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(54) Title: REINFORCED DISPLAY DEVICES

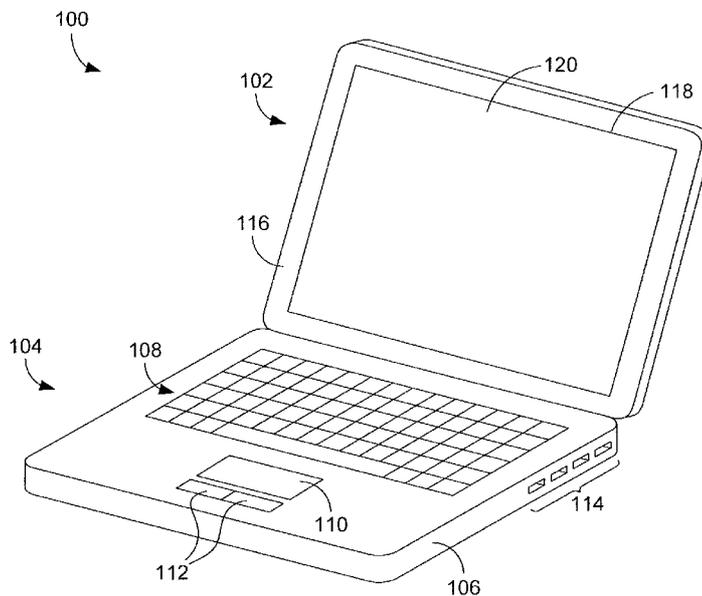


FIG. 1

(57) Abstract: A display device intended for use in a display panel of a computer, the display device including a frame that defines a mounting surface and a reinforcement member directly attached to the mounting surface of the frame with bonding material, the reinforcement member comprising fiber reinforced plastic.



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- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(H))*

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REINFORCED DISPLAY DEVICES**BACKGROUND**

Notebook or "laptop" computers are being made thinner and lighter every year to satisfy customer demand for high portability. One challenge that arises with the drive
10 toward thinner and lighter computers relates to durability. Specifically, when the display panel of a notebook computer is very thin, it can be more difficult to protect its display device from damage. Another challenge relates to perceived quality. In particular, thin display panels may twist and flex to a significant degree when manipulated by the user, thereby creating the perception of poor quality.

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BRIEF DESCRIPTION OF THE DRAWINGS

The disclosed reinforced display devices can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale.

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FIG. 1 is a perspective view of an embodiment of a notebook computer having a reinforced display device.

FIG. 2 is a front view of an embodiment of a display device used in the notebook computer of FIG. 1.

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FIG. 3 is a rear view of the display device of FIG. 2 prior to application of a reinforcement member.

FIG. 4 is perspective view of a display device, illustrating adhesive material and a reinforcement member that are to be applied to the display device.

FIG. 5 is a perspective view of the display device shown in FIG. 4, illustrating the adhesive material applied to the display device and a reinforcement panel to be applied to the adhesive material.

FIG. 6 is a perspective view of the display device shown in FIG. 4, illustrating the reinforcement member attached to the display device using the adhesive material.

FIG. 7 is a side view of the notebook computer of FIG. 1, illustrating integration of the display device of FIG. 6 into a display panel of the computer.

DETAILED DESCRIPTION

As described above, the purchasing public desires thinner and lighter notebook computers. Unfortunately, reducing the size and/or weight of such computers can result in reduced rigidity, which can lead to display damage and/or the perception of poor quality. As described in the following, however, thinness and light weight can be achieved without sacrificing rigidity when a high-strength, lightweight reinforcement member is affixed to the display device. In some embodiments, the reinforcement member comprises a panel of carbon fiber reinforced plastic that is directly bonded to the display device before the display device is installed within a display panel of the computer.

Referring now in more detail to the drawings in which like numerals indicate corresponding parts throughout the several views, FIG. 1 illustrates a notebook or "laptop" computer 100 having a reinforced display device. As indicated in the figure, the computer 100 includes a first or base portion 102 and a second or display portion

or panel 104 that are attached to each other with a hinge mechanism (not shown) such that the two portions can be pivoted relative to each other in a "clam shell" manner typical to many notebook computers. The base portion 102 includes an outer housing 106 that surrounds various internal components of the computer 100, such as a processor, memory, hard drive, and the like. Also included in the base portion 102 are user input devices, including a keyboard 108, a mouse pad 110, and selection buttons 112. As is further illustrated in FIG. 1, various ports or connectors 114 may be accessible through the housing 106.

With further reference to FIG. 1, the display panel 102 includes its own outer housing 116. In some embodiments, the housing 116 includes two portions that are connected together, such as a front cover and a back cover (see, e.g., FIG. 7). Regardless, formed within the housing 116 is an opening 118 through which a display device 120 may be viewed. For purposes of this disclosure, the term "display device" denotes the component used to generate and display images to a user, as opposed to the entire display panel 102. Therefore, the display device 120 comprises an independent component that is installed within the display panel 102, for example between the front and back cover of the housing 116. In some embodiments, the display device 120 comprises a liquid crystal display (LCD). In other embodiments, the display device 120 comprises a light emitting diode (LED) display, such as an organic LED (OLED) display.

Although a "notebook computer" has been identified and described, it is to be appreciated that the present disclosure more generally relates to any computer or computer-type device that comprises a display device that could benefit from reinforcement. Therefore, the present disclosure should be interpreted as applying

to other devices, such as tablet computers, personal digital assistants, mobile phones, portable game units and so forth.

Referring next to FIGs. 2 and 3, illustrated is an example display device 120 that can be used in the computer 100. Beginning with FIG. 2, the front side of the display device 120 comprises a display screen 122 that is surrounded by a front frame or bezel 124. Extending outward (e.g., downward) from the display device 120 is a connector element 126 with which power and display control signals can be provided to display device. Turning to FIG. 3, the back side of the display device 120 comprises a frame 128 that, in the illustrated embodiment, generally follows the perimeter of the display device. In some embodiments, the frame 128 is raised above the remainder of the display device 120 so as to define a depression 129 within the center of the display device. Regardless, the frame 128 defines a surface that lies within a flat plane that can be used as a mounting surface for a reinforcement member (described below).

FIGs. 4-6 illustrate application of a reinforcement member 130 to the display device 120 to provide increased rigidity to the display device and to the display panel 102 in which it is used. The reinforcement member 130 comprises a flat panel of high-strength, lightweight reinforcement material. By way of example, the reinforcement member 130 is approximately 0.25 millimeters (mm) to 1.2 mm thick. In some embodiments, the member 130 is formed of carbon fiber reinforced plastic. In such a case, the member 130 comprises a composite material that is formed by layering sheets of carbon fiber (e.g., filament) cloth within a mold and then injecting a suitable plastic material, such as epoxy, polyester, vinyl ester, or nylon, into the mold. Although carbon fiber reinforced plastic has been explicitly identified, alternative materials can be used. For example, in addition or in exception to carbon

fibers, Kevlar (para-aramid) fibers, aluminum fibers, and glass fibers can be used as reinforcing fibers.

Regardless of the particular materials used, the reinforcement member 130 is very rigid. That rigidity can be imparted to the display device 120 by securely affixing
5 the reinforcement member 130 to the display device. In some embodiments, such affixation is achieved by directly bonding the reinforcement member to the back side of the display device 120 and, more particularly, to the surface of the frame 128. FIG. 4 illustrates bonding material 132 that may be used to bond the reinforcement member 130 to the display panel 120. In some embodiments, the bonding material
10 132 comprises very high bond (VHB) double-sided tape, such as that available from the 3M Company. In other embodiments, the bonding material 132 comprises a layer of structural adhesive.

As indicated in FIG. 4, the bonding material 132 is positioned between the display device 120 and the reinforcement member 130. It is noted, however, that the
15 arrangement shown in FIG. 4 is provided for purposes of explanation only. Therefore, the bonding material 132 and/or reinforcement member 130 need not be applied to the display device 120 in the manner suggested by FIG. 4.

Turning to FIG. 5, the bonding material 132 has been applied to the display device. As is apparent in FIG. 5 the bonding material 132 has been applied to the
20 surface of the frame 128 (i.e., the mounting surface) around the perimeter of the display device 120 such that bonding material is provided along each side or edge of the display device. Although desirable reinforcement can be achieved by only providing the bonding material around the perimeter of the display device 120 and by only bonding the reinforcement member 130 to the display device around its

perimeter, it is noted that the bonding material can be provided on other portions of the display device if desired.

FIG. 6 illustrates the reinforcement member 130 after it has been bonded to the display device 120 using the bonding material 132 (not visible in FIG. 6). In the
5 embodiment of FIG. 6, the reinforcement member 130 spans substantially the entire height and width of the display device 120. In other embodiments, however, the reinforcement member 130 may cover a lesser, but still substantial, portion of the display device 120. In still other embodiments, one or more openings or cut-outs can be provided in the reinforcement member 130 and/or the bonding material 132
10 to enable the passage of wires or cables, such as a display cable.

FIG. 7 illustrates integration of the reinforced display device 120 into the computer 100 of FIG. 1. As indicated in FIG. 7, the display device 120, along with the reinforcement member 130 that is bonded thereto, is positioned within the display panel 102 between a front cover 132 and a back cover 134 that together
15 form the housing 116 of the display panel. Therefore, the reinforcement member 130 comprises an internal element of the computer 100 that is not visible to the user once the computer has been fully assembled.

Due to the bonding of the reinforcement member 130 to the display device 120, the display device is significantly more rigid than it would have been without the
20 reinforcement. Therefore, the display device 130 is better suited to withstand forces applied to the device without damage. Moreover, the increased rigidity of the display device 120 imparts increased structural integrity to the entire display panel 102, which provides the customer with the impression of high quality.

CLAIMS

Claimed are:

1. A display device intended for use in a display panel of a computer, the display device comprising:

a frame that defines a mounting surface; and

a reinforcement member directly attached to the mounting surface of the frame with bonding material, the reinforcement member comprising fiber reinforced plastic.

2. The display device of claim 1, wherein the display device is a liquid crystal display (LCD) display device.

3. The display device of claim 1, wherein the frame follows a perimeter of the display device.

4. The display device of claim 1, wherein the mounting surface lies in a flat plane.

5. The display device of claim 1, wherein the reinforcement member comprises a flat panel of fiber reinforced plastic.

6. The display device of claim 1, wherein the fiber reinforced plastic is carbon fiber reinforced plastic.

7. The display device of claim 1, wherein the bonding material comprises double-sided tape.

8. The display device of claim 1, wherein the bonding material comprises structural adhesive.

9. The display device of claim 1, wherein reinforcement material is bonded to the frame along each edge of the display device.

10. A display device intended for use in a display panel of a computer, the display device comprising:

a frame provided on a back side of the display device that follows a perimeter of the display device and defines a flat mounting surface;

bonding material applied to the mounting surface along each edge of the display device; and

a flat panel of fiber reinforced plastic directly bonded to the mounting surface with the bonding material.

11. The display device of claim 10, wherein the display device is a liquid crystal display (LCD) display device.

12. The display device of claim 10, wherein the fiber reinforced plastic is carbon fiber reinforced plastic.

13. The display device of claim 1, wherein the bonding material comprises double-sided tape.

14. The display device of claim 1, wherein the bonding material comprises structural adhesive.

15. A computer comprising:

a display panel including an outer housing and a reinforced display device provided within the outer housing, the reinforced display device comprising a frame that defines a mounting surface and an internal reinforcement member directly bonded to the mounting surface of the frame with bonding material, the reinforcement member comprising fiber reinforced plastic.

16. The computer of claim 15, wherein the display device is a liquid crystal display (LCD) display device.

17. The computer of claim 15, wherein the reinforcement member comprises a flat panel of fiber reinforced plastic.

18. The computer of claim 15, wherein the fiber reinforced plastic is carbon fiber reinforced plastic.

19. The computer of claim 15, wherein the bonding material comprises double-sided tape.

20. The computer of claim 15, wherein the bonding material comprises structural adhesive.

21. The computer of claim 15, wherein the outer housing comprises a front cover and a back cover and wherein the internal reinforcement member is not visible once the back cover has been attached to the computer.

22. The computer of claim 15, further comprising a base portion to which the display panel is attached.

23. The computer of claim 15, wherein the computer is a notebook computer.

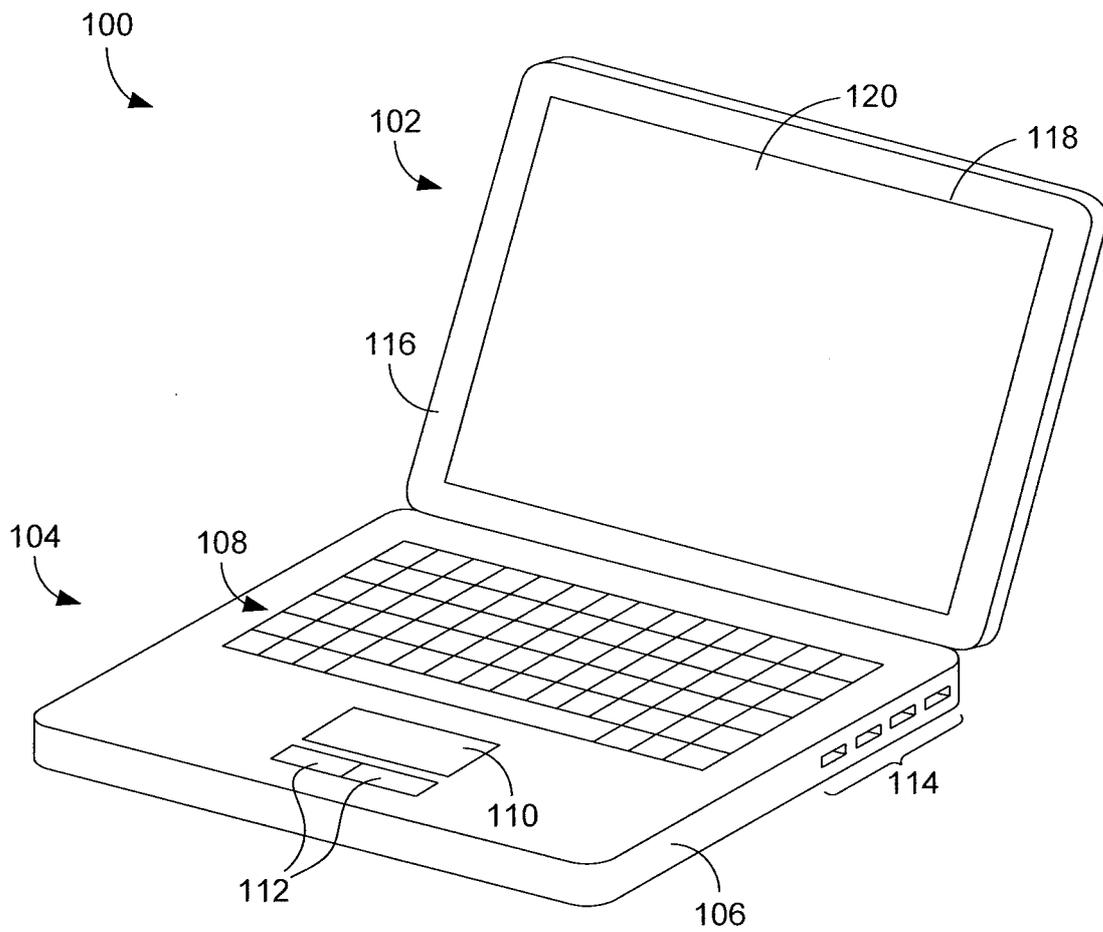


FIG. 1

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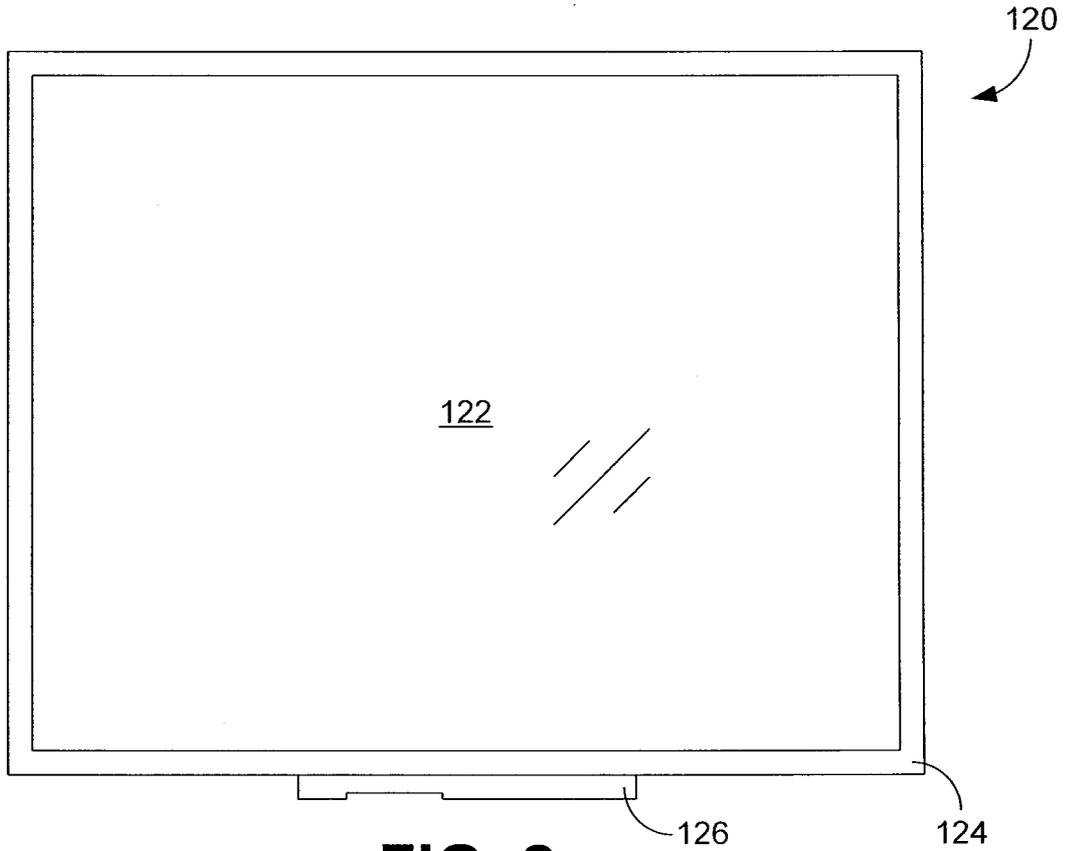


FIG. 2

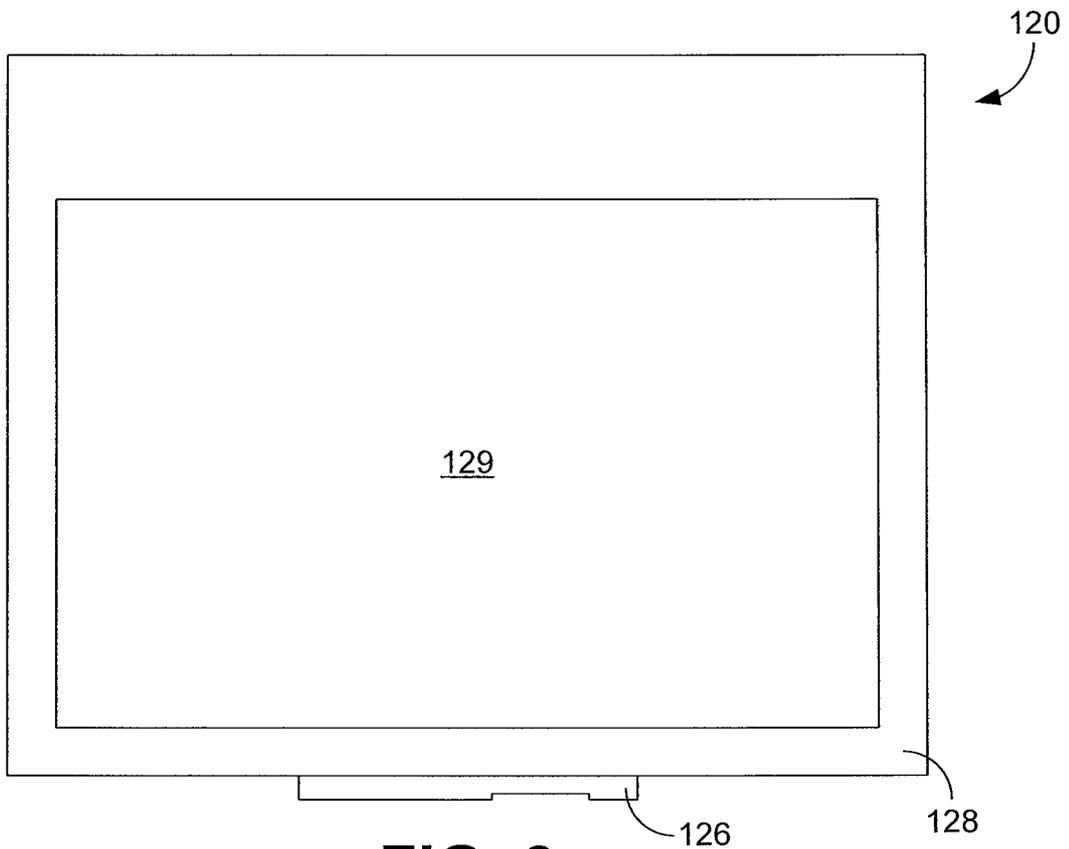


FIG. 3

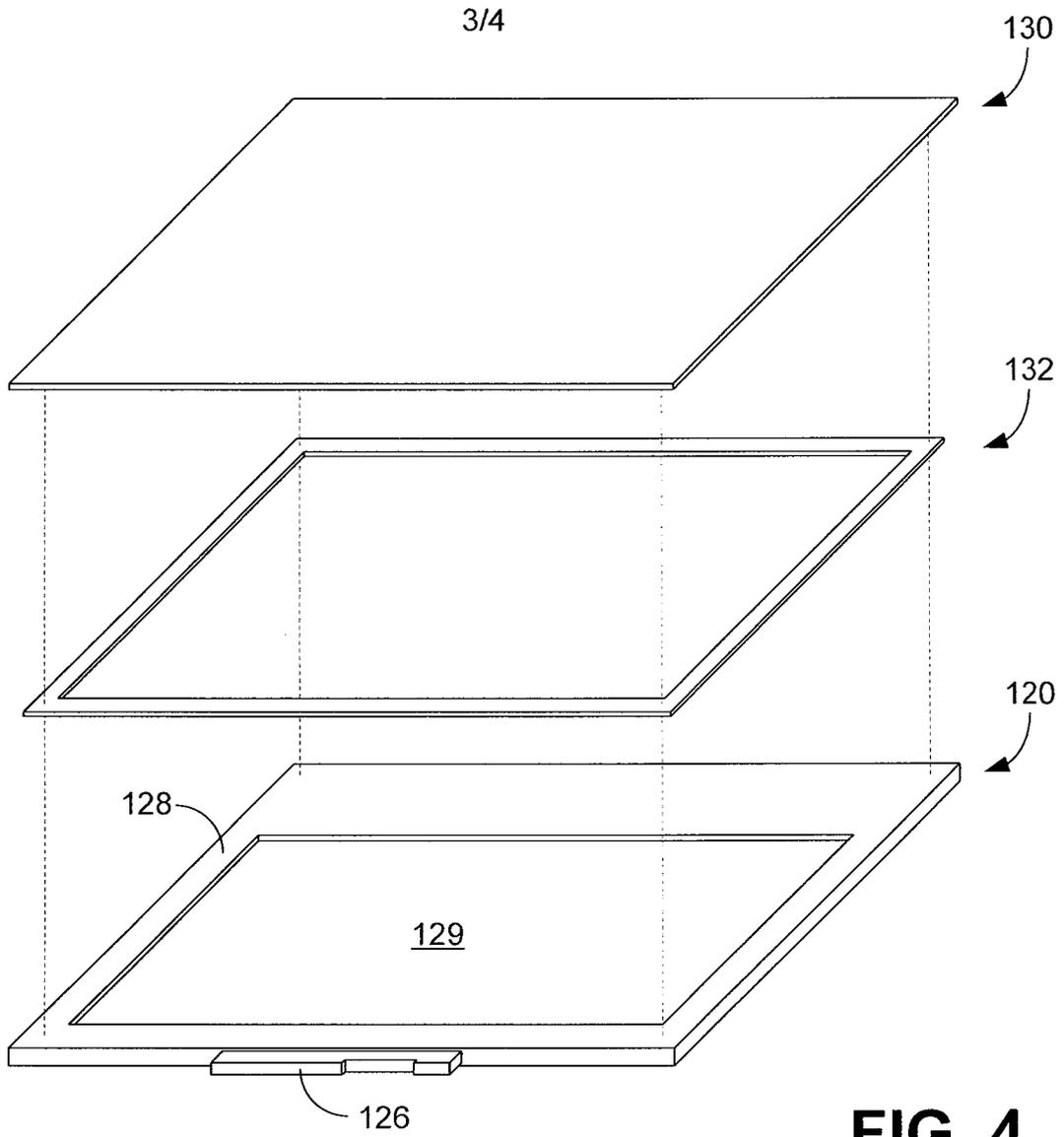


FIG. 4

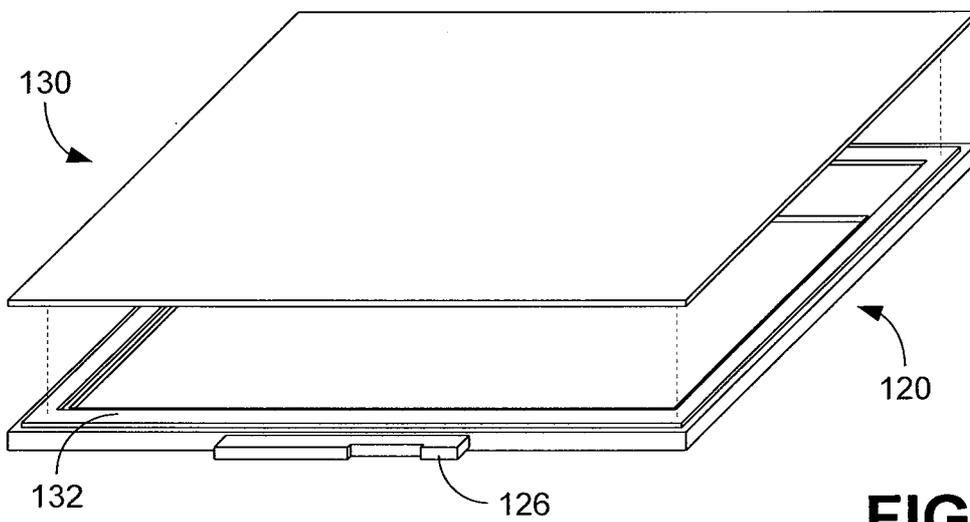


FIG. 5

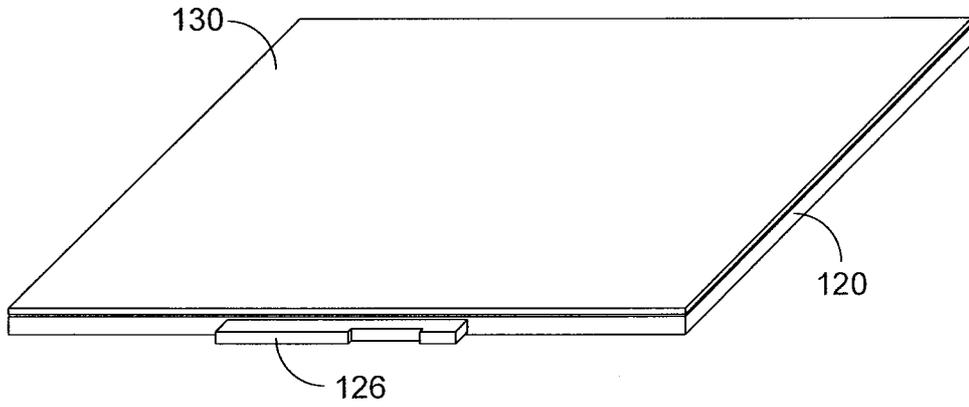


FIG. 6

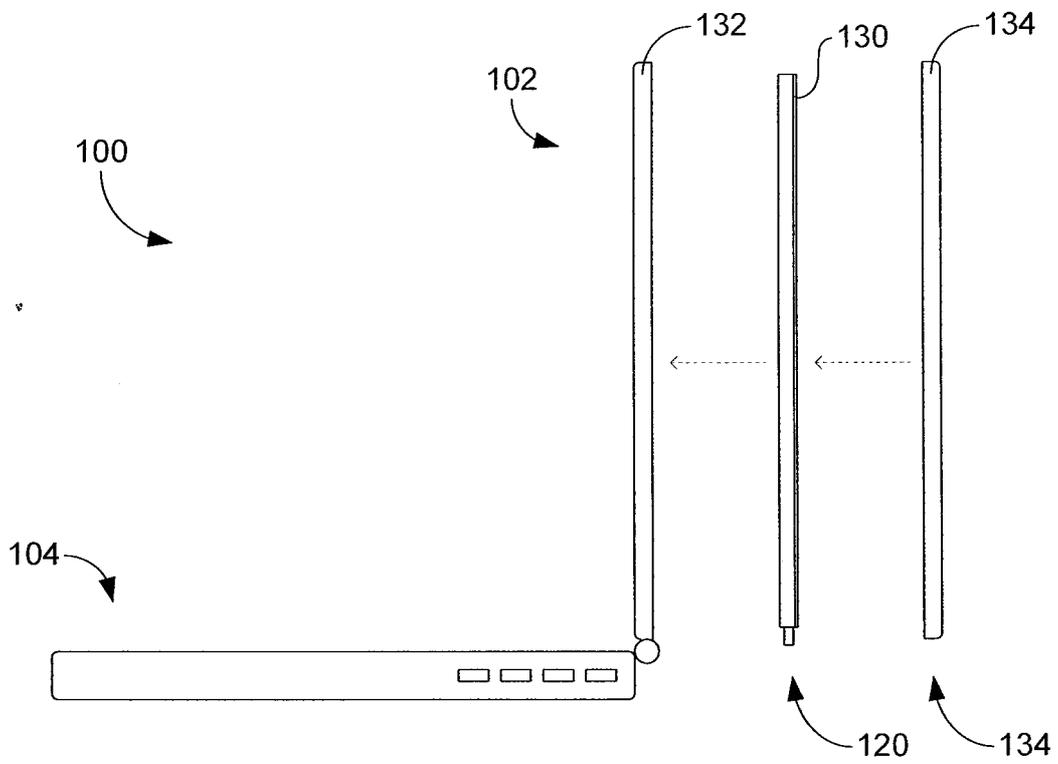


FIG. 7

A. CLASSIFICATION OF SUBJECT MATTER		
G06F I/16(2006.01)i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC 8 G06F 1/00, HOIJ 5/02		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched KOREAN UTILITY MODELS AND APPLICATIONS FOR UTILITY MODELS SINCE 1975 JAPANESE UTILITY MODELS AND APPLICATIONS FOR UTILITY MODELS SINCE 1975		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKIPASS(KIPO internal) "display" "support" "frame" "reinforcement" "attach" "adhesive" "tape" "bond*" and similar terms		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
Y	US 6498718 B1 (KIM et al) 24 December 2002 See the abstract, figures 1-2, claim 1	1-23
Y	EP 1398812 A2 (BRIDGESTONE CORPORATION) 17 March 2004 See the abstract, figure 8A	1-23
A	KR 10-2002-0092734 A (LG PHILIPS LCD CORPORATION, Ltd) 12 December 2002 See the abstract, figures 1-5, claims 1-13	1, 10, 15
A	KR 10-2004-0085684 A (LG PHILIPS LCD CORPORATION, Ltd) 08 October 2004 See figure 3, claim 1	1, 10, 15
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> 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 application or patent but 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 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 28 OCTOBER 2008 (28 10 2008)		Date of mailing of the international search report 28 OCTOBER 2008 (28.10.2008)
Name and mailing address of the ISA/KR  Korean Intellectual Property Office Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No 82-42-472-7140		Authorized officer Yoon, Jin Hoon Telephone No 82-42-481-5391 

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No
PCT/US2008/053805

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6498718 B1	24.12.2002	US 2003/0067740 A1 US 2004/0174667 A1	10.04.2004 09.09.2004
EP 1398812 A2	17.03.2004	EP 0908920 A2 JP 11-119666 A JP 11-119667 A JP 11-119668 A JP 11-119669 A JP 11-119670 A JP 11-119671 A JP 11-119672 A JP 11-119673 A JP 11-119674 A US 6255778 B1	14.04.1999 30.04.1999 30.04.1999 30.04.1999 30.04.1999 30.04.1999 30.04.1999 30.04.1999 30.04.1999 30.04.1999 03.07.2001
KR 10-2002-0092734 A	12.12.2002	None	
KR 10-2004-0085684 A	08.10.2004	None	