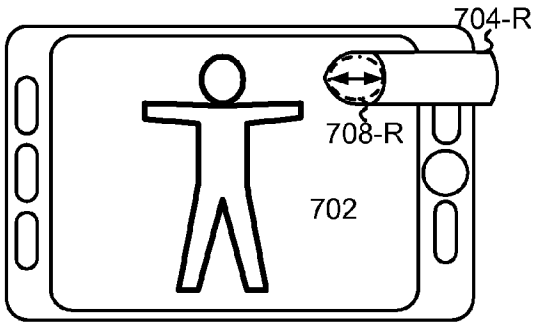


Figure 7B

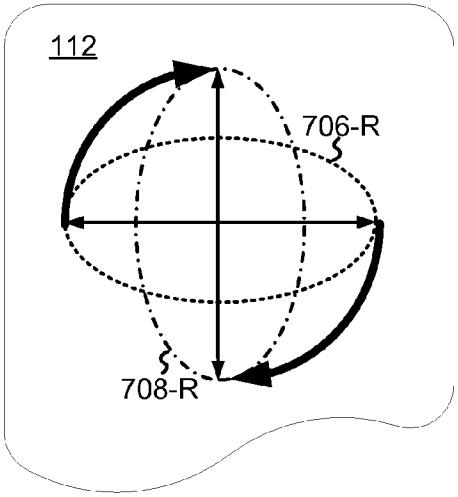


Figure 7C

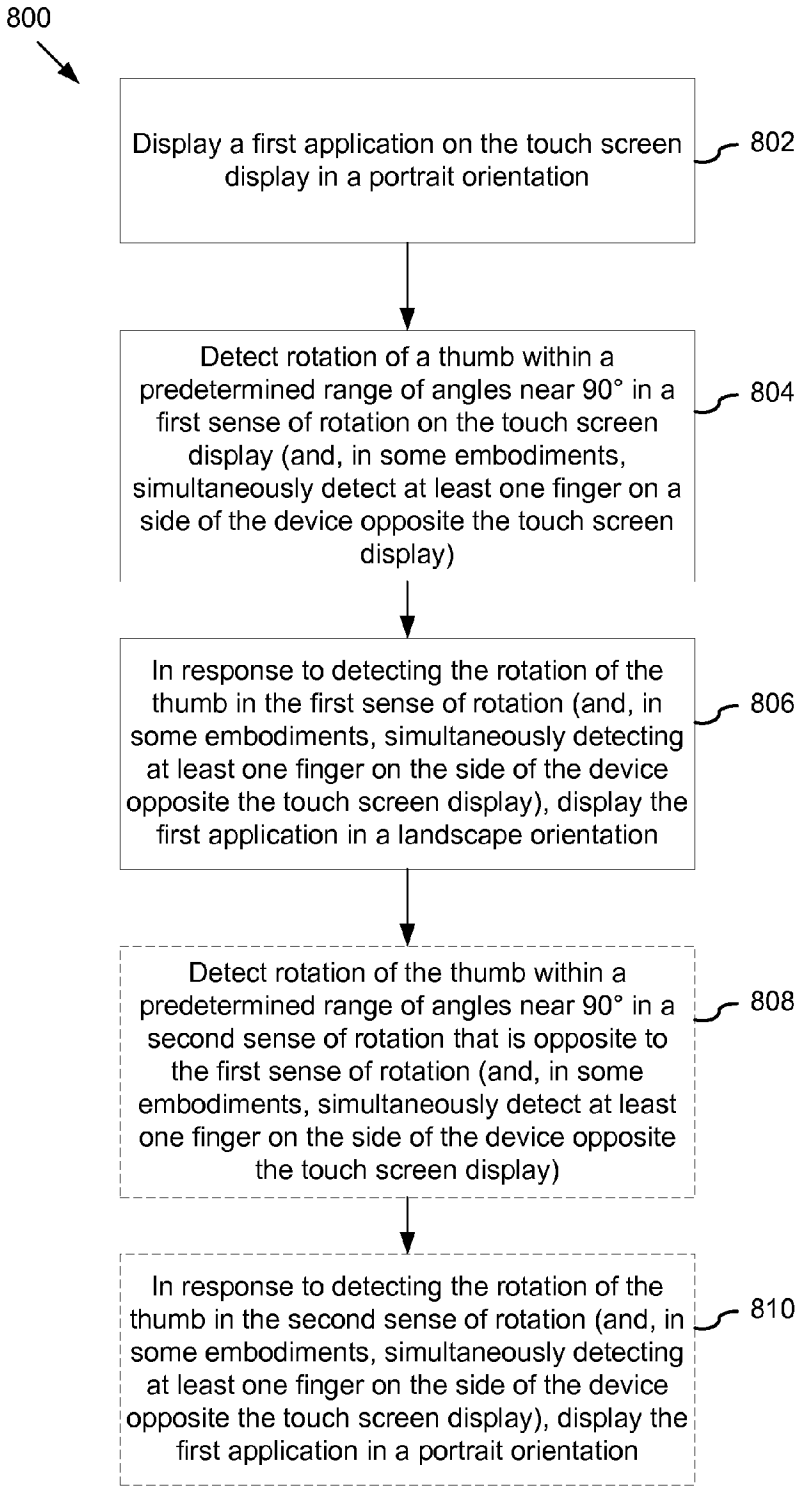

800
Display a first application on the touch screen display in a portrait orientation
802
Detect rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display (and, in some embodiments, simultaneously detect at least one finger on a side of the device opposite the touch screen display)
804
In response to detecting the rotation of the thumb in the first sense of rotation (and, in some embodiments, simultaneously detecting at least one finger on the side of the device opposite the touch screen display), display the first application in a landscape orientation
806
Detect rotation of the thumb within a predetermined range of angles near 90° in a second sense of rotation that is opposite to the first sense of rotation (and, in some embodiments, simultaneously detect at least one finger on the side of the device opposite the touch screen display)
808
In response to detecting the rotation of the thumb in the second sense of rotation (and, in some embodiments, simultaneously detecting at least one finger on the side of the device opposite the touch screen display), display the first application in a portrait orientation
810

Figure 8

SCREEN ROTATION GESTURES ON A PORTABLE MULTIFUNCTION DEVICE

RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Nos. 60/937,993, "Portable Multifunction Device," filed Jun. 29, 2007; 60/946,970, "Screen Rotation Gestures on a Portable Multifunction Device," filed Jun. 28, 2007, 60/879,469, "Portable Multifunction Device," filed Jan. 8, 2007; and 60/879,253, "Portable Multifunction Device," filed Jan. 7, 2007. All of these applications are incorporated by reference herein in their entirety.

[0002] This application is related to the following applications: (1) U.S. patent application Ser. No. 10/188,182, "Touch Pad For Handheld Device," filed Jul. 1, 2002; (2) U.S. patent application Ser. No. 10/722,948, "Touch Pad For Handheld Device," filed Nov. 25, 2003; (3) U.S. patent application Ser. No. 10/643,256, "Movable Touch Pad With Added Functionality," filed Aug. 18, 2003; (4) U.S. patent application Ser. No. 10/654,108, "Ambidextrous Mouse," filed Sep. 2, 2003; (5) U.S. patent application Ser. No. 10/840,862, "Multipoint Touchscreen," filed May 6, 2004; (6) U.S. patent application Ser. No.: 10/903,964, "Gestures For Touch Sensitive Input Devices," filed Jul. 30,2004; (7) U.S. patent application Ser. No. 11/038,590, "Mode-Based Graphical User Interfaces For Touch Sensitive Input Devices" filed Jan. 18, 2005; (8) U.S. patent application Ser. No. 11/057,050, "Display Actuator," filed Feb. 11, 2005; (9) U.S. Provisional Patent Application No. 60/658,777, "Multi-Functional Hand-Held Device," filed Mar. 4, 2005; (10) U.S. patent application Ser. No. 11/367,749, "Multi-Functional Hand-Held Device," filed Mar. 3, 2006; and U.S. Provisional Patent Application No. 60/824,769, "Portable Multifunction Device," filed Sep. 6, 2006. All of these applications are incorporated by reference in their entirety.

TECHNICAL FIELD

[0003] The disclosed embodiments relate generally to portable electronic devices, and more particularly, to portable devices that implement screen rotation gestures.

BACKGROUND

[0004] As portable electronic devices become more compact, and the number of functions performed by a given device increase, it has become a significant challenge to design a user interface that allows users to easily interact with a multifunction device. This challenge is particular significant for handheld portable devices, which have much smaller screens than desktop or laptop computers. This situation is unfortunate because the user interface is the gateway through which users receive not only content but also responses to user actions or behaviors, including user attempts to access a device's features, tools, and functions. Some portable communication devices (e.g., mobile telephones, sometimes called mobile phones, cell phones, cellular telephones, and the like) have resorted to adding more pushbuttons, increasing the density of push buttons, overloading the functions of pushbuttons, or using complex menu systems to allow a user to access, store and manipulate data. These conventional user interfaces often result in complicated key sequences and menu hierarchies that must be memorized by the user.

[0005] Many conventional user interfaces, such as those that include physical pushbuttons, are also inflexible. This is unfortunate because it may prevent a user interface from being configured and/or adapted by either an application running on the portable device or by users. When coupled with the time consuming requirement to memorize multiple key sequences and menu hierarchies, and the difficulty in activating a desired pushbutton, such inflexibility is frustrating to most users.

[0006] Some portable electronic devices have displays with information that may be viewed in either a portrait orientation or a landscape orientation. But the input from a user required to initiate a screen rotation between the portrait and landscape orientations may not be readily apparent to the user.

[0007] Some portable devices use one or more accelerometers to automatically adjust the orientation of the information on the screen. In these devices, information is displayed on the display in a portrait view or a landscape view based on an analysis of data received from the one or more accelerometers. For these devices, the user may occasionally want to override the orientation displayed based on the accelerometer data. Here too, the user input required to initiate a change between the portrait and landscape orientations may not be readily apparent to the user.

[0008] Accordingly, there is a need for portable multifunction devices with more transparent and intuitive user interfaces for implementing screen rotations. Such interfaces increase the effectiveness, efficiency and user satisfaction with portable multifunction devices.

SUMMARY

[0009] The above deficiencies and other problems associated with user interfaces for portable devices are reduced or eliminated by the disclosed portable multifunction device. In some embodiments, the device has a touch-sensitive display (also known as a "touch screen") with a graphical user interface (GUI), one or more processors, memory and one or more modules, programs or sets of instructions stored in the memory for performing multiple functions. In some embodiments, the user interacts with the GUI primarily through finger contacts and gestures on the touch-sensitive display. In some embodiments, the functions may include telephoning, video conferencing, e-mailing, instant messaging, blogging, digital photographing, digital videoing, web browsing, digital music playing, and/or digital video playing. Instructions for performing these functions may be included in a computer program product configured for execution by one or more processors.

[0010] In accordance with some embodiments, a computer-implemented method performed at a portable multifunction device with a touch screen display includes displaying information on the touch screen display in a portrait orientation. The method also includes detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display, and in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation, displaying the information in a landscape orientation. In some embodiments, the method further includes detecting simultaneous rotation of the two thumbs in a second sense of rotation that is opposite the first sense of rotation, and in response to detecting the simultaneous rotation of the two thumbs in the second sense of rotation, displaying the information in a portrait orientation.

[0011] In accordance with some embodiments, a graphical user interface on a portable multifunction device with a touch screen display includes an application that is displayed in

either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In response to detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display, the display of the application changes from the first orientation to the second orientation.

[0012] In accordance with some embodiments, a portable multifunction device includes a touch screen display, one or more processors, memory, and one or more programs. The one or more programs are stored in the memory and configured to be executed by the one or more processors, The programs include instructions for: displaying a first application on the touch screen display in a portrait orientation; detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display; and displaying the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

[0013] In accordance with some embodiments, a computer-program product includes a computer readable storage medium and a computer program mechanism embedded therein. The computer program mechanism includes instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to display a first application on the touch screen display in a portrait orientation. The instructions also cause the device to detect simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display and display the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

[0014] In accordance with some embodiments, a portable multifunction device with a touch screen display includes: means for displaying a first application on the touch screen display in a portrait orientation; means for detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display; and means for displaying the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

[0015] In accordance with some embodiments, a computer-implemented method performed at a portable multifunction device with a touch screen display includes displaying information on the touch screen display in a portrait orientation. The method also includes detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display, and in response to detecting the rotation of the thumb, displaying the information in a landscape orientation.

[0016] In accordance with some embodiments, a graphical user interface on a portable multifunction device with a touch screen display includes an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In response to detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display, the display of the application changes from the first orientation to the second orientation.

[0017] In accordance with some embodiments, a portable multifunction device includes a touch screen display, one or more processors, memory, and one or more programs. The one or more programs are stored in the memory and configured to be executed by the one or more processors. The programs include instructions for: displaying a first application on the touch screen display in a portrait orientation; detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and displaying the first application in a landscape orientation in response to detecting the rotation of the thumb.

[0018] In accordance with some embodiments, a computer-program product includes a computer readable storage medium and a computer program mechanism embedded therein. The computer program mechanism includes instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to display a first application on the touch screen display in a portrait orientation. The instructions also cause the device to detect a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display and display the first application in a landscape orientation in response to detecting the rotation of the thumb.

[0019] In accordance with some embodiments, a portable multifunction device with a touch screen display includes: means for displaying a first application on the touch screen display in a portrait orientation; means for detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and means for displaying the first application in a landscape orientation in response to detecting the rotation of the thumb.

[0020] In accordance with some embodiments, a computer-implemented method performed at a portable multifunction device with a touch screen display includes displaying information on the touch screen display in a portrait orientation. The method also includes detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display, displaying the information in a landscape orientation.

[0021] In accordance with some embodiments, a graphical user interface on a portable multifunction device with a touch screen display includes an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In response to detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display and simultaneously detecting at least one finger on a side of the device opposite the touch screen display, the display of the application changes from the first orientation to the second orientation.

[0022] In accordance with some embodiments, a portable multifunction device includes a touch screen display, one or more processors, memory, and one or more programs. The one or more programs are stored in the memory and configured to be executed by the one or more processors. The programs include instructions for: displaying a first application on the touch screen display in a portrait orientation; detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and displaying the first application in a landscape orientation in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

[0023] In accordance with some embodiments, a computer-program product includes a computer readable storage medium and a computer program mechanism embedded therein. The computer program mechanism includes instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to display a first application on the touch screen display in a portrait orientation. The instructions also cause the device to detect a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; simultaneously detect at least one finger on a side of the device opposite the touch screen display; and display the first application in a landscape orientation in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

[0024] In accordance with some embodiments, a portable multifunction device with a touch screen display includes: means for displaying a first application on the touch screen display in a portrait orientation; means for detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; means for simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and means for displaying the first application in a landscape orientation in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

[0025] Thus, the invention provides a portable multifunction device with more transparent and intuitive user interfaces for implementing screen rotations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] For a better understanding of the aforementioned embodiments of the invention as well as additional embodiments thereof, reference should be made to the Description of Embodiments below, in conjunction with the following drawings in which like reference numerals refer to corresponding parts throughout the figures.

[0027] FIGS. **1**A and **1**B are block diagrams illustrating portable multifunction devices with touch-sensitive displays in accordance with some embodiments.

[0028] FIG. **2** illustrates a portable multifunction device having a touch screen in accordance with some embodiments.

[0029] FIG. **3** illustrates an exemplary user interface for unlocking a portable electronic device in accordance with some embodiments.

[0030] FIGS. **4**A and **4**B illustrate exemplary user interfaces for a menu of applications on a portable multifunction device in accordance with some embodiments.

[0031] FIGS. **5**A-**5**C illustrate an exemplary screen rotation gesture in accordance with some embodiments.

[0032] FIG. **6** is a flow diagram illustrating a process for implementing screen rotation gestures in accordance with some embodiments.

[0033] FIGS. **7**A-**7**C illustrate an exemplary screen rotation gesture in accordance with some embodiments.

[0034] FIG. **8** is a flow diagram illustrating a process for implementing screen rotation gestures in accordance with some embodiments.

DESCRIPTION OF EMBODIMENTS

[0035] Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings. In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well-known methods, procedures, components, circuits, and networks have not been described in detail so as not to unnecessarily obscure aspects of the embodiments.

[0036] It will also be understood that, although the terms first, second, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first gesture could be termed a second gesture, and, similarly, a second gesture could be termed a first gesture, without departing from the scope of the present invention.

[0037] The terminology used in the description of the invention herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used in the description of the invention and the appended claims, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will also be understood that the term "and/or" as used herein refers to and encompasses any and all possible combinations of one or more of the associated listed items. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0038] Embodiments of a portable multifunction device, user interfaces for such devices, and associated processes for using such devices are described. In some embodiments, the device is a portable communications device such as a mobile telephone that also contains other functions, such as PDA and/or music player functions.

[0039] The user interface may include a physical click wheel in addition to a touch screen or a virtual click wheel displayed on the touch screen. A click wheel is a user-interface device that may provide navigation commands based on an angular displacement of the wheel or a point of contact with the wheel by a user of the device. A click wheel may also be used to provide a user command corresponding to selection of one or more items, for example, when the user of the device presses down on at least a portion of the wheel or the center of the wheel. Alternatively, breaking contact with a click wheel image on a touch screen surface may indicate a user command corresponding to selection. For simplicity, in the discussion that follows, a portable multifunction device that includes a touch screen is used as an exemplary embodiment. It should be understood, however, that some of the user interfaces and associated processes may be applied to other devices, such as personal computers and laptop computers,

that may include one or more other physical user-interface devices, such as a physical click wheel, a physical keyboard, a mouse and/or a joystick.

[0040] The device supports a variety of applications, such as a telephone application, a video conferencing application, an e-mail application, an instant messaging application, a blogging application, a digital camera application, a digital video camera application, a web browsing application, a digital music player application, and/or a digital video player application.

[0041] The various applications that may be executed on the device may use at least one common physical user-interface device, such as the touch screen. One or more functions of the touch screen as well as corresponding information displayed on the device may be adjusted and/or varied from one application to the next and/or within a respective application. In this way, a common physical architecture (such as the touch screen) of the device may support the variety of applications with user interfaces that are intuitive and transparent.

[0042] The user interfaces may include one or more soft keyboard embodiments. The soft keyboard embodiments may include standard (QWERTY) and/or non-standard configurations of symbols on the displayed icons of the keyboard, such as those described in U.S. patent applications Ser. No. 11/459,606, "Keyboards For Portable Electronic Devices," filed Jul. 24, 2006, and Ser. No. 11/459,615, "Touch Screen Keyboards For Portable Electronic Devices," filed Jul. 24, 2006, the contents of which are hereby incorporated by reference in their entirety. The keyboard embodiments may include a reduced number of icons (or soft keys) relative to the number of keys in existing physical keyboards, such as that for a typewriter. This may make it easier for users to select one or more icons in the keyboard, and thus, one or more corresponding symbols. The keyboard embodiments may be adaptive. For example, displayed icons may be modified in accordance with user actions, such as selecting one or more icons and/or one or more corresponding symbols. One or more applications on the portable device may utilize common and/or different keyboard embodiments. Thus, the keyboard embodiment used may be tailored to at least some of the applications. In some embodiments, one or more keyboard embodiments may be tailored to a respective user. For example, one or more keyboard embodiments may be tailored to a respective user based on a word usage history (lexicography, slang, individual usage) of the respective user. Some of the keyboard embodiments may be adjusted to reduce a probability of a user error when selecting one or more icons, and thus one or more symbols, when using the soft keyboard embodiments.

[0043] Attention is now directed towards embodiments of the device. FIGS. **1**A and **1**B are block diagrams illustrating portable multifunction devices **100** with touch-sensitive displays **112** in accordance with some embodiments. The touch-sensitive display **112** is sometimes called a "touch screen" for convenience, and may also be known as or called a touch-sensitive display system. The device **100** may include a memory **102** (which may include one or more computer readable storage mediums), a memory controller **122**, one or more processing units (CPU's) **120**, a peripherals interface **118**, RF circuitry **108**, audio circuitry **110**, a speaker **111**, a microphone **113**, an input/output (I/O) subsystem **106**, other input or control devices **116**, and an external port **124**. The device **100** may include one or more optical sensors **164**. These components may communicate over one or more communication buses or signal lines **103**.

[0044] It should be appreciated that the device **100** is only one example of a portable multifunction device **100**, and that the device **100** may have more or fewer components than shown, may combine two or more components, or a may have a different configuration or arrangement of the components. The various components shown in FIGS. **1**A and **1**B may be implemented in hardware, software or a combination of both hardware and software, including one or more signal processing and/or application specific integrated circuits.

[0045] Memory **102** may include high-speed random access memory and may also include non-volatile memory, such as one or more magnetic disk storage devices, flash memory devices, or other non-volatile solid-state memory devices. Access to memory **102** by other components of the device **100**, such as the CPU **120** and the peripherals interface **118**, may be controlled by the memory controller **122**.

[0046] The peripherals interface **118** couples the input and output peripherals of the device to the CPU **120** and memory **102**. The one or more processors **120** run or execute various software programs and/or sets of instructions stored in memory **102** to perform various functions for the device **100** and to process data.

[0047] In some embodiments, the peripherals interface **118**, the CPU **120**, and the memory controller **122** may be implemented on a single chip, such as a chip **104**. In some other embodiments, they may be implemented on separate chips.

[0048] The RF (radio frequency) circuitry **108** receives and sends RF signals, also called electromagnetic signals. The RF circuitry **108** converts electrical signals to/from electromagnetic signals and communicates with communications networks and other communications devices via the electromagnetic signals. The RF circuitry **108** may include well-known circuitry for performing these functions, including but not limited to an antenna system, an RF transceiver, one or more amplifiers, a tuner, one or more oscillators, a digital signal processor, a CODEC chipset, a subscriber identity module (SIM) card, memory, and so forth. The RF circuitry **108** may communicate with networks, such as the Internet, also referred to as the World Wide Web (WWW), an intranet and/or a wireless network, such as a cellular telephone network, a wireless local area network (LAN) and/or a metropolitan area network (MAN), and other devices by wireless communication. The wireless communication may use any of a plurality of communications standards, protocols and technologies, including but not limited to Global System for Mobile Communications (GSM), Enhanced Data GSM Environment (EDGE), high-speed downlink packet access (HSDPA), wideband code division multiple access (W-CDMA), code division multiple access (CDMA), time division multiple access (TDMA), Bluetooth, Wireless Fidelity (Wi-Fi) (e.g., IEEE 802.11a, IEEE 802.11b, IEEE 802.11g and/or IEEE 802.11n), voice over Internet Protocol (VoIP), Wi-MAX, a protocol for email (e.g., Internet message access protocol (IMAP) and/or post office protocol (POP)), instant messaging (e.g., extensible messaging and presence protocol (XMPP), Session Initiation Protocol for Instant Messaging and Presence Leveraging Extensions (SIMPLE), and/or Instant Messaging and Presence Service (IMPS)), and/or Short Message Service (SMS)), or any other suitable communication protocol, including communication protocols not yet developed as of the filing date of this document.

[0049] The audio circuitry **110**, the speaker **111**, and the microphone **113** provide an audio interface between a user and the device **100**. The audio circuitry **110** receives audio data from the peripherals interface **118**, converts the audio data to an electrical signal, and transmits the electrical signal

to the speaker **111**. The speaker **111** converts the electrical signal to human-audible sound waves. The audio circuitry **110** also receives electrical signals converted by the microphone **113** from sound waves. The audio circuitry **110** converts the electrical signal to audio data and transmits the audio data to the peripherals interface **118** for processing. Audio data may be retrieved from and/or transmitted to memory **102** and/or the RF circuitry **108** by the peripherals interface **118**. In some embodiments, the audio circuitry **110** also includes a headset jack (e.g. **212**, FIG. **2**). The headset jack provides an interface between the audio circuitry **110** and removable audio input/output peripherals, such as output-only headphones or a headset with both output (e.g., a headphone for one or both ears) and input (e.g., a microphone).

[0050] The I/O subsystem **106** couples input/output peripherals on the device **100**, such as the touch screen **112** and other input/control devices **116**, to the peripherals interface **118**. The I/O subsystem **106** may include a display controller **156** and one or more input controllers **160** for other input or control devices. The one or more input controllers **160** receive/send electrical signals from/to other input or control devices **116**. The other input/control devices **116** may include physical buttons (e.g., push buttons, rocker buttons, etc.), dials, slider switches, joysticks, click wheels, and so forth. In some alternate embodiments, input controller(s) **160** may be coupled to any (or none) of the following: a keyboard, infrared port, USB port, and a pointer device such as a mouse. The one or more buttons (e.g., **208**, FIG. **2**) may include an up/down button for volume control of the speaker **111** and/or the microphone **113**. The one or more buttons may include a push button (e.g., **206**, FIG. **2**). A quick press of the push button may disengage a lock of the touch screen **112** or begin a process that uses gestures on the touch screen to unlock the device, as described in U.S. patent application Ser. No. 11/322,549, "Unlocking a Device by Performing Gestures on an Unlock Image," filed Dec. 23, 2005, which is hereby incorporated by reference in their entirety. A longer press of the push button (e.g., **206**) may turn power to the device **100** on or off. The user may be able to customize a functionality of one or more of the buttons. The touch screen **112** is used to implement virtual or soft buttons and one or more soft keyboards.

[0051] The touch-sensitive touch screen **112** provides an input interface and an output interface between the device and a user. The display controller **156** receives and/or sends electrical signals from/to the touch screen **112**. The touch screen **112** displays visual output to the user. The visual output may include graphics, text, icons, video, and any combination thereof (collectively termed "graphics"). In some embodiments, some or all of the visual output may correspond to user-interface objects, further details of which are described below.

[0052] A touch screen **112** has a touch-sensitive surface, sensor or set of sensors that accepts input from the user based on haptic and/or tactile contact. The touch screen **112** and the display controller **156** (along with any associated modules and/or sets of instructions in memory **102**) detect contact (and any movement or breaking of the contact) on the touch screen **112** and converts the detected contact into interaction with user-interface objects (e.g., one or more soft keys, icons, web pages or images) that are displayed on the touch screen. In an exemplary embodiment, a point of contact between a touch screen **112** and the user corresponds to a finger of the user.

[0053] The touch screen **112** may use LCD (liquid crystal display) technology, or LPD (light emitting polymer display) technology, although other display technologies may be used in other embodiments. The touch screen **112** and the display controller **156** may detect contact and any movement or breaking thereof using any of a plurality of touch sensing technologies now known or later developed, including but not limited to capacitive, resistive, infrared, and surface acoustic wave technologies, as well as other proximity sensor arrays or other elements for determining one or more points of contact with a touch screen **112**.

[0054] A touch-sensitive display in some embodiments of the touch screen **112** may be analogous to the multi-touch sensitive tablets described in the following U.S. Pat. No.: 6,323,846 (Westerman et al.), U.S. Pat. No. 6,570,557 (Westerman et al.), and/or U.S. Pat. No. 6,677,932 (Westerman), and/or U.S. Patent Publication 2002/0015024A1, each of which is hereby incorporated by reference in their entirety. However, a touch screen **112** displays visual output from the portable device **100**, whereas touch sensitive tablets do not provide visual output.

[0055] A touch-sensitive display in some embodiments of the touch screen **112** may be as described in the following applications: (1) U.S. patent application Ser. No. 11/381,313, "Multipoint Touch Surface Controller," filed May 2, 2006; (2) U.S. patent application Ser. No. 10/840,862, "Multipoint Touchscreen," filed May 6, 2004; (3) U.S. patent application Ser. No. 10/903,964, "Gestures For Touch Sensitive Input Devices," filed Jul. 30, 2004; (4) U.S. patent application Ser. No. 11/048,264, "Gestures For Touch Sensitive Input Devices," filed Jan. 31, 2005; (5) U.S. patent application Ser. No. 11/038,590, "Mode-Based Graphical User Interfaces For Touch Sensitive Input Devices," filed Jan. 18, 2005; (6) U.S. patent application Ser. No. 11/228,758, "Virtual Input Device Placement On A Touch Screen User Interface," filed Sep. 16, 2005; (7) U.S. patent application Ser. No. 11/228,700, "Operation Of A Computer With A Touch Screen Interface," filed Sep. 16, 2005; (8) U.S. patent application Ser. No. 11/228,737, "Activating Virtual Keys Of A Touch-Screen Virtual Keyboard," filed Sep. 16, 2005; and (9) U.S. patent application Ser. No. 11/367,749, "Multi-Functional Hand-Held Device," filed Mar. 3, 2006. All of these applications are incorporated by reference in their entirety.

[0056] The touch screen **112** may have a resolution in excess of 100 dpi. In an exemplary embodiment, the touch screen has a resolution of approximately 160 dpi. The user may make contact with the touch screen **112** using any suitable object or appendage, such as a stylus, a finger, and so forth. In some embodiments, the user interface is designed to work primarily with finger-based contacts and gestures, which are much less precise than stylus-based input due to the larger area of contact of a finger on the touch screen. In some embodiments, the device translates the rough finger-based input into a precise pointer/cursor position or command for performing the actions desired by the user.

[0057] In some embodiments, in addition to the touch screen, the device **100** may include a touchpad (not shown) for activating or deactivating particular functions. In some embodiments, the touchpad is a touch-sensitive area of the device that, unlike the touch screen, does not display visual output. The touchpad may be a touch-sensitive surface that is separate from the touch screen **112** or an extension of the touch-sensitive surface formed by the touch screen.

[0058] In some embodiments, the device **100** may include a physical or virtual click wheel as an input control device **116**. A user may navigate among and interact with one or more graphical objects (henceforth referred to as icons) displayed in the touch screen **112** by rotating the click wheel or by moving a point of contact with the click wheel (e.g., where the amount of movement of the point of contact is measured by its angular displacement with respect to a center point of the

click wheel). The click wheel may also be used to select one or more of the displayed icons. For example, the user may press down on at least a portion of the click wheel or an associated button. User commands and navigation commands provided by the user via the click wheel may be processed by an input controller **160** as well as one or more of the modules and/or sets of instructions in memory **102**. For a virtual click wheel, the click wheel and click wheel controller may be part of the touch screen **112** and the display controller **156**, respectively. For a virtual click wheel, the click wheel may be either an opaque or semitransparent object that appears and disappears on the touch screen display in response to user interaction with the device. In some embodiments, a virtual click wheel is displayed on the touch screen of a portable multifunction device and operated by user contact with the touch screen.

[0059] The device **100** also includes a power system **162** for powering the various components. The power system **162** may include a power management system, one or more power sources (e.g., battery, alternating current (AC)), a recharging system, a power failure detection circuit, a power converter or inverter, a power status indicator (e.g., a light-emitting diode (LED)) and any other components associated with the generation, management and distribution of power in portable devices.

[0060] The device **100** may also include one or more optical sensors **164**. FIGS. **1**A and **1**B show an optical sensor coupled to an optical sensor controller **158** in I/O subsystem **106**. The optical sensor **164** may include charge-coupled device (CCD) or complementary metal-oxide semiconductor (CMOS) phototransistors. The optical sensor **164** receives light from the environment, projected through one or more lens, and converts the light to data representing an image. In conjunction with an imaging module **143** (also called a camera module), the optical sensor **164** may capture still images or video. In some embodiments, an optical sensor is located on the back of the device **100**, opposite the touch screen display **112** on the front of the device, so that the touch screen display may be used as a viewfinder for either still and/or video image acquisition. In some embodiments, an optical sensor is located on the front of the device so that the user's image may be obtained for videoconferencing while the user views the other video conference participants on the touch screen display. In some embodiments, the position of the optical sensor **164** can be changed by the user (e.g., by rotating the lens and the sensor in the device housing) so that a single optical sensor **164** may be used along with the touch screen display for both video conferencing and still and/or video image acquisition.

[0061] The device **100** may also include one or more proximity sensors **166**. FIGS. **1**A and **1**B show a proximity sensor **166** coupled to the peripherals interface **118**. Alternately, the proximity sensor **166** may be coupled to an input controller **160** in the I/O subsystem **106**. The proximity sensor **166** may perform as described in U.S. patent application Ser. No. 11/241,839, "Proximity Detector In Handheld Device," filed Sep. 30, 2005; Ser. No. 11/240,788, "Proximity Detector In Handheld Device," filed Sep. 30, 2005; number to be determined, filed Jan. 7, 2007, "Using Ambient Light Sensor To Augment Proximity Sensor Output," attorney docket no. 04860.P4851US1; number to be determined, filed Oct. 24, 2006, "Automated Response To And Sensing Of User Activity In Portable Devices," attorney docket no. 04860.P4293; and number to be determined, filed Dec. 12, 2006, "Methods And Systems For Automatic Configuration Of Peripherals," attorney docket no. 04860.P4634, which are hereby incorporated by reference in their entirety. In some embodiments, the proximity sensor turns off and disables the touch screen **112** when the multifunction device is placed near the user's ear (e.g., when the user is making a phone call). In some embodiments, the proximity sensor keeps the screen off when the device is in the user's pocket, purse, or other dark area to prevent unnecessary battery drainage when the device is a locked state.

[0062] The device **100** may also include one or more accelerometers **168**. FIGS. **1**A and **1**B show an accelerometer **168** coupled to the peripherals interface **118**. Alternately, the accelerometer **168** may be coupled to an input controller **160** in the I/O subsystem **106**. The accelerometer **168** may perform as described in U.S. Patent Publication No. 20050190059, "Acceleration-based Theft Detection System for Portable Electronic Devices," and U.S. Patent Publication No. 20060017692, "Methods And Apparatuses For Operating A Portable Device Based On An Accelerometer," both of which are which are incorporated herein by reference. In some embodiments, information is displayed on the touch screen display in a portrait view or a landscape view based on an analysis of data received from the one or more accelerometers.

[0063] In some embodiments, the software components stored in memory **102** may include an operating system **126**, a communication module (or set of instructions) **128**, a contact/motion module (or set of instructions) **130**, a graphics module (or set of instructions) **132**, a text input module (or set of instructions) **134**, a Global Positioning System (GPS) module (or set of instructions) **135**, and applications (or set of instructions) **136**.

[0064] The operating system **126** (e.g., Darwin, RTXC, LINUX, UNIX, OS X, WINDOWS, or an embedded operating system such as VxWorks) includes various software components and/or drivers for controlling and managing general system tasks (e.g., memory management, storage device control, power management, etc.) and facilitates communication between various hardware and software components.

[0065] The communication module **128** facilitates communication with other devices over one or more external ports **124** and also includes various software components for handling data received by the RF circuitry **108** and/or the external port **124**. The external port **124** (e.g., Universal Serial Bus (USB), FIREWIRE, etc.) is adapted for coupling directly to other devices or indirectly over a network (e.g., the Internet, wireless LAN, etc.). In some embodiments, the external port is a multi-pin (e.g., 30-pin) connector that is the same as, or similar to and/or compatible with the 30-pin connector used on iPod (trademark of Apple Computer, Inc.) devices.

[0066] The contact/motion module **130** may detect contact with the touch screen **112** (in conjunction with the display controller **156**) and other touch sensitive devices (e.g., a touchpad or physical click wheel). The contact/motion module **130** includes various software components for performing various operations related to detection of contact, such as determining if contact has occurred, determining if there is movement of the contact and tracking the movement across the touch screen **112**, and determining if the contact has been broken (i.e., if the contact has ceased). Determining movement of the point of contact may include determining speed (magnitude), velocity (magnitude and direction), and/or an acceleration (a change in magnitude and/or direction) of the point of contact. These operations may be applied to single contacts (e.g., one finger contacts) or to multiple simultaneous contacts (e.g., "multitouch"/multiple finger contacts). In some embodiments, the contact/motion module **130** and the display controller **156** also detects contact on a touchpad. In some embodiments, the contact/motion module **130** and the controller **160** detects contact on a click wheel.

[0067] The graphics module **132** includes various known software components for rendering and displaying graphics on the touch screen **112**, including components for changing the intensity of graphics that are displayed. As used herein, the term "graphics" includes any object that can be displayed to a user, including without limitation text, web pages, icons (such as user-interface objects including soft keys), digital images, videos, animations and the like.

[0068] The text input module **134**, which may be a component of graphics module **132**, provides soft keyboards for entering text in various applications (e.g., contacts **137**, e-mail **140**, IM **141**, blogging **142**, browser **147**, and any other application that needs text input).

[0069] The GPS module **135** determines the location of the device and provides this information for use in various applications (e.g., to telephone **138** for use in location-based dialing, to camera **143** and/or blogger **142** as picture/video metadata, and to applications that provide location-based services such as weather widgets, local yellow page widgets, and map/navigation widgets).

[0070] The applications **136** may include the following modules (or sets of instructions), or a subset or superset thereof:

- **[0071]** a contacts module **137** (sometimes called an address book or contact list);
- **[0072]** a telephone module **138**;
- **[0073]** a video conferencing module **139**;
- **[0074]** an e-mail client module **140**;
- **[0075]** an instant messaging (IM) module **141**;
- **[0076]** a blogging module **142**;
- **[0077]** a camera module **143** for still and/or video images;
- **[0078]** an image management module **144**;
- **[0079]** a video player module **145**;
- **[0080]** a music player module **146**;
- **[0081]** a browser module **147**;
- **[0082]** a calendar module **148**;
- **[0083]** widget modules **149**, which may include weather widget **149-1**, stocks widget **149-2**, calculator widget **149-3**, alarm clock widget **149-4**, dictionary widget **149-5**, and other widgets obtained by the user, as well as user-created widgets **149-6**;
- **[0084]** widget creator module **150** for making user-created widgets **149-6**;
- **[0085]** search module **151**;
- **[0086]** video and music player module **152**, which merges video player module **145** and music player module **146**;
- **[0087]** notes module **153**; and/or
- **[0088]** map module **154**.

[0089] Examples of other applications **136** that may be stored in memory **102** include other word processing applications, JAVA-enabled applications, encryption, digital rights management, voice recognition, and voice replication.

[0090] In conjunction with touch screen **112**, display controller **156**, contact module **130**, graphics module **132**, and text input module **134**, the contacts module **137** may be used to manage an address book or contact list, including: adding name(s) to the address book; deleting name(s) from the address book; associating telephone number(s), e-mail address(es), physical address(es) or other information with a name; associating an image with a name; categorizing and sorting names; providing telephone numbers or e-mail addresses to initiate and/or facilitate communications by telephone **138**, video conference **139**, e-mail **140**, or IM **141**; and so forth. Embodiments of user interfaces and associated processes using contacts module **137** are described further below.

[0091] In conjunction with RF circuitry **108**, audio circuitry **110**, speaker **111**, microphone **113**, touch screen **112**, display controller **156**, contact module **130**, graphics module **132**, and text input module **134**, the telephone module **138** may be used to enter a sequence of characters corresponding to a telephone number, access one or more telephone numbers in the address book **137**, modify a telephone number that has been entered, dial a respective telephone number, conduct a conversation and disconnect or hang up when the conversation is completed. As noted above, the wireless communication may use any of a plurality of communications standards, protocols and technologies. Embodiments of user interfaces and associated processes using telephone module **138** are described further below.

[0092] In conjunction with RF circuitry **108**, audio circuitry **110**, speaker **111**, microphone **113**, touch screen **112**, display controller **156**, optical sensor **164**, optical sensor controller **158**, contact module **130**, graphics module **132**, text input module **134**, contact list **137**, and telephone module **138**, the videoconferencing module **139** may be used to initiate, conduct, and terminate a video conference between a user and one or more other participants. Embodiments of user interfaces and associated processes using videoconferencing module **139** are described further below.

[0093] In conjunction with RF circuitry **108**, touch screen **112**, display controller **156**, contact module **130**, graphics module **132**, and text input module **134**, the e-mail client module **140** may be used to create, send, receive, and manage e-mail. In conjunction with image management module **144**, the e-mail module **140** makes it very easy to create and send e-mails with still or video images taken with camera module **143**. Embodiments of user interfaces and associated processes using e-mail module **140** are described further below.

[0094] In conjunction with RF circuitry **108**, touch screen **112**, display controller **156**, contact module **130**, graphics module **132**, and text input module **134**, the instant messaging module **141** may be used to enter a sequence of characters corresponding to an instant message, to modify previously entered characters, to transmit a respective instant message (for example, using a Short Message Service (SMS) or Multimedia Message Service (MMS) protocol for telephony-based instant messages or using XMPP, SIMPLE, or IMPS for Internet-based instant messages), to receive instant messages and to view received instant messages. In some embodiments, transmitted and/or received instant messages may include graphics, photos, audio files, video files and/or other attachments as are supported in a MMS and/or an Enhanced Messaging Service (EMS). As used herein, "instant messaging" refers to both telephony-based messages (e.g., messages sent using SMS or MMS) and Internet-based messages (e.g., messages sent using XMPP, SIMPLE, or IMPS). Embodiments of user interfaces and associated processes using instant messaging module **141** are described further below.

[0095] In conjunction with RF circuitry **108**, touch screen **112**, display controller **156**, contact module **130**, graphics module **132**, text input module **134**, image management module **144**, and browsing module **147**, the blogging module **142** may be used to send text, still images, video, and/or other graphics to a blog (e.g., the user's blog). Embodiments of user interfaces and associated processes using blogging module **142** are described further below.

[0096] In conjunction with touch screen **112**, display controller **156**, optical sensor(s) **164**, optical sensor controller **158**, contact module **130**, graphics module **132**, and image

management module **144**, the camera module **143** may be used to capture still images or video (including a video stream) and store them into memory **102**, modify characteristics of a still image or video, or delete a still image or video from memory **102**. Embodiments of user interfaces and associated processes using camera module **143** are described further below.

[0097] In conjunction with touch screen **112**, display controller **156**, contact module **130**, graphics module **132**, text input module **134**, and camera module **143**, the image management module **144** may be used to arrange, modify or otherwise manipulate, label, delete, present (e.g., in a digital slide show or album), and store still and/or video images. Embodiments of user interfaces and associated processes using image management module **144** are described further below.

[0098] In conjunction with touch screen **112**, display controller **156**, contact module **130**, graphics module **132**, audio circuitry **110**, and speaker **111**, the video player module **145** may be used to display, present or otherwise play back videos (e.g., on the touch screen or on an external, connected display via external port **124**). Embodiments of user interfaces and associated processes using video player module **145** are described further below.

[0099] In conjunction with touch screen **112**, display system controller **156**, contact module **130**, graphics module **132**, audio circuitry **110**, speaker **111**, RF circuitry **108**, and browser module **147**, the music player module **146** allows the user to download and play back recorded music and other sound files stored in one or more file formats, such as MP3 or AAC files. In some embodiments, the device **100** may include the functionality of an MP3 player, such as an iPod (trademark of Apple Computer, Inc.). Embodiments of user interfaces and associated processes using music player module **146** are described further below.

[0100] In conjunction with RF circuitry **108**, touch screen **112**, display system controller **156**, contact module **130**, graphics module **132**, and text input module **134**, the browser module **147** may be used to browse the Internet, including searching, linking to, receiving, and displaying web pages or portions thereof, as well as attachments and other files linked to web pages. Embodiments of user interfaces and associated processes using browser module **147** are described further below.

[0101] In conjunction with RF circuitry **108**, touch screen **112**, display system controller **156**, contact module **130**, graphics module **132**, text input module **134**, e-mail module **140**, and browser module **147**, the calendar module **148** may be used to create, display, modify, and store calendars and data associated with calendars (e.g., calendar entries, to do lists, etc.). Embodiments of user interfaces and associated processes using calendar module **148** are described further below.

[0102] In conjunction with RF circuitry **108**, touch screen **112**, display system controller **156**, contact module **130**, graphics module **132**, text input module **134**, and browser module **147**, the widget modules **149** are mini-applications that may be downloaded and used by a user (e.g., weather widget **149-1**, stocks widget **149-2**, calculator widget **149-3**, alarm clock widget **149-4**, and dictionary widget **149-5**) or created by the user (e.g., user-created widget **149-6**). In some embodiments, a widget includes an HTML (Hypertext Markup Language) file, a CSS (Cascading Style Sheets) file, and a JavaScript file. In some embodiments, a widget includes an XML (Extensible Markup Language) file and a JavaScript file (e.g., Yahoo! Widgets). Embodiments of user interfaces and associated processes using widget modules **149** are described further below.

[0103] In conjunction with RF circuitry **108**, touch screen **112**, display system controller **156**, contact module **130**, graphics module **132**, text input module **134**, and browser module **147**, the widget creator module **150** may be used by a user to create widgets (e.g., turning a user-specified portion of a web page into a widget). Embodiments of user interfaces and associated processes using widget creator module **150** are described further below.

[0104] In conjunction with touch screen **112**, display system controller **156**, contact module **130**, graphics module **132**, and text input module **134**, the search module **151** may be used to search for text, music, sound, image, video, and/or other files in memory **102** that match one or more search criteria (e.g., one or more user-specified search terms). Embodiments of user interfaces and associated processes using search module **151** are described further below.

[0105] In conjunction with touch screen **112**, display controller **156**, contact module **130**, graphics module **132**, and text input module **134**, the notes module **153** may be used to create and manage notes, to do lists, and the like. Embodiments of user interfaces and associated processes using notes module **153** are described further below.

[0106] In conjunction with RF circuitry **108**, touch screen **112**, display system controller **156**, contact module **130**, graphics module **132**, text input module **134**, GPS module **135**, and browser module **147**, the map module **154** may be used to receive, display, modify, and store maps and data associated with maps (e.g., driving directions; data on stores and other points of interest at or near a particular location; and other location-based data). Embodiments of user interfaces and associated processes using map module **154** are described further below.

[0107] Each of the above identified modules and applications correspond to a set of instructions for performing one or more functions described above. These modules (i.e., sets of instructions) need not be implemented as separate software programs, procedures or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. For example, video player module **145** may be combined with music player module **146** into a single module (e.g., video and music player module **152**, FIG. **1**B). In some embodiments, memory **102** may store a subset of the modules and data structures identified above. Furthermore, memory **102** may store additional modules and data structures not described above.

[0108] In some embodiments, the device **100** is a device where operation of a predefined set of functions on the device is performed exclusively through a touch screen **112** and/or a touchpad. By using a touch screen and/or a touchpad as the primary input/control device for operation of the device **100**, the number of physical input/control devices (such as push buttons, dials, and the like) on the device **100** may be reduced.

[0109] The predefined set of functions that may be performed exclusively through a touch screen and/or a touchpad include navigation between user interfaces. In some embodiments, the touchpad, when touched by the user, navigates the device **100** to a main, home, or root menu from any user interface that may be displayed on the device **100**. In such embodiments, the touchpad may be referred to as a "menu button." In some other embodiments, the menu button may be a physical push button or other physical input/control device instead of a touchpad.

[0110] FIG. **2** illustrates a portable multifunction device **100** having a touch screen **112** in accordance with some

embodiments. The touch screen may display one or more graphics within user interface (UI) **200**. In this embodiment, as well as others described below, a user may select one or more of the graphics by making contact or touching the graphics, for example, with one or more fingers **202** (not drawn to scale in the figure). In some embodiments, selection of one or more graphics occurs when the user breaks contact with the one or more graphics. In some embodiments, the contact may include a gesture, such as one or more taps, one or more swipes (from left to right, right to left, upward and/or downward) and/or a rolling of a finger (from right to left, left to right, upward and/or downward) that has made contact with the device **100**. In some embodiments, inadvertent contact with a graphic may not select the graphic. For example, a swipe gesture that sweeps over an application icon may not select the corresponding application when the gesture corresponding to selection is a tap.

[0111] The device **100** may also include one or more physical buttons, such as "home" or menu button **204**. As described previously, the menu button **204** may be used to navigate to any application **136** in a set of applications that may be executed on the device **100**. Alternatively, in some embodiments, the menu button is implemented as a soft key in a GUI in touch screen **112**.

[0112] In one embodiment, the device **100** includes a touch screen **112**, a menu button **204**, a push button **206** for powering the device on/off and locking the device, volume adjustment button(s) **208**, a Subscriber Identity Module (SIM) card slot **210**, a head set jack **212**, and a docking/charging external port **124**. The push button **206** may be used to turn the power on/off on the device by depressing the button and holding the button in the depressed state for a predefined time interval; to lock the device by depressing the button and releasing the button before the predefined time interval has elapsed; and/or to unlock the device or initiate an unlock process. In an alternative embodiment, the device **100** also may accept verbal input for activation or deactivation of some functions through the microphone **113**.

[0113] Attention is now directed towards embodiments of user interfaces ("UI") and associated processes that may be implemented on a portable multifunction device **100**.

[0114] FIG. **3** illustrates an exemplary user interface for unlocking a portable electronic device in accordance with some embodiments. In some embodiments, user interface **300** includes the following elements, or a subset or superset thereof:

- **[0115]** Unlock image **302** that is moved with a finger gesture to unlock the device;
- **[0116]** Arrow **304** that provides a visual cue to the unlock gesture;
- **[0117]** Channel **306** that provides additional cues to the unlock gesture;
- **[0118]** Time **308**;
- **[0119]** Day **310**;
- **[0120]** Date **312**; and
- **[0121]** Wallpaper image **314**.

[0122] In some embodiments, the device detects contact with the touch-sensitive display (e.g., a user's finger making contact on or near the unlock image **302**) while the device is in a user-interface lock state. The device moves the unlock image **302** in accordance with the contact. The device transitions to a user-interface unlock state if the detected contact corresponds to a predefined gesture, such as moving the unlock image across channel **306**. Conversely, the device maintains the user-interface lock state if the detected contact does not correspond to the predefined gesture. As noted above, processes that use gestures on the touch screen to unlock the device are described in U.S. patent applications Ser. No. 11/322,549, "Unlocking A Device By Performing Gestures On An Unlock Image," filed Dec. 23, 2005, and Ser. No. 11/322,550, "Indication Of Progress Towards Satisfaction Of A User Input Condition," filed Dec. 23, 2005, which are hereby incorporated by reference in their entirety.

[0123] FIGS. **4**A and **4**B illustrate exemplary user interfaces for a menu of applications on a portable multifunction device in accordance with some embodiments. In some embodiments, user interface **400**A includes the following elements, or a subset or superset thereof:

- **[0124]** Signal strength indicator(s) **402** for wireless communication(s), such as cellular and Wi-Fi signals;
- **[0125]** Time **404**;
- **[0126]** Battery status indicator **406**;
- **[0127]** Tray **408** with icons for frequently used applications, such as one or more of the following:
  - **[0128]** Phone **138**, which may include an indicator **414** of the number of missed calls or voicemail messages;
  - **[0129]** E-mail client **140**, which may include an indicator **410** of the number of unread e-mails;
  - **[0130]** Browser **147**; and
  - **[0131]** Music player **146**; and
- **[0132]** Icons for other applications, such as one or more of the following:
  - **[0133]** IM **141**;
  - **[0134]** Image management **144**;
  - **[0135]** Camera **143**;
  - **[0136]** Video player **145**;
  - **[0137]** Weather **149-1**;
  - **[0138]** Stocks **149-2**;
  - **[0139]** Blog **142**;
  - **[0140]** Calendar **148**;
  - **[0141]** Calculator **149-3**;
  - **[0142]** Alarm clock **149-4**;
  - **[0143]** Dictionary **149-5**; and
  - **[0144]** User-created widget **149-6**.

[0145] In some embodiments, user interface **400**B includes the following elements, or a subset or superset thereof:

- **[0146]** **402**, **404**, **406**, **141**, **148**, **144**, **143**, **149-3**, **149-2**, **149-1**, **149-4**, **410**, **414**, **138**, **140**, and **147**, as described above;
- **[0147]** Map **154**;
- **[0148]** Notes **153**;
- **[0149]** Settings **412**, which provides access to settings for the device **100** and its various applications **136**, as described further below; and
- **[0150]** Video and music player module **152**, also referred to as iPod (trademark of Apple Computer, Inc.) module **152**.

[0151] In some embodiments, UI **400**A or **400**B displays all of the available applications **136** on one screen so that there is no need to scroll through a list of applications (e.g., via a scroll bar). In some embodiments, as the number of applications increase, the icons corresponding to the applications may decrease in size so that all applications may be displayed on a single screen without scrolling. In some embodiments, having all applications on one screen and a menu button enables a user to access any desired application with at most two inputs, such as activating the menu button **204** and then activating the desired application (e.g., by a tap or other finger gesture on the icon corresponding to the application).

[0152] In some embodiments, UI **400**A or **400**B provides integrated access to both widget-based applications and non-

widget-based applications. In some embodiments, all of the widgets, whether user-created or not, are displayed in UI **400**A or **400**B. In other embodiments, activating the icon for user-created widget **149-6** may lead to another UI that contains the user-created widgets or icons corresponding to the user-created widgets.

[0153] In some embodiments, a user may rearrange the icons in UI **400**A or **400**B, e.g., using processes described in U.S. patent application Ser. No. 11/459,602, "Portable Electronic Device With Interface Reconfiguration Mode," filed Jul. 24, 2006, which is hereby incorporated by reference in its entirety. For example, a user may move application icons in and out of tray **408** using finger gestures.

[0154] In some embodiments, UI **400**A or **400**B includes a gauge (not shown) that displays an updated account usage metric for an account associated with usage of the device (e.g., a cellular phone account), as described in U.S. patent application Ser. No. 11/322,552, "Account Information Display For Portable Communication Device," filed Dec. 23, 2005, which is hereby incorporated by reference in its entirety.

[0155] FIGS. **5**A-**5**C illustrate an exemplary screen rotation gesture in accordance with some embodiments.

[0156] FIG. **6** is a flow diagram illustrating a process for implementing screen rotation gestures in accordance with some embodiments.

[0157] In some embodiments, a portable multifunction device (e.g., device **100**) displays (**602**) a first application **5702** on a touch screen display (e.g., **112**) in a portrait orientation (e.g., FIG. **5**A). In some embodiments, the first application is a browser, a photo manager, a music player, or a video player. In most implementations, but not necessarily all, the display is rectangular, or substantially rectangular (e.g., the display may have rounded corners, but otherwise has a rectangular shape).

[0158] Simultaneous rotation of two thumbs (e.g., **5704**-L and **5704**-R) in a first sense of rotation is detected (**604**) on the touch screen display **112**. In some embodiments, the first sense of rotation is a clockwise rotation (e.g., FIG. **5**C).

[0159] In some embodiments, the sense of rotation for each thumb is detected by monitoring the change in orientation of the contact area of the thumb with the touch screen display. For example, if the contact area of the thumb is elliptical, the change in the orientation of an axis of the ellipse may be detected (e.g., from contact ellipse **5706**-L in FIG. **5**A to contact ellipse **5708**-L in FIG. **5**B, as shown on an enlarged portion of touch screen **112** in FIG. **5**C). In some embodiments, at least some of a user's other fingers (i.e., fingers other than thumbs **5704**-L and **5704**-R) support the device **100** by contacting the backside of the device.

[0160] In some embodiments, the first sense of rotation is a counterclockwise rotation. For example, if thumb **5704**-L is initially on the lower left side of touch screen **112** (rather than the upper left side in FIG. **5**A), thumb **5704**-R is initially on the upper right side of touch screen **112** (rather than the lower right side in FIG. **5**A), and the thumbs are moved apart from each other, then the sense of rotation detected by the touch screen **112** will be counterclockwise for both thumbs.

[0161] In response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation, the first application **5702** is displayed (**606**) in a landscape orientation.

[0162] In some embodiments, the simultaneous two-thumb rotation gesture is used to override automatic changes in portrait/landscape orientation based on analysis of data from accelerometers **168** until a predetermined condition is met. In some embodiments, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected are disregarded until the device displays a second application different from the first application. In some embodiments, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected are disregarded until the device is put in a locked state or turned off. In some embodiments, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected are disregarded for a predetermined time period.

[0163] In some embodiments, simultaneous rotation of the two thumbs is detected (**608**) in a second sense of rotation that is opposite the first sense of rotation on the touch screen display. In response to detecting the simultaneous rotation of the two thumbs in the second sense of rotation, the first application is displayed (**610**) in a portrait orientation.

[0164] In some embodiments, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs in the first sense is detected are disregarded until the simultaneous rotation of the two thumbs in the second sense is detected.

[0165] A graphical user interface on a portable multifunction device with a touch screen display comprises an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In response to detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display, the display of the application changes from the first orientation to the second orientation. In some embodiments, the first orientation is a portrait orientation (e.g., FIG. **5**A) and the second orientation is a landscape orientation (e.g., FIG. **5**B). In some embodiments, the first orientation is a landscape orientation and the second orientation is a portrait orientation.

[0166] FIGS. **7**A-**7**C illustrate an exemplary screen rotation gesture in accordance with some embodiments.

[0167] FIG. **8** is a flow diagram illustrating a process for implementing screen rotation gestures in accordance with some embodiments.

[0168] In some embodiments, a portable multifunction device (e.g., device **100**) displays (**802**) a first application **702** on a touch screen display (e.g., **112**) in a portrait orientation (e.g., FIG. **7**A). In some embodiments, the first application is a browser, a photo manager, a music player, or a video player. In most implementations, but not necessarily all, the display is rectangular, or substantially rectangular (e.g., the display may have rounded corners, but otherwise has a rectangular shape).

[0169] Rotation of a thumb (e.g., **704**-R) within a predetermined range of angles near 90° (e.g., between 85° and 95°, between 80° and 100°, between 75° and 105°, or between 70° and 110°) in a first sense of rotation is detected (**804**) on the touch screen display **112**. In some embodiments, the first sense of rotation is a clockwise rotation (e.g., FIG. **7**C). In some embodiments, at least one finger (e.g., **710**) on a side of the device opposite the touch screen display (i.e., the backside of the device) is simultaneously detected (**805**) while detecting the rotation of the thumb.

[0170] In some embodiments, the sense of rotation is detected by monitoring the change in orientation of the contact area of the thumb with the touch screen display. For example, if the contact area of the thumb is elliptical, the change in the orientation of an axis of the ellipse may be detected (e.g., from contact ellipse **706**-R in FIG. **7**A to contact ellipse **708**-R in FIG. **7**B, as shown on an enlarged portion of touch screen **112** in FIG. **7**C). In some embodiments, at least some of a user's other fingers (i.e., fingers other than thumb **704**-R) support the device **100** by contacting the backside of the device.

[0171] In some embodiments, the first sense of rotation is a counterclockwise rotation. For example, thumb **704**-R is initially on the upper right side of touch screen **112** (rather than the lower right side in FIG. **7**A), and the device is rotated clockwise, then the sense of rotation detected by the touch screen **112** will be counterclockwise for the thumb.

[0172] In some embodiments, in response to detecting the rotation of the thumb, the first application **702** is displayed (**806**) in a landscape orientation. In some embodiments, in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display, the first application **702** is displayed in a landscape orientation.

[0173] In some embodiments, the thumb rotation gesture is used to override automatic changes in portrait/landscape orientation based on analysis of data from accelerometers **168** until a predetermined condition is met. In some embodiments, any changes in orientation of the device that are detected after the rotation of the thumb is detected are disregarded until the device displays a second application different from the first application. In some embodiments, any changes in orientation of the device that are detected after the rotation of the thumb is detected are disregarded until the device is put in a locked state or turned off. In some embodiments, any changes in orientation of the device that are detected after the rotation of the thumb is detected are disregarded for a predetermined time period.

[0174] In some embodiments, rotation of the thumb is detected (**808**) within a predetermined range of angles near 90° in a second sense of rotation that is opposite the first sense of rotation on the touch screen display. In response to detecting the rotation of the thumb in the second sense of rotation, the first application is displayed (**810**) in a portrait orientation.

[0175] In some embodiments, any changes in orientation of the device that are detected after the rotation of the thumb in the first sense is detected are disregarded until the rotation of the thumb in the second sense is detected.

[0176] A graphical user interface on a portable multifunction device with a touch screen display comprises an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In some embodiments, in response to detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display, the display of the application changes from the first orientation to the second orientation. In some embodiments, in response to detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display and simultaneously detecting at least one finger on a side of the device opposite the touch screen display, the display of the application changes from the first orientation to the second orientation.

[0177] In some embodiments, the detection of finger positions and/or a palm by sensors on the sides of the device may be used to determine whether a user is holding the device in a portrait or landscape orientation and a corresponding portrait or landscape orientation may be displayed on the screen. For example, if a palm is detected on one side of the device, the user is probably holding the device in a portrait orientation and thus an application may be displayed in a portrait orientation on the screen. On the other hand, if only fingers are detected (e.g., one finger is detected at or near each corner of the device, because fingers typically have less contact area than a palm), the user is probably holding the device in a landscape orientation and thus an application may be displayed in a landscape orientation on the screen. In some embodiments, the detection of finger positions and/or a palm by sensors on the sides of the device may be used in conjunction with input from other sensors (e.g., accelerometer(s) **168**) to determine whether a user is holding the device in a portrait or landscape orientation and a corresponding portrait or landscape orientation may be displayed on the screen.

[0178] The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated.

What is claimed is:

1. A computer-implemented method, comprising:

at a portable multifunction device with a touch screen display,

displaying information on the touch screen display in a portrait orientation;

detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display;

in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation, displaying the information in a landscape orientation;

detecting simultaneous rotation of the two thumbs in a second sense of rotation that is opposite the first sense of rotation; and

in response to detecting the simultaneous rotation of the two thumbs in the second sense of rotation, displaying the information in a portrait orientation.

2. A computer-implemented method, comprising:

at a portable multifunction device with a touch screen display,

displaying a first application on the touch screen display in a portrait orientation;

detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display; and

in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation, displaying the first application in a landscape orientation.

3. The computer-implemented method of claim **2**, wherein the first sense of rotation is a clockwise rotation.

4. The computer-implemented method of claim **2**, wherein the first sense of rotation is a counterclockwise rotation.

5. The computer-implemented method of claim **2**, wherein the first application is a browser, a photo manager, a music player, or a video player.

6. The computer-implemented method of claim **2**, including disregarding any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected until the device displays a second application different from the first application.

7. The computer-implemented method of claim **2**, including disregarding any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected until the device is put in a locked state or turned off.

8. The computer-implemented method of claim **2**, including disregarding, for a predetermined time period, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected.

9. The computer-implemented method of claim 2, including:
detecting simultaneous rotation of the two thumbs in a second sense of rotation that is opposite the first sense of rotation on the touch screen display; and
in response to detecting the simultaneous rotation of the two thumbs in the second sense of rotation, displaying the first application in a portrait orientation.

10. The computer-implemented method of claim 9, including disregarding any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs in the first sense is detected until the simultaneous rotation of the two thumbs in the second sense is detected.

11. A graphical user interface on a portable multifunction device with a touch screen display, comprising:
an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation,
wherein:
in response to detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display, the display of the application changes from the first orientation to the second orientation.

12. A portable multifunction device, comprising:
a touch screen display;
one or more processors;
memory; and
one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors, the programs including:
instructions for displaying a first application on the touch screen display in a portrait orientation;
instructions for detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display; and
instructions for displaying the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

13. A computer-program product, comprising:
a computer readable storage medium and a computer program mechanism embedded therein, the computer program mechanism comprising instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to:
display a first application on the touch screen display in a portrait orientation;
detect simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display; and
display the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

14. A portable multifunction device with a touch screen display, comprising:
means for displaying a first application on the touch screen display in a portrait orientation;
means for detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display; and
means for displaying the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

15. A computer-implemented method, comprising:
at a portable multifunction device with a touch screen display,
displaying a first application on the touch screen display in a portrait orientation;
detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and
in response to detecting the rotation of the thumb, displaying the first application in a landscape orientation.

16. The computer-implemented method of claim 15, wherein predetermined range of angles is between 85° and 95°.

17. The computer-implemented method of claim 15, wherein predetermined range of angles is between 80° and 100°.

18. The computer-implemented method of claim 15, wherein predetermined range of angles is between 75+ and 105°.

19. The computer-implemented method of claim 15, wherein predetermined range of angles is between 70° and 110°.

20. The computer-implemented method of claim 15, including:
detecting a rotation of the thumb within a predetermined range of angles near 90° in a second sense of rotation on the touch screen display, wherein the second sense of rotation is opposite the first sense of rotation; and
in response to detecting the rotation of the thumb in the second sense of rotation, displaying the first application in a portrait orientation.

21. A graphical user interface on a portable multifunction device with a touch screen display, comprising:
an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation,
wherein:
in response to detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display, the display of the application changes from the first orientation to the second orientation.

22. A portable multifunction device, comprising:
a touch screen display;
one or more processors;
memory; and
one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors, the programs including:
instructions for displaying a first application on the touch screen display in a portrait orientation;
instructions for detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and
instructions for displaying the first application in a landscape orientation in response to detecting the rotation of the thumb.

23. A computer-program product, comprising:
a computer readable storage medium and a computer program mechanism embedded therein, the computer program mechanism comprising instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to:

display a first application on the touch screen display in a portrait orientation;

detect a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and

display the first application in a landscape orientation in response to detecting the rotation of the thumb.

24. A portable multifunction device with a touch screen display, comprising:

means for displaying a first application on the touch screen display in a portrait orientation;

means for detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and

means for displaying the first application in a landscape orientation in response to detecting the rotation of the thumb.

25. A computer-implemented method, comprising:

at a portable multifunction device with a touch screen display,

displaying a first application on the touch screen display in a portrait orientation;

detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display;

simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and

in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display, displaying the first application in a landscape orientation.

26. A graphical user interface on a portable multifunction device with a touch screen display, comprising:

an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation,

wherein:

in response to detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display and simultaneously detecting at least one finger on a side of the device opposite the touch screen display, the display of the application changes from the first orientation to the second orientation.

27. A portable multifunction device, comprising:

a touch screen display;

one or more processors;

memory; and

one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors, the programs including:

instructions for displaying a first application on the touch screen display in a portrait orientation;

instructions for detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and

instructions for simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and

instructions for displaying the first application in a landscape orientation in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

28. A computer-program product, comprising:

a computer readable storage medium and a computer program mechanism embedded therein, the computer program mechanism comprising instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to:

display a first application on the touch screen display in a portrait orientation;

detect a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display;

simultaneously detect at least one finger on a side of the device opposite the touch screen display; and

display the first application in a landscape orientation in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

29. A portable multifunction device with a touch screen display, comprising:

means for displaying a first application on the touch screen display in a portrait orientation;

means for detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display;

means for simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and

means for displaying the first application in a landscape orientation in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

* * * * *

Exhibit 1028

Electronically filed June 28, 2007

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Docket Number	P3940USP1/63266-5022PR

INVENTOR(s)

LAST NAME	FIRST NAME	MIDDLE INITIAL	RESIDENCE (City and either State or Foreign Country)
Ording	Bas		San Francisco, California
Alten	Brett		Cupertino, California

☐ Additional inventors are being named on separately numbered sheets attached hereto.

TITLE OF THE INVENTION (500 characters max):

SCREEN ROTATION GESTURES ON A PORTABLE MULTIFUNCTION DEVICE

CORRESPONDENCE ADDRESS:

MORGAN, LEWIS & BOCKIUS LLP
Customer Number: 61725

ENCLOSED APPLICATION PARTS (*check all that apply*)

☐ Application Data Sheet. See 37 CFR 1.76
☐ Fee Transmittal Form
☒ Specification *Number of pages* 40
☐ Other (specify)
☒ Drawing(s) *Number of sheets* 10

Fees Dues: Filing Fee of $200 ($100 for small entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 36 CFR 1.16(s).

METHOD OF PAYMENT (*check one*)

☐ Applicant claims small entity status, see 37 CFR §1.27

200
Total Fee Amount ($)

☒ The Director is hereby authorized to charge the filing fee and application size fee (if applicable or credit any overpayment to Deposit Account Number 50-0310 (order no. 63266-5022-PR). A Duplicate copy of this form is enclosed for fee processing.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.
☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Signature: _____ Date: June 28, 2007

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Total number of cover sheet pages. 1

USE ONLY FOR A PROVISIONAL APPLICATION FOR PATENT

Screen Rotation Gestures on a Portable Multifunction Device

RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Nos. 60/879,469, "Portable Multifunction Device," filed January 8, 2007; 60/879,253, "Portable Multifunction Device," filed January 7, 2007; and 60/824,769, "Portable Multifunction Device," filed September 6, 2006. All of these applications are incorporated by referenced herein in their entirety.

[0002] This application is related to the following applications: (1) U.S. Patent Application No. 10/188,182, "Touch Pad For Handheld Device," filed July 1, 2002; (2) U.S. Patent Application No. 10/722,948, "Touch Pad For Handheld Device," filed November 25, 2003; (3) U. S. Patent Application No. 10/643,256, "Movable Touch Pad With Added Functionality," filed August 18, 2003; (4) U.S. Patent Application No. 10/654,108, "Ambidextrous Mouse," filed September 2, 2003; (5) U.S. Patent Application No. 10/840,862, "Multipoint Touchscreen," filed May 6, 2004; (6) U.S. Patent Application No: 10/903,964, "Gestures For Touch Sensitive Input Devices," filed July 30,2004; (7) U.S. Patent Application No. 11/038,590, "Mode-Based Graphical User Interfaces For Touch Sensitive Input Devices" filed January 18, 2005; (8) U.S. Patent Application No. 11/057,050, "Display Actuator," filed February 11, 2005; (9) U.S. Provisional Patent Application No. 60/658,777, "Multi-Functional Hand-Held Device," filed March 4, 2005; and (10) U.S. Patent Application No. 11/367,749, "Multi-Functional Hand-Held Device," filed March 3, 2006. All of these applications are incorporated by reference herein.

TECHNICAL FIELD

[0003] The disclosed embodiments relate generally to portable electronic devices, and more particularly, to portable devices that implement screen rotation gestures.

BACKGROUND

[0004] As portable electronic devices become more compact, and the number of functions performed by a given device increase, it has become a significant challenge to design a user interface that allows users to easily interact with a multifunction device. This

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challenge is particular significant for handheld portable devices, which have much smaller screens than desktop or laptop computers. This situation is unfortunate because the user interface is the gateway through which users receive not only content but also responses to user actions or behaviors, including user attempts to access a device's features, tools, and functions. Some portable communication devices (e.g., mobile telephones, sometimes called mobile phones, cell phones, cellular telephones, and the like) have resorted to adding more pushbuttons, increasing the density of push buttons, overloading the functions of pushbuttons, or using complex menu systems to allow a user to access, store and manipulate data. These conventional user interfaces often result in complicated key sequences and menu hierarchies that must be memorized by the user.

[0005] Many conventional user interfaces, such as those that include physical pushbuttons, are also inflexible. This is unfortunate because it may prevent a user interface from being configured and/or adapted by either an application running on the portable device or by users. When coupled with the time consuming requirement to memorize multiple key sequences and menu hierarchies, and the difficulty in activating a desired pushbutton, such inflexibility is frustrating to most users.

[0006] Some portable electronic devices have displays with information that may be viewed in either a portrait orientation or a landscape orientation. But the input from a user required to initiate a screen rotation between the portrait and landscape orientations may not be readily apparent to the user.

[0007] Some portable devices use one or more accelerometers to automatically adjust the orientation of the information on the screen. In these devices, information is displayed on the display in a portrait view or a landscape view based on an analysis of data received from the one or more accelerometers. For these devices, the user may occasionally want to override the orientation displayed based on the accelerometer data. Here too, the user input required to initiate a change between the portrait and landscape orientations may not be readily apparent to the user.

[0008] Accordingly, there is a need for portable multifunction devices with more transparent and intuitive user interfaces for implementing screen rotations. Such interfaces increase the effectiveness, efficiency and user satisfaction with portable multifunction devices.

SUMMARY

[0009] The above deficiencies and other problems associated with user interfaces for portable devices are reduced or eliminated by the disclosed portable multifunction device. In some embodiments, the device has a touch-sensitive display (also known as a "touch screen") with a graphical user interface (GUI), one or more processors, memory and one or more modules, programs or sets of instructions stored in the memory for performing multiple functions. In some embodiments, the user interacts with the GUI primarily through finger contacts and gestures on the touch-sensitive display. In some embodiments, the functions may include telephoning, video conferencing, e-mailing, instant messaging, blogging, digital photographing, digital videoing, web browsing, digital music playing, and/or digital video playing. Instructions for performing these functions may be included in a computer program product configured for execution by one or more processors.

[0010] In accordance with some embodiments, a computer-implemented method performed at a portable multifunction device with a touch screen display includes displaying information on the touch screen display in a portrait orientation. The method also includes detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display, and in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation, displaying the information in a landscape orientation. In some embodiments, the method further includes detecting simultaneous rotation of the two thumbs in a second sense of rotation that is opposite the first sense of rotation, and in response to detecting the simultaneous rotation of the two thumbs in the second sense of rotation, displaying the information in a portrait orientation.

[0011] In accordance with some embodiments, a graphical user interface on a portable multifunction device with a touch screen display includes an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In response to detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display, the display of the application changes from the first orientation to the second orientation.

[0012] In accordance with some embodiments, a portable multifunction device includes a touch screen display, one or more processors, memory, and one or more programs. The one or more programs are stored in the memory and configured to be

executed by the one or more processors, The programs include instructions for: displaying a first application on the touch screen display in a portrait orientation; detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display; and displaying the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

[0013] In accordance with some embodiments, a computer-program product includes a computer readable storage medium and a computer program mechanism embedded therein. The computer program mechanism includes instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to display a first application on the touch screen display in a portrait orientation. The instructions also cause the device to detect simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display and display the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

[0014] In accordance with some embodiments, a portable multifunction device with a touch screen display includes: means for displaying a first application on the touch screen display in a portrait orientation; means for detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display; and means for displaying the first application in a landscape orientation in response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation.

[0015] In accordance with some embodiments, a computer-implemented method performed at a portable multifunction device with a touch screen display includes displaying information on the touch screen display in a portrait orientation. The method also includes detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display, and in response to detecting the rotation of the thumb, displaying the information in a landscape orientation.

[0016] In accordance with some embodiments, a graphical user interface on a portable multifunction device with a touch screen display includes an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In response to detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen

display, the display of the application changes from the first orientation to the second orientation.

[0017] In accordance with some embodiments, a portable multifunction device includes a touch screen display, one or more processors, memory, and one or more programs. The one or more programs are stored in the memory and configured to be executed by the one or more processors. The programs include instructions for: displaying a first application on the touch screen display in a portrait orientation; detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and displaying the first application in a landscape orientation in response to detecting the rotation of the thumb.

[0018] In accordance with some embodiments, a computer-program product includes a computer readable storage medium and a computer program mechanism embedded therein. The computer program mechanism includes instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to display a first application on the touch screen display in a portrait orientation. The instructions also cause the device to detect a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display and display the first application in a landscape orientation in response to detecting the rotation of the thumb.

[0019] In accordance with some embodiments, a portable multifunction device with a touch screen display includes: means for displaying a first application on the touch screen display in a portrait orientation; means for detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; and means for displaying the first application in a landscape orientation in response to detecting the rotation of the thumb.

[0020] In accordance with some embodiments, a computer-implemented method performed at a portable multifunction device with a touch screen display includes displaying information on the touch screen display in a portrait orientation. The method also includes detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and in response to

detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display, displaying the information in a landscape orientation.

[0021] In accordance with some embodiments, a graphical user interface on a portable multifunction device with a touch screen display includes an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In response to detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display and simultaneously detecting at least one finger on a side of the device opposite the touch screen display, the display of the application changes from the first orientation to the second orientation.

[0022] In accordance with some embodiments, a portable multifunction device includes a touch screen display, one or more processors, memory, and one or more programs. The one or more programs are stored in the memory and configured to be executed by the one or more processors, The programs include instructions for: displaying a first application on the touch screen display in a portrait orientation; detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and displaying the first application in a landscape orientation in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

[0023] In accordance with some embodiments, a computer-program product includes a computer readable storage medium and a computer program mechanism embedded therein. The computer program mechanism includes instructions, which when executed by a portable multifunction device with a touch screen display, cause the device to display a first application on the touch screen display in a portrait orientation. The instructions also cause the device to detect a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; simultaneously detect at least one finger on a side of the device opposite the touch screen display; and display the first application in a landscape orientation in response to detecting

the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

[0024] In accordance with some embodiments, a portable multifunction device with a touch screen display includes: means for displaying a first application on the touch screen display in a portrait orientation; means for detecting a rotation of a thumb within a predetermined range of angles near 90° in a first sense of rotation on the touch screen display; means for simultaneously detecting at least one finger on a side of the device opposite the touch screen display; and means for displaying the first application in a landscape orientation in response to detecting the rotation of the thumb and simultaneously detecting at least one finger on the side of the device opposite the touch screen display.

[0025] Thus, the invention provides a portable multifunction device with more transparent and intuitive user interfaces for implementing screen rotations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] For a better understanding of the aforementioned embodiments of the invention as well as additional embodiments thereof, reference should be made to the Description of Embodiments below, in conjunction with the following drawings in which like reference numerals refer to corresponding parts throughout the figures.

[0027] Figures 1A and 1B are block diagrams illustrating portable multifunction devices with touch-sensitive displays in accordance with some embodiments.

[0028] Figure 2 illustrates a portable multifunction device having a touch screen in accordance with some embodiments.

[0029] Figure 3 illustrates an exemplary user interface for unlocking a portable electronic device in accordance with some embodiments.

[0030] Figures 4A and 4B illustrate exemplary user interfaces for a menu of applications on a portable multifunction device in accordance with some embodiments.

[0031] Figures 5A-5C illustrate an exemplary screen rotation gesture in accordance with some embodiments.

[0032] Figure 6 is a flow diagram illustrating a process for implementing screen rotation gestures in accordance with some embodiments.

[0033] Figures 7A-7C illustrate an exemplary screen rotation gesture in accordance with some embodiments.

[0034] Figure 8 is a flow diagram illustrating a process for implementing screen rotation gestures in accordance with some embodiments.

DESCRIPTION OF EMBODIMENTS

[0035] Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings. In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well-known methods, procedures, components, circuits, and networks have not been described in detail so as not to unnecessarily obscure aspects of the embodiments.

[0036] It will also be understood that, although the terms first, second, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first gesture could be termed a second gesture, and, similarly, a second gesture could be termed a first gesture, without departing from the scope of the present invention.

[0037] The terminology used in the description of the invention herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used in the description of the invention and the appended claims, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will also be understood that the term "and/or" as used herein refers to and encompasses any and all possible combinations of one or more of the associated listed items. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0038] Embodiments of a portable multifunction device, user interfaces for such devices, and associated processes for using such devices are described. In some

embodiments, the device is a portable communications device such as a mobile telephone that also contains other functions, such as PDA and/or music player functions.

[0039] The user interface may include a physical click wheel in addition to a touch screen or a virtual click wheel displayed on the touch screen. A click wheel is a user-interface device that may provide navigation commands based on an angular displacement of the wheel or a point of contact with the wheel by a user of the device. A click wheel may also be used to provide a user command corresponding to selection of one or more items, for example, when the user of the device presses down on at least a portion of the wheel or the center of the wheel. Alternatively, breaking contact with a click wheel image on a touch screen surface may indicate a user command corresponding to selection. For simplicity, in the discussion that follows, a portable multifunction device that includes a touch screen is used as an exemplary embodiment. It should be understood, however, that some of the user interfaces and associated processes may be applied to other devices, such as personal computers and laptop computers, that may include one or more other physical user-interface devices, such as a physical click wheel, a physical keyboard, a mouse and/or a joystick.

[0040] The device supports a variety of applications, such as a telephone application, a video conferencing application, an e-mail application, an instant messaging application, a blogging application, a digital camera application, a digital video camera application, a web browsing application, a digital music player application, and/or a digital video player application.

[0041] The various applications that may be executed on the device may use at least one common physical user-interface device, such as the touch screen. One or more functions of the touch screen as well as corresponding information displayed on the device may be adjusted and/or varied from one application to the next and/or within a respective application. In this way, a common physical architecture (such as the touch screen) of the device may support the variety of applications with user interfaces that are intuitive and transparent.

[0042] The user interfaces may include one or more soft keyboard embodiments. The soft keyboard embodiments may include standard (QWERTY) and/or non-standard configurations of symbols on the displayed icons of the keyboard, such as those described in U.S. Patent Applications 11/459,606, "Keyboards For Portable Electronic Devices," filed

July 24, 2006, and 11/459,615, "Touch Screen Keyboards For Portable Electronic Devices," filed July 24, 2006, the contents of which are hereby incorporated by reference. The keyboard embodiments may include a reduced number of icons (or soft keys) relative to the number of keys in existing physical keyboards, such as that for a typewriter. This may make it easier for users to select one or more icons in the keyboard, and thus, one or more corresponding symbols. The keyboard embodiments may be adaptive. For example, displayed icons may be modified in accordance with user actions, such as selecting one or more icons and/or one or more corresponding symbols. One or more applications on the portable device may utilize common and/or different keyboard embodiments. Thus, the keyboard embodiment used may be tailored to at least some of the applications. In some embodiments, one or more keyboard embodiments may be tailored to a respective user. For example, one or more keyboard embodiments may be tailored to a respective user based on a word usage history (lexicography, slang, individual usage) of the respective user. Some of the keyboard embodiments may be adjusted to reduce a probability of a user error when selecting one or more icons, and thus one or more symbols, when using the soft keyboard embodiments.

[0043] Attention is now directed towards embodiments of the device. Figures 1A and 1B are block diagrams illustrating portable multifunction devices 100 with touch-sensitive displays 112 in accordance with some embodiments. The touch-sensitive display 112 is sometimes called a "touch screen" for convenience, and may also be known as or called a touch-sensitive display system. The device 100 may include a memory 102 (which may include one or more computer readable storage mediums), a memory controller 122, one or more processing units (CPU's) 120, a peripherals interface 118, RF circuitry 108, audio circuitry 110, a speaker 111, a microphone 113, an input/output (I/O) subsystem 106, other input or control devices 116, and an external port 124. The device 100 may include one or more optical sensors 164. These components may communicate over one or more communication buses or signal lines 103.

[0044] It should be appreciated that the device 100 is only one example of a portable multifunction device 100, and that the device 100 may have more or fewer components than shown, may combine two or more components, or a may have a different configuration or arrangement of the components. The various components shown in Figures 1A and 1B may

be implemented in hardware, software or a combination of both hardware and software, including one or more signal processing and/or application specific integrated circuits.

[0045] Memory 102 may include high-speed random access memory and may also include non-volatile memory, such as one or more magnetic disk storage devices, flash memory devices, or other non-volatile solid-state memory devices. Access to memory 102 by other components of the device 100, such as the CPU 120 and the peripherals interface 118, may be controlled by the memory controller 122.

[0046] The peripherals interface 118 couples the input and output peripherals of the device to the CPU 120 and memory 102. The one or more processors 120 run or execute various software programs and/or sets of instructions stored in memory 102 to perform various functions for the device 100 and to process data.

[0047] In some embodiments, the peripherals interface 118, the CPU 120, and the memory controller 122 may be implemented on a single chip, such as a chip 104. In some other embodiments, they may be implemented on separate chips.

[0048] The RF (radio frequency) circuitry 108 receives and sends RF signals, also called electromagnetic signals. The RF circuitry 108 converts electrical signals to/from electromagnetic signals and communicates with communications networks and other communications devices via the electromagnetic signals. The RF circuitry 108 may include well-known circuitry for performing these functions, including but not limited to an antenna system, an RF transceiver, one or more amplifiers, a tuner, one or more oscillators, a digital signal processor, a CODEC chipset, a subscriber identity module (SIM) card, memory, and so forth. The RF circuitry 108 may communicate with networks, such as the Internet, also referred to as the World Wide Web (WWW), an intranet and/or a wireless network, such as a cellular telephone network, a wireless local area network (LAN) and/or a metropolitan area network (MAN), and other devices by wireless communication. The wireless communication may use any of a plurality of communications standards, protocols and technologies, including but not limited to Global System for Mobile Communications (GSM), Enhanced Data GSM Environment (EDGE), high-speed downlink packet access (HSDPA), wideband code division multiple access (W-CDMA), code division multiple access (CDMA), time division multiple access (TDMA), Bluetooth, Wireless Fidelity (Wi-Fi) (e.g., IEEE 802.11a, IEEE 802.11b, IEEE 802.11g and/or IEEE 802.11n), voice over

Internet Protocol (VoIP), Wi-MAX, a protocol for email (e.g., Internet message access protocol (IMAP) and/or post office protocol (POP)), instant messaging (e.g., extensible messaging and presence protocol (XMPP), Session Initiation Protocol for Instant Messaging and Presence Leveraging Extensions (SIMPLE), and/or Instant Messaging and Presence Service (IMPS)), and/or Short Message Service (SMS)), or any other suitable communication protocol, including communication protocols not yet developed as of the filing date of this document.

[0049] The audio circuitry 110, the speaker 111, and the microphone 113 provide an audio interface between a user and the device 100. The audio circuitry 110 receives audio data from the peripherals interface 118, converts the audio data to an electrical signal, and transmits the electrical signal to the speaker 111. The speaker 111 converts the electrical signal to human-audible sound waves. The audio circuitry 110 also receives electrical signals converted by the microphone 113 from sound waves. The audio circuitry 110 converts the electrical signal to audio data and transmits the audio data to the peripherals interface 118 for processing. Audio data may be retrieved from and/or transmitted to memory 102 and/or the RF circuitry 108 by the peripherals interface 118. In some embodiments, the audio circuitry 110 also includes a headset jack (e.g. 212, Figure 2). The headset jack provides an interface between the audio circuitry 110 and removable audio input/output peripherals, such as output-only headphones or a headset with both output (e.g., a headphone for one or both ears) and input (e.g., a microphone).

[0050] The I/O subsystem 106 couples input/output peripherals on the device 100, such as the touch screen 112 and other input/control devices 116, to the peripherals interface 118. The I/O subsystem 106 may include a display controller 156 and one or more input controllers 160 for other input or control devices. The one or more input controllers 160 receive/send electrical signals from/to other input or control devices 116. The other input/control devices 116 may include physical buttons (e.g., push buttons, rocker buttons, etc.), dials, slider switches, joysticks, click wheels, and so forth. In some alternate embodiments, input controller(s) 160 may be coupled to any (or none) of the following: a keyboard, infrared port, USB port, and a pointer device such as a mouse. The one or more buttons (e.g., 208, Figure 2) may include an up/down button for volume control of the speaker 111 and/or the microphone 113. The one or more buttons may include a push button (e.g., 206, Figure 2). A quick press of the push button may disengage a lock of the

touch screen 112 or begin a process that uses gestures on the touch screen to unlock the device, as described in U.S. Patent Application 11/322,549, "Unlocking a Device by Performing Gestures on an Unlock Image," filed December 23, 2005, which is hereby incorporated by reference. A longer press of the push button (e.g., 206) may turn power to the device 100 on or off. The user may be able to customize a functionality of one or more of the buttons. The touch screen 112 is used to implement virtual or soft buttons and one or more soft keyboards.

[0051] The touch-sensitive touch screen 112 provides an input interface and an output interface between the device and a user. The display controller 156 receives and/or sends electrical signals from/to the touch screen 112. The touch screen 112 displays visual output to the user. The visual output may include graphics, text, icons, video, and any combination thereof (collectively termed "graphics"). In some embodiments, some or all of the visual output may correspond to user-interface objects, further details of which are described below.

[0052] A touch screen 112 has a touch-sensitive surface, sensor or set of sensors that accepts input from the user based on haptic and/or tactile contact. The touch screen 112 and the display controller 156 (along with any associated modules and/or sets of instructions in memory 102) detect contact (and any movement or breaking of the contact) on the touch screen 112 and converts the detected contact into interaction with user-interface objects (e.g., one or more soft keys, icons, web pages or images) that are displayed on the touch screen. In an exemplary embodiment, a point of contact between a touch screen 112 and the user corresponds to a finger of the user.

[0053] The touch screen 112 may use LCD (liquid crystal display) technology, or LPD (light emitting polymer display) technology, although other display technologies may be used in other embodiments. The touch screen 112 and the display controller 156 may detect contact and any movement or breaking thereof using any of a plurality of touch sensing technologies now known or later developed, including but not limited to capacitive, resistive, infrared, and surface acoustic wave technologies, as well as other proximity sensor arrays or other elements for determining one or more points of contact with a touch screen 112.

[0054] A touch-sensitive display in some embodiments of the touch screen 112 may be analogous to the multi-touch sensitive tablets described in the following U.S. Patents: 6,323,846 (Westerman et al.), 6,570,557 (Westerman et al.), and/or 6,677,932 (Westerman), and/or U.S. Patent Publication 2002/0015024A1, each of which is hereby incorporated by reference. However, a touch screen 112 displays visual output from the portable device 100, whereas touch sensitive tablets do not provide visual output.

[0055] A touch-sensitive display in some embodiments of the touch screen 112 may be as described in the following applications: (1) U.S. Patent Application No. 11/381,313, "Multipoint Touch Surface Controller," filed May 2, 2006; (2) U.S. Patent Application No. 10/840,862, "Multipoint Touchscreen," filed May 6, 2004; (3) U.S. Patent Application No. 10/903,964, "Gestures For Touch Sensitive Input Devices," filed July 30, 2004; (4) U.S. Patent Application No. 11/048,264, "Gestures For Touch Sensitive Input Devices," filed January 31, 2005; (5) U.S. Patent Application No. 11/038,590, "Mode-Based Graphical User Interfaces For Touch Sensitive Input Devices," filed January 18, 2005; (6) U.S. Patent Application No. 11/228,758, "Virtual Input Device Placement On A Touch Screen User Interface," filed September 16, 2005; (7) U.S. Patent Application No. 11/228,700, "Operation Of A Computer With A Touch Screen Interface," filed September 16, 2005; (8) U.S. Patent Application No. 11/228,737, "Activating Virtual Keys Of A Touch-Screen Virtual Keyboard," filed September 16, 2005; and (9) U.S. Patent Application No. 11/367,749, "Multi-Functional Hand-Held Device," filed March 3, 2006. All of these applications are incorporated by reference herein.

[0056] The touch screen 112 may have a resolution in excess of 100 dpi. In an exemplary embodiment, the touch screen has a resolution of approximately 160 dpi. The user may make contact with the touch screen 112 using any suitable object or appendage, such as a stylus, a finger, and so forth. In some embodiments, the user interface is designed to work primarily with finger-based contacts and gestures, which are much less precise than stylus-based input due to the larger area of contact of a finger on the touch screen. In some embodiments, the device translates the rough finger-based input into a precise pointer/cursor position or command for performing the actions desired by the user.

[0057] In some embodiments, in addition to the touch screen, the device 100 may include a touchpad (not shown) for activating or deactivating particular functions. In some

embodiments, the touchpad is a touch-sensitive area of the device that, unlike the touch screen, does not display visual output. The touchpad may be a touch-sensitive surface that is separate from the touch screen 112 or an extension of the touch-sensitive surface formed by the touch screen.

[0058] In some embodiments, the device 100 may include a physical or virtual click wheel as an input control device 116. A user may navigate among and interact with one or more graphical objects (henceforth referred to as icons) displayed in the touch screen 112 by rotating the click wheel or by moving a point of contact with the click wheel (e.g., where the amount of movement of the point of contact is measured by its angular displacement with respect to a center point of the click wheel). The click wheel may also be used to select one or more of the displayed icons. For example, the user may press down on at least a portion of the click wheel or an associated button. User commands and navigation commands provided by the user via the click wheel may be processed by an input controller 160 as well as one or more of the modules and/or sets of instructions in memory 102. For a virtual click wheel, the click wheel and click wheel controller may be part of the touch screen 112 and the display controller 156, respectively. For a virtual click wheel, the click wheel may be either an opaque or semitransparent object that appears and disappears on the touch screen display in response to user interaction with the device. In some embodiments, a virtual click wheel is displayed on the touch screen of a portable multifunction device and operated by user contact with the touch screen.

[0059] The device 100 also includes a power system 162 for powering the various components. The power system 162 may include a power management system, one or more power sources (e.g., battery, alternating current (AC)), a recharging system, a power failure detection circuit, a power converter or inverter, a power status indicator (e.g., a light-emitting diode (LED)) and any other components associated with the generation, management and distribution of power in portable devices.

[0060] The device 100 may also include one or more optical sensors 164. Figures 1A and 1B show an optical sensor coupled to an optical sensor controller 158 in I/O subsystem 106. The optical sensor 164 may include charge-coupled device (CCD) or complementary metal-oxide semiconductor (CMOS) phototransistors. The optical sensor 164 receives light from the environment, projected through one or more lens, and converts

the light to data representing an image. In conjunction with an imaging module 143 (also called a camera module), the optical sensor 164 may capture still images or video. In some embodiments, an optical sensor is located on the back of the device 100, opposite the touch screen display 112 on the front of the device, so that the touch screen display may be used as a viewfinder for either still and/or video image acquisition. In some embodiments, an optical sensor is located on the front of the device so that the user's image may be obtained for videoconferencing while the user views the other video conference participants on the touch screen display. In some embodiments, the position of the optical sensor 164 can be changed by the user (e.g., by rotating the lens and the sensor in the device housing) so that a single optical sensor 164 may be used along with the touch screen display for both video conferencing and still and/or video image acquisition.

[0061] The device 100 may also include one or more proximity sensors 166. Figures 1A and 1B show a proximity sensor 166 coupled to the peripherals interface 118. Alternately, the proximity sensor 166 may be coupled to an input controller 160 in the I/O subsystem 106. The proximity sensor 166 may perform as described in U.S. Patent Application Nos. 11/241,839, "Proximity Detector In Handheld Device"; 11/240,788, "Proximity Detector In Handheld Device"; number to be determined, filed January 7, 2007, "Using Ambient Light Sensor To Augment Proximity Sensor Output," attorney docket no. 04860.P4851US1; number to be determined, filed October 24, 2006, "Automated Response To And Sensing Of User Activity In Portable Devices," attorney docket no. 04860.P4293; and number to be determined, filed December 12, 2006, "Methods And Systems For Automatic Configuration Of Peripherals," attorney docket no. 04860.P4634, which are hereby incorporated by reference. In some embodiments, the proximity sensor turns off and disables the touch screen 112 when the multifunction device is placed near the user's ear (e.g., when the user is making a phone call). In some embodiments, the proximity sensor keeps the screen off when the device is in the user's pocket, purse, or other dark area to prevent unnecessary battery drainage when the device is a locked state.

[0062] The device 100 may also include one or more accelerometers 168. Figures 1A and 1B show an accelerometer 168 coupled to the peripherals interface 118. Alternately, the accelerometer 168 may be coupled to an input controller 160 in the I/O subsystem 106. The accelerometer 168 may perform as described in U.S. Patent Publication No. 20050190059, "Acceleration-based Theft Detection System for Portable

Electronic Devices," and U.S. Patent Publication No. 20060017692, "Methods And Apparatuses For Operating A Portable Device Based On An Accelerometer," both of which are which are incorporated herein by reference. In some embodiments, information is displayed on the touch screen display in a portrait view or a landscape view based on an analysis of data received from the one or more accelerometers.

[0063] In some embodiments, the software components stored in memory 102 may include an operating system 126, a communication module (or set of instructions) 128, a contact/motion module (or set of instructions) 130, a graphics module (or set of instructions) 132, a text input module (or set of instructions) 134, a Global Positioning System (GPS) module (or set of instructions) 135, and applications (or set of instructions) 136.

[0064] The operating system 126 (e.g., Darwin, RTXC, LINUX, UNIX, OS X, WINDOWS, or an embedded operating system such as VxWorks) includes various software components and/or drivers for controlling and managing general system tasks (e.g., memory management, storage device control, power management, etc.) and facilitates communication between various hardware and software components.

[0065] The communication module 128 facilitates communication with other devices over one or more external ports 124 and also includes various software components for handling data received by the RF circuitry 108 and/or the external port 124. The external port 124 (e.g., Universal Serial Bus (USB), FIREWIRE, etc.) is adapted for coupling directly to other devices or indirectly over a network (e.g., the Internet, wireless LAN, etc.). In some embodiments, the external port is a multi-pin (e.g., 30-pin) connector that is the same as, or similar to and/or compatible with the 30-pin connector used on iPod (trademark of Apple Computer, Inc.) devices.

[0066] The contact/motion module 130 may detect contact with the touch screen 112 (in conjunction with the display controller 156) and other touch sensitive devices (e.g., a touchpad or physical click wheel). The contact/motion module 130 includes various software components for performing various operations related to detection of contact, such as determining if contact has occurred, determining if there is movement of the contact and tracking the movement across the touch screen 112, and determining if the contact has been broken (i.e., if the contact has ceased). Determining movement of the point of contact may

include determining speed (magnitude), velocity (magnitude and direction), and/or an acceleration (a change in magnitude and/or direction) of the point of contact. These operations may be applied to single contacts (e.g., one finger contacts) or to multiple simultaneous contacts (e.g., "multitouch"/multiple finger contacts). In some embodiments, the contact/motion module 130 and the display controller 156 also detects contact on a touchpad. In some embodiments, the contact/motion module 130 and the controller 160 detects contact on a click wheel.

[0067] The graphics module 132 includes various known software components for rendering and displaying graphics on the touch screen 112, including components for changing the intensity of graphics that are displayed. As used herein, the term "graphics" includes any object that can be displayed to a user, including without limitation text, web pages, icons (such as user-interface objects including soft keys), digital images, videos, animations and the like.

[0068] The text input module 134, which may be a component of graphics module 132, provides soft keyboards for entering text in various applications (e.g., contacts 137, e-mail 140, IM 141, blogging 142, browser 147, and any other application that needs text input).

[0069] The GPS module 135 determines the location of the device and provides this information for use in various applications (e.g., to telephone 138 for use in location-based dialing, to camera 143 and/or blogger 142 as picture/video metadata, and to applications that provide location-based services such as weather widgets, local yellow page widgets, and map/navigation widgets).

[0070] The applications 136 may include the following modules (or sets of instructions), or a subset or superset thereof:

- a contacts module 137 (sometimes called an address book or contact list);
- a telephone module 138;
- a video conferencing module 139;
- an e-mail client module 140;
- an instant messaging (IM) module 141;
- a blogging module 142;

- a camera module 143 for still and/or video images;
- an image management module 144;
- a video player module 145;
- a music player module 146;
- a browser module 147;
- a calendar module 148;
- widget modules 149, which may include weather widget 149-1, stocks widget 149-2, calculator widget 149-3, alarm clock widget 149-4, dictionary widget 149-5, and other widgets obtained by the user, as well as user-created widgets 149-6;
- widget creator module 150 for making user-created widgets 149-6;
- search module 151;
- video and music player module 152, which merges video player module 145 and music player module 146;
- notes module 153; and/or
- map module 154.

[0071] Examples of other applications 136 that may be stored in memory 102 include other word processing applications, JAVA-enabled applications, encryption, digital rights management, voice recognition, and voice replication.

[0072] In conjunction with touch screen 112, display controller 156, contact module 130, graphics module 132, and text input module 134, the contacts module 137 may be used to manage an address book or contact list, including: adding name(s) to the address book; deleting name(s) from the address book; associating telephone number(s), e-mail address(es), physical address(es) or other information with a name; associating an image with a name; categorizing and sorting names; providing telephone numbers or e-mail addresses to initiate and/or facilitate communications by telephone 138, video conference 139, e-mail 140, or IM 141; and so forth. Embodiments of user interfaces and associated processes using contacts module 137 are described further below.

[0073] In conjunction with RF circuitry 108, audio circuitry 110, speaker 111, microphone 113, touch screen 112, display controller 156, contact module 130, graphics module 132, and text input module 134, the telephone module 138 may be used to enter a sequence of characters corresponding to a telephone number, access one or more telephone numbers in the address book 137, modify a telephone number that has been entered, dial a respective telephone number, conduct a conversation and disconnect or hang up when the conversation is completed. As noted above, the wireless communication may use any of a plurality of communications standards, protocols and technologies. Embodiments of user interfaces and associated processes using telephone module 138 are described further below.

[0074] In conjunction with RF circuitry 108, audio circuitry 110, speaker 111, microphone 113, touch screen 112, display controller 156, optical sensor 164, optical sensor controller 158, contact module 130, graphics module 132, text input module 134, contact list 137, and telephone module 138, the videoconferencing module 139 may be used to initiate, conduct, and terminate a video conference between a user and one or more other participants. Embodiments of user interfaces and associated processes using videoconferencing module 139 are described further below.

[0075] In conjunction with RF circuitry 108, touch screen 112, display controller 156, contact module 130, graphics module 132, and text input module 134, the e-mail client module 140 may be used to create, send, receive, and manage e-mail. In conjunction with image management module 144, the e-mail module 140 makes it very easy to create and send e-mails with still or video images taken with camera module 143. Embodiments of user interfaces and associated processes using e-mail module 140 are described further below.

[0076] In conjunction with RF circuitry 108, touch screen 112, display controller 156, contact module 130, graphics module 132, and text input module 134, the instant messaging module 141 may be used to enter a sequence of characters corresponding to an instant message, to modify previously entered characters, to transmit a respective instant message (for example, using a Short Message Service (SMS) or Multimedia Message Service (MMS) protocol for telephony-based instant messages or using XMPP, SIMPLE, or IMPS for Internet-based instant messages), to receive instant messages and to view received

instant messages. In some embodiments, transmitted and/or received instant messages may include graphics, photos, audio files, video files and/or other attachments as are supported in a MMS and/or an Enhanced Messaging Service (EMS). As used herein, "instant messaging" refers to both telephony-based messages (e.g., messages sent using SMS or MMS) and Internet-based messages (e.g., messages sent using XMPP, SIMPLE, or IMPS). Embodiments of user interfaces and associated processes using instant messaging module 141 are described further below.

[0077] In conjunction with RF circuitry 108, touch screen 112, display controller 156, contact module 130, graphics module 132, text input module 134, image management module 144, and browsing module 147, the blogging module 142 may be used to send text, still images, video, and/or other graphics to a blog (e.g., the user's blog). Embodiments of user interfaces and associated processes using blogging module 142 are described further below.

[0078] In conjunction with touch screen 112, display controller 156, optical sensor(s) 164, optical sensor controller 158, contact module 130, graphics module 132, and image management module 144, the camera module 143 may be used to capture still images or video (including a video stream) and store them into memory 102, modify characteristics of a still image or video, or delete a still image or video from memory 102. Embodiments of user interfaces and associated processes using camera module 143 are described further below.

[0079] In conjunction with touch screen 112, display controller 156, contact module 130, graphics module 132, text input module 134, and camera module 143, the image management module 144 may be used to arrange, modify or otherwise manipulate, label, delete, present (e.g., in a digital slide show or album), and store still and/or video images. Embodiments of user interfaces and associated processes using image management module 144 are described further below.

[0080] In conjunction with touch screen 112, display controller 156, contact module 130, graphics module 132, audio circuitry 110, and speaker 111, the video player module 145 may be used to display, present or otherwise play back videos (e.g., on the touch screen or on an external, connected display via external port 124). Embodiments of user interfaces and associated processes using video player module 145 are described further below.

[0081] In conjunction with touch screen 112, display system controller 156, contact module 130, graphics module 132, audio circuitry 110, speaker 111, RF circuitry 108, and browser module 147, the music player module 146 allows the user to download and play back recorded music and other sound files stored in one or more file formats, such as MP3 or AAC files. In some embodiments, the device 100 may include the functionality of an MP3 player, such as an iPod (trademark of Apple Computer, Inc.). Embodiments of user interfaces and associated processes using music player module 146 are described further below.

[0082] In conjunction with RF circuitry 108, touch screen 112, display system controller 156, contact module 130, graphics module 132, and text input module 134, the browser module 147 may be used to browse the Internet, including searching, linking to, receiving, and displaying web pages or portions thereof, as well as attachments and other files linked to web pages. Embodiments of user interfaces and associated processes using browser module 147 are described further below.

[0083] In conjunction with RF circuitry 108, touch screen 112, display system controller 156, contact module 130, graphics module 132, text input module 134, e-mail module 140, and browser module 147, the calendar module 148 may be used to create, display, modify, and store calendars and data associated with calendars (e.g., calendar entries, to do lists, etc.). Embodiments of user interfaces and associated processes using calendar module 148 are described further below.

[0084] In conjunction with RF circuitry 108, touch screen 112, display system controller 156, contact module 130, graphics module 132, text input module 134, and browser module 147, the widget modules 149 are mini-applications that may be downloaded and used by a user (e.g., weather widget 149-1, stocks widget 149-2, calculator widget 149-3, alarm clock widget 149-4, and dictionary widget 149-5) or created by the user (e.g., user-created widget 149-6). In some embodiments, a widget includes an HTML (Hypertext Markup Language) file, a CSS (Cascading Style Sheets) file, and a JavaScript file. In some embodiments, a widget includes an XML (Extensible Markup Language) file and a JavaScript file (e.g., Yahoo! Widgets). Embodiments of user interfaces and associated processes using widget modules 149 are described further below.

[0085] In conjunction with RF circuitry 108, touch screen 112, display system controller 156, contact module 130, graphics module 132, text input module 134, and browser module 147, the widget creator module 150 may be used by a user to create widgets (e.g., turning a user-specified portion of a web page into a widget). Embodiments of user interfaces and associated processes using widget creator module 150 are described further below.

[0086] In conjunction with touch screen 112, display system controller 156, contact module 130, graphics module 132, and text input module 134, the search module 151 may be used to search for text, music, sound, image, video, and/or other files in memory 102 that match one or more search criteria (e.g., one or more user-specified search terms). Embodiments of user interfaces and associated processes using search module 151 are described further below.

[0087] In conjunction with touch screen 112, display controller 156, contact module 130, graphics module 132, and text input module 134, the notes module 153 may be used to create and manage notes, to do lists, and the like. Embodiments of user interfaces and associated processes using notes module 153 are described further below.

[0088] In conjunction with RF circuitry 108, touch screen 112, display system controller 156, contact module 130, graphics module 132, text input module 134, GPS module 135, and browser module 147, the map module 154 may be used to receive, display, modify, and store maps and data associated with maps (e.g., driving directions; data on stores and other points of interest at or near a particular location; and other location-based data). Embodiments of user interfaces and associated processes using map module 154 are described further below.

[0089] Each of the above identified modules and applications correspond to a set of instructions for performing one or more functions described above. These modules (i.e., sets of instructions) need not be implemented as separate software programs, procedures or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. For example, video player module 145 may be combined with music player module 146 into a single module (e.g., video and music player module 152, Figure 1B). In some embodiments, memory 102 may store a subset of the modules and

data structures identified above. Furthermore, memory 102 may store additional modules and data structures not described above.

[0090] In some embodiments, the device 100 is a device where operation of a predefined set of functions on the device is performed exclusively through a touch screen 112 and/or a touchpad. By using a touch screen and/or a touchpad as the primary input/control device for operation of the device 100, the number of physical input/control devices (such as push buttons, dials, and the like) on the device 100 may be reduced.

[0091] The predefined set of functions that may be performed exclusively through a touch screen and/or a touchpad include navigation between user interfaces. In some embodiments, the touchpad, when touched by the user, navigates the device 100 to a main, home, or root menu from any user interface that may be displayed on the device 100. In such embodiments, the touchpad may be referred to as a "menu button." In some other embodiments, the menu button may be a physical push button or other physical input/control device instead of a touchpad.

[0092] Figure 2 illustrates a portable multifunction device 100 having a touch screen 112 in accordance with some embodiments. The touch screen may display one or more graphics within user interface (UI) 200. In this embodiment, as well as others described below, a user may select one or more of the graphics by making contact or touching the graphics, for example, with one or more fingers 202 (not drawn to scale in the figure). In some embodiments, selection of one or more graphics occurs when the user breaks contact with the one or more graphics. In some embodiments, the contact may include a gesture, such as one or more taps, one or more swipes (from left to right, right to left, upward and/or downward) and/or a rolling of a finger (from right to left, left to right, upward and/or downward) that has made contact with the device 100. In some embodiments, inadvertent contact with a graphic may not select the graphic. For example, a swipe gesture that sweeps over an application icon may not select the corresponding application when the gesture corresponding to selection is a tap.

[0093] The device 100 may also include one or more physical buttons, such as "home" or menu button 204. As described previously, the menu button 204 may be used to navigate to any application 136 in a set of applications that may be executed on the device

100. Alternatively, in some embodiments, the menu button is implemented as a soft key in a GUI in touch screen 112.

[0094] In one embodiment, the device 100 includes a touch screen 112, a menu button 204, a push button 206 for powering the device on/off and locking the device, volume adjustment button(s) 208, a Subscriber Identity Module (SIM) card slot 210, a head set jack 212, and a docking/charging external port 124. The push button 206 may be used to turn the power on/off on the device by depressing the button and holding the button in the depressed state for a predefined time interval; to lock the device by depressing the button and releasing the button before the predefined time interval has elapsed; and/or to unlock the device or initiate an unlock process. In an alternative embodiment, the device 100 also may accept verbal input for activation or deactivation of some functions through the microphone 113.

[0095] Attention is now directed towards embodiments of user interfaces ("UI") and associated processes that may be implemented on a portable multifunction device 100.

[0096] Figure 3 illustrates an exemplary user interface for unlocking a portable electronic device in accordance with some embodiments. In some embodiments, user interface 300 includes the following elements, or a subset or superset thereof:

- Unlock image 302 that is moved with a finger gesture to unlock the device;
- Arrow 304 that provides a visual cue to the unlock gesture;
- Channel 306 that provides additional cues to the unlock gesture;
- Time 308;
- Day 310;
- Date 312; and
- Wallpaper image 314.

[0097] In some embodiments, the device detects contact with the touch-sensitive display (e.g., a user's finger making contact on or near the unlock image 302) while the device is in a user-interface lock state. The device moves the unlock image 302 in accordance with the contact. The device transitions to a user-interface unlock state if the detected contact corresponds to a predefined gesture, such as moving the unlock image

across channel 306. Conversely, the device maintains the user-interface lock state if the detected contact does not correspond to the predefined gesture. As noted above, processes that use gestures on the touch screen to unlock the device are described in U.S. Patent Applications 11/322,549, "Unlocking A Device By Performing Gestures On An Unlock Image," filed December 23, 2005, and 11/322,550, "Indication Of Progress Towards Satisfaction Of A User Input Condition," filed December 23, 2005, which are hereby incorporated by reference.

[0098] Figures 4A and 4B illustrate exemplary user interfaces for a menu of applications on a portable multifunction device in accordance with some embodiments. In some embodiments, user interface 400A includes the following elements, or a subset or superset thereof:

- Signal strength indicator(s) 402 for wireless communication(s), such as cellular and Wi-Fi signals;
- Time 404;
- Battery status indicator 406;
- Tray 408 with icons for frequently used applications, such as one or more of the following:
    - Phone 138, which may include an indicator 414 of the number of missed calls or voicemail messages;
    - E-mail client 140, which may include an indicator 410 of the number of unread e-mails;
    - Browser 147; and
    - Music player 146; and
- Icons for other applications, such as one or more of the following:
    - IM 141;
    - Image management 144;
    - Camera 143;
    - Video player 145;

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- Weather 149-1;
- Stocks 149-2;
- Blog 142;
- Calendar 148;
- Calculator 149-3;
- Alarm clock 149-4;
- Dictionary 149-5; and
- User-created widget 149-6.

[0099] In some embodiments, user interface 400B includes the following elements, or a subset or superset thereof:

- 402, 404, 406, 141, 148, 144, 143, 149-3, 149-2, 149-1, 149-4, 410, 414, 138, 140, and 147, as described above;
- Map 154;
- Notes 153;
- Settings 412, which provides access to settings for the device 100 and its various applications 136, as described further below; and
- Video and music player module 152, also referred to as iPod (trademark of Apple Computer, Inc.) module 152.

[00100] In some embodiments, UI 400A or 400B displays all of the available applications 136 on one screen so that there is no need to scroll through a list of applications (e.g., via a scroll bar). In some embodiments, as the number of applications increase, the icons corresponding to the applications may decrease in size so that all applications may be displayed on a single screen without scrolling. In some embodiments, having all applications on one screen and a menu button enables a user to access any desired application with at most two inputs, such as activating the menu button 204 and then activating the desired application (e.g., by a tap or other finger gesture on the icon corresponding to the application).

[00101] In some embodiments, UI 400A or 400B provides integrated access to both widget-based applications and non-widget-based applications. In some embodiments, all of the widgets, whether user-created or not, are displayed in UI 400A or 400B. In other embodiments, activating the icon for user-created widget 149-6 may lead to another UI that contains the user-created widgets or icons corresponding to the user-created widgets.

[00102] In some embodiments, a user may rearrange the icons in UI 400A or 400B, e.g., using processes described in U.S. Patent Application No. 11/459,602, "Portable Electronic Device With Interface Reconfiguration Mode," filed July 24, 2006, which is hereby incorporated by reference. For example, a user may move application icons in and out of tray 408 using finger gestures.

[00103] In some embodiments, UI 400A or 400B includes a gauge (not shown) that displays an updated account usage metric for an account associated with usage of the device (e.g., a cellular phone account), as described in U.S. Patent Application 11/322,552, "Account Information Display For Portable Communication Device," filed December 23, 2005, which is hereby incorporated by reference.

[00104] Figures 5A-5C illustrate an exemplary screen rotation gesture in accordance with some embodiments.

[00105] Figure 6 is a flow diagram illustrating a process for implementing screen rotation gestures in accordance with some embodiments.

[00106] In some embodiments, a portable multifunction device (e.g., device 100) displays (602) a first application 5702 on a touch screen display (e.g., 112) in a portrait orientation (e.g., Figure 5A). In some embodiments, the first application is a browser, a photo manager, a music player, or a video player. In most implementations, but not necessarily all, the display is rectangular, or substantially rectangular (e.g., the display may have rounded corners, but otherwise has a rectangular shape).

[00107] Simultaneous rotation of two thumbs (e.g., 5704-L and 5704-R) in a first sense of rotation is detected (604) on the touch screen display 112. In some embodiments, the first sense of rotation is a clockwise rotation (e.g., Figure 5C).

[00108] In some embodiments, the sense of rotation for each thumb is detected by monitoring the change in orientation of the contact area of the thumb with the touch screen

display. For example, if the contact area of the thumb is elliptical, the change in the orientation of an axis of the ellipse may be detected (e.g., from contact ellipse 5706-L in Figure 5A to contact ellipse 5708-L in Figure 5B, as shown on an enlarged portion of touch screen 112 in Figure 5C). In some embodiments, at least some of a user's other fingers (i.e., fingers other than thumbs 5704-L and 5704-R) support the device 100 by contacting the backside of the device.

[00109] In some embodiments, the first sense of rotation is a counterclockwise rotation. For example, if thumb 5704-L is initially on the lower left side of touch screen 112 (rather than the upper left side in Figure 5A), thumb 5704-R is initially on the upper right side of touch screen 112 (rather than the lower right side in Figure 5A), and the thumbs are moved apart from each other, then the sense of rotation detected by the touch screen 112 will be counterclockwise for both thumbs.

[00110] In response to detecting the simultaneous rotation of the two thumbs in the first sense of rotation, the first application 5702 is displayed (606) in a landscape orientation.

[00111] In some embodiments, the simultaneous two-thumb rotation gesture is used to override automatic changes in portrait/landscape orientation based on analysis of data from accelerometers 168 until a predetermined condition is met. In some embodiments, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected are disregarded until the device displays a second application different from the first application. In some embodiments, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected are disregarded until the device is put in a locked state or turned off. In some embodiments, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs is detected are disregarded for a predetermined time period.

[00112] In some embodiments, simultaneous rotation of the two thumbs is detected (608) in a second sense of rotation that is opposite the first sense of rotation on the touch screen display. In response to detecting the simultaneous rotation of the two thumbs in the second sense of rotation, the first application is displayed (610) in a portrait orientation.

[00113] In some embodiments, any changes in orientation of the device that are detected after the simultaneous rotation of the two thumbs in the first sense is detected are

disregarded until the simultaneous rotation of the two thumbs in the second sense is detected.

[00114] A graphical user interface on a portable multifunction device with a touch screen display comprises an application that is displayed in either a first orientation or a second orientation, the second orientation being 90° from the first orientation. In response to detecting simultaneous rotation of two thumbs in a first sense of rotation on the touch screen display, the display of the application changes from the first orientation to the second orientation. In some embodiments, the first orientation is a portrait orientation (e.g., Figure 5A) and the second orientation is a landscape orientation (e.g., Figure 5B). In some embodiments, the first orientation is a landscape orientation and the second orientation is a portrait orientation.

[00115] Figures 7A-7C illustrate an exemplary screen rotation gesture in accordance with some embodiments.

[00116] Figure 8 is a flow diagram illustrating a process for implementing screen rotation gestures in accordance with some embodiments.

[00117] In some embodiments, a portable multifunction device (e.g., device 100) displays (802) a first application 702 on a touch screen display (e.g., 112) in a portrait orientation (e.g., Figure 7A). In some embodiments, the first application is a browser, a photo manager, a music player, or a video player. In most implementations, but not necessarily all, the display is rectangular, or substantially rectangular (e.g., the display may have rounded corners, but otherwise has a rectangular shape).

[00118] Rotation of a thumb (e.g., 704-R) within a predetermined range of angles near 90° (e.g., between 85° and 95°, between 80° and 100°, between 75° and 105°, or between 70° and 110°) in a first sense of rotation is detected (804) on the touch screen display 112. In some embodiments, the first sense of rotation is a clockwise rotation (e.g., Figure 7C). In some embodiments, at least one finger (e.g., 710) on a side of the device opposite the touch screen display (i.e., the backside of the device) is simultaneously detected (805) while detecting the rotation of the thumb.

[00119] In some embodiments, the sense of rotation is detected by monitoring the change in orientation of the contact area of the thumb with the touch screen display. For