US 20150334862A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2015/0334862 A1

(43) Pub. Date: Nov. 19, 2015

Minaguchi et al.

(54) **PROTECTIVE SHEET AND ELECTRONIC DEVICE WITH PROTECTIVE SHEET**

(71) Applicant: **Kabushiki Kaisha Toshiba**, Tokyo (JP)

(72) Inventors: **Hiroyuki Minaguchi**, Higashimatsuyama Saitama (JP); **Takayuki Arisaka**, Fussa Tokyo (JP); **Kyohei Matsumoto**, Ome Tokyo (JP)

(21) Appl. No.: **14/637,033**

(22) Filed: **Mar. 3, 2015**

Related U.S. Application Data

(60) Provisional application No. 61/992,574, filed on May 13, 2014.

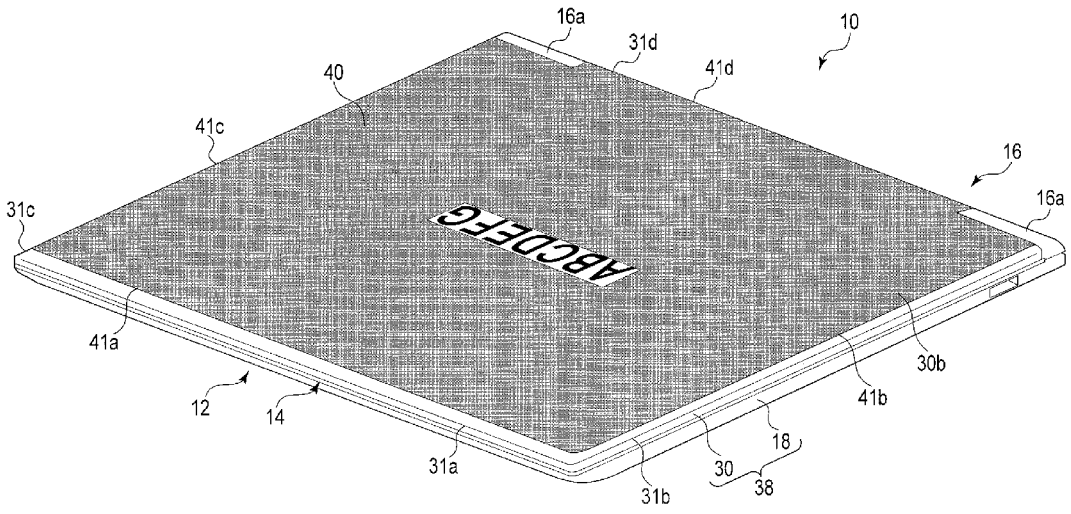
Publication Classification

(51) **Int. Cl.**
H05K 5/03 (2006.01)

(52) **U.S. Cl.**
CPC ***H05K 5/03*** (2013.01)

(57) **ABSTRACT**

According to one embodiment, a protective sheet to be attached to an outer surface of a housing of an electronic device is provided. The protective sheet comprises a sheet body formed of a material more flexible than that of the housing and having an external form defined by sides extending along edges of the electronic device, an adhesive layer applied to one entire surface of the sheet body, a notch comprising a closing end positioned in the sheet body and an opening end positioned at the side and extending along an extending direction connecting the closing end and the opening end, and a tab formed on the sheet body at least one side of the extending direction of the notch portion and easily peelable off from the outer surface.



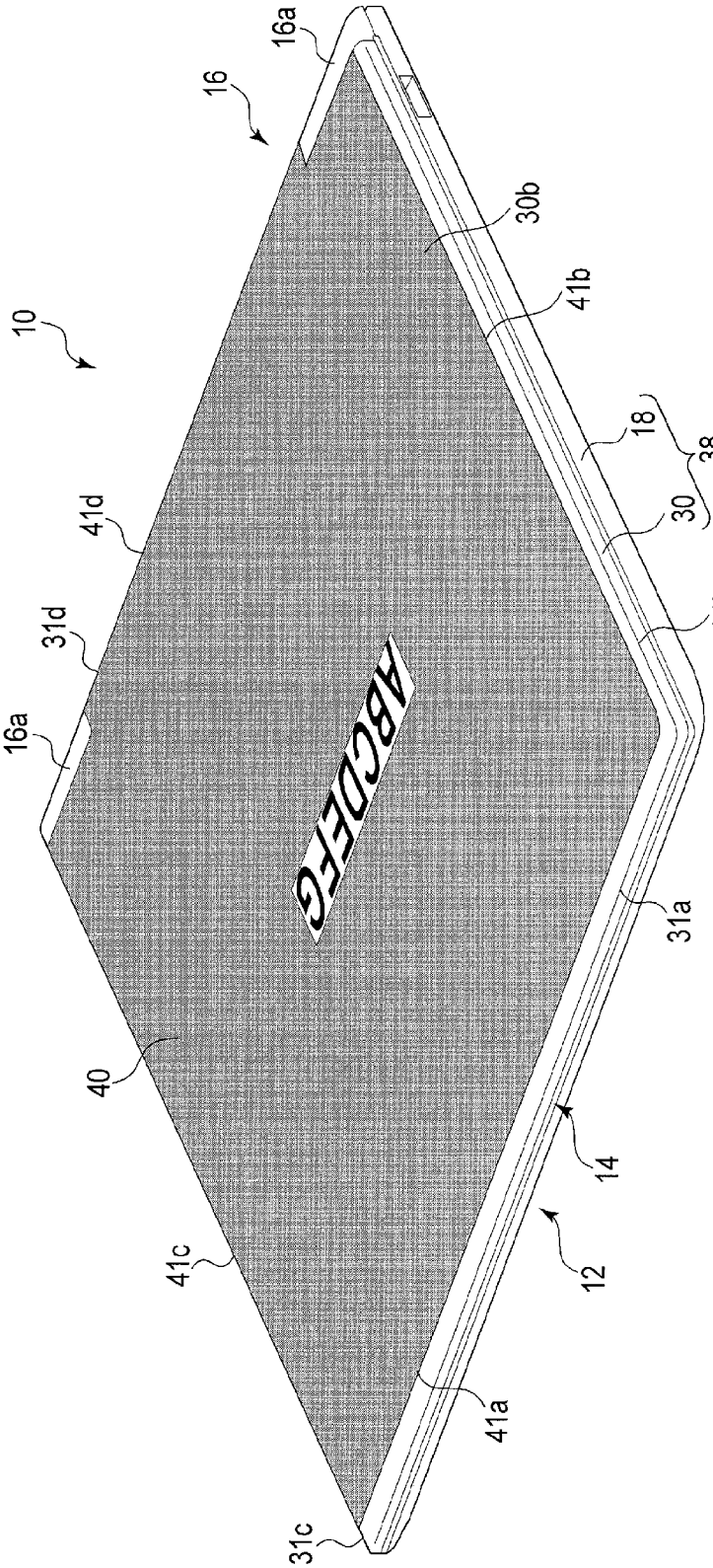

16a
16
30b
41b
10
18
38
30
41d
31d
31b
16a
ABCDEFG
31a
40
14
41c
12
41a
31c

FIG. 1

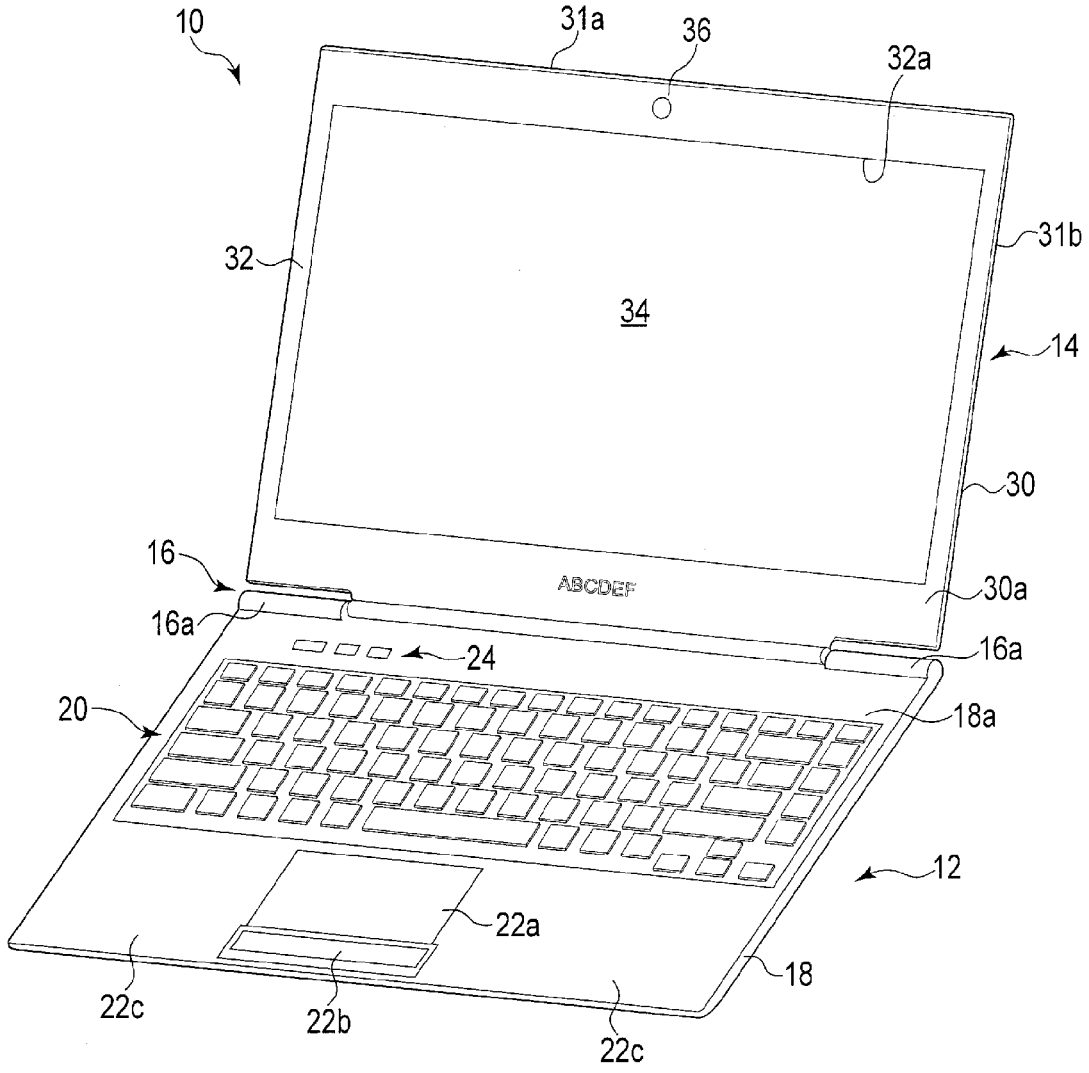

10
31a
36
32a
32
31b
34
14
30
16
ABCDEF
30a
16a
16a
24
20
18a
12
22a
18
22c
22b
22c

FIG. 2

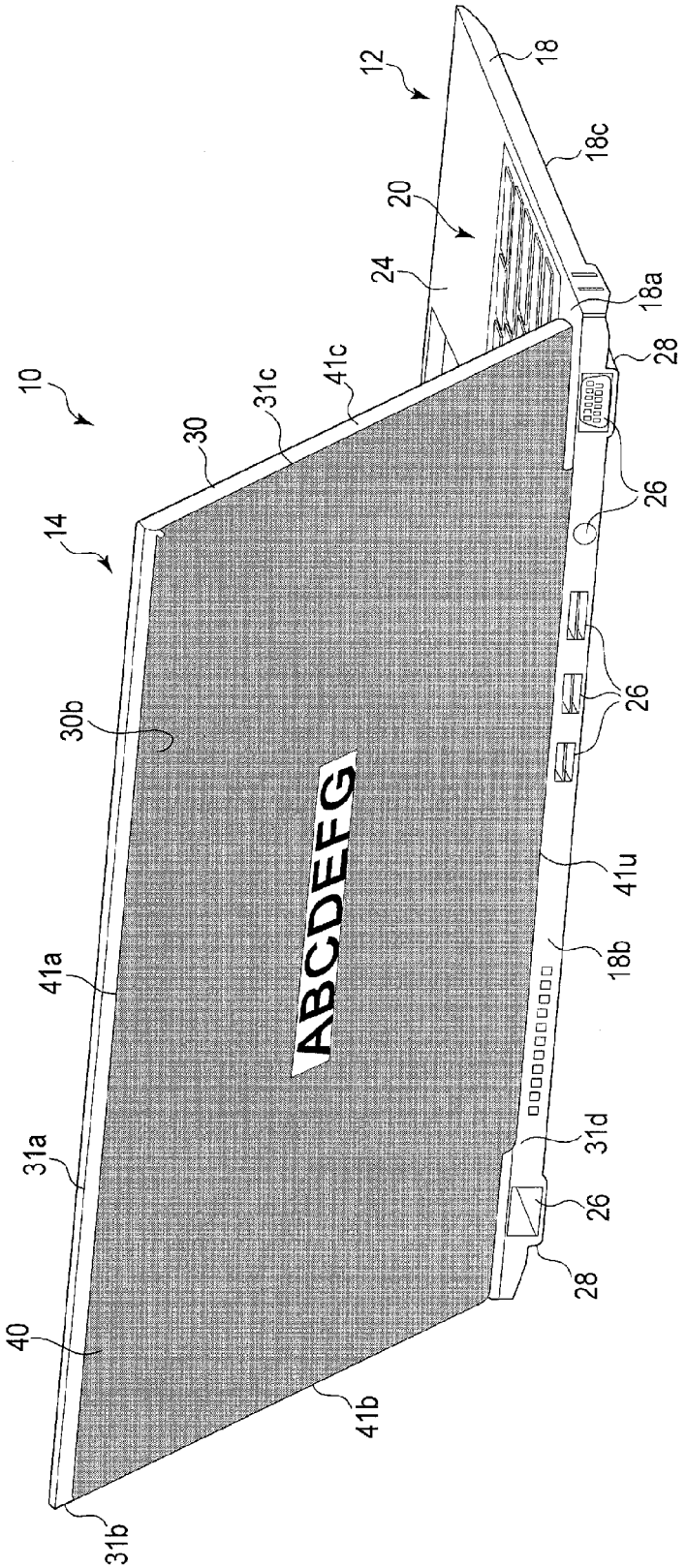

12
18
18c
20
24
18a
28
10
30
31c
41c
26
14
30b
26
ABCDEFG
41u
18b
41a
31d
31a
26
28
40
41b
31b

FIG. 3

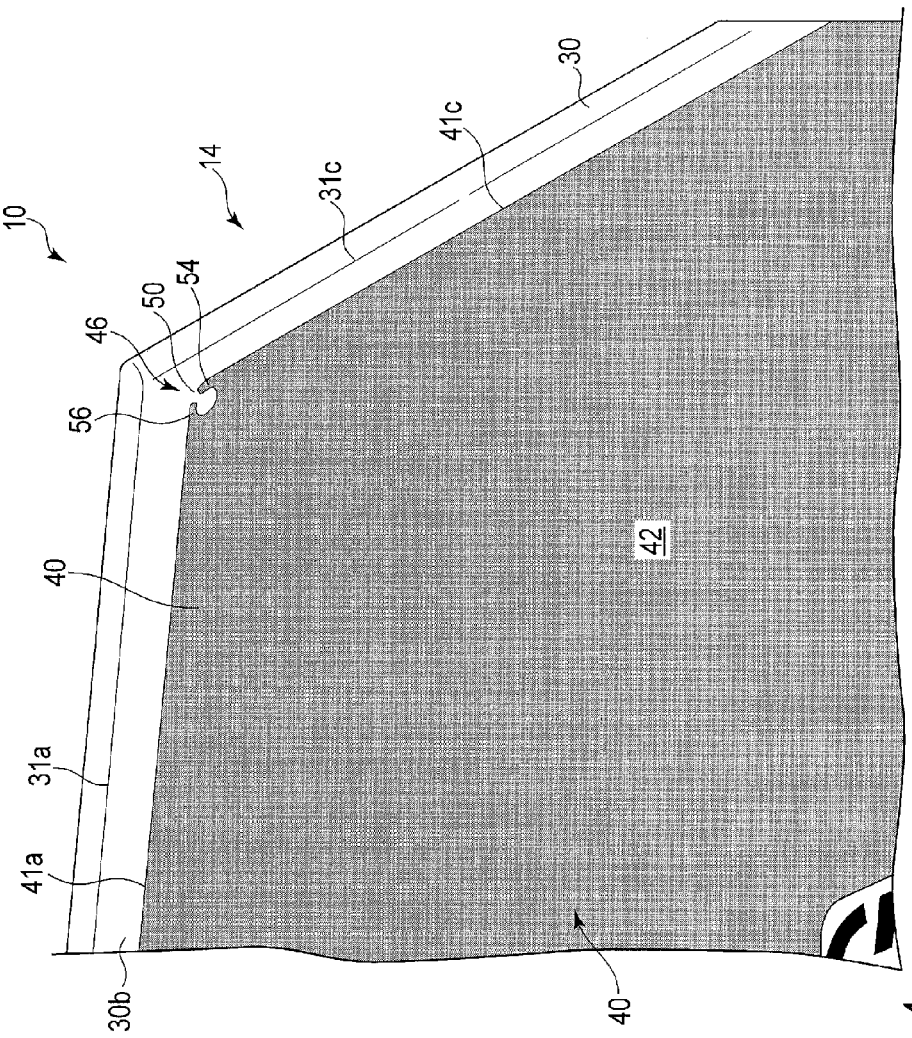


FIG. 4

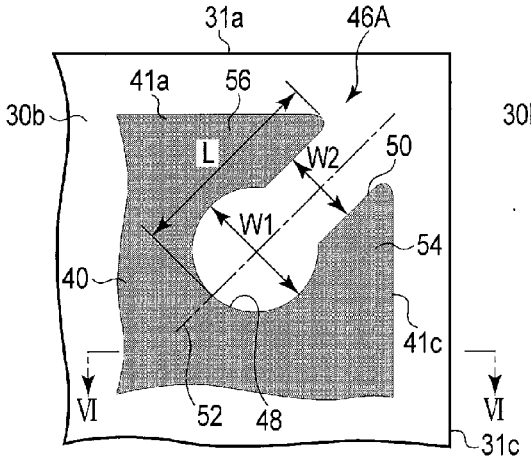


FIG. 5A

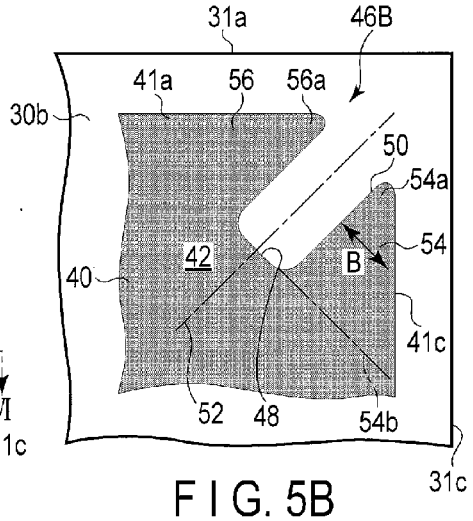


FIG. 5B

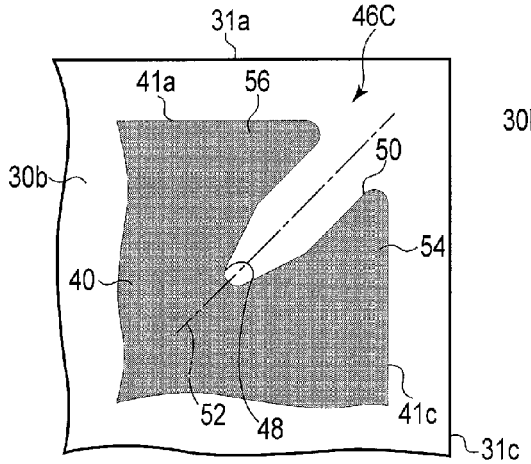


FIG. 5C

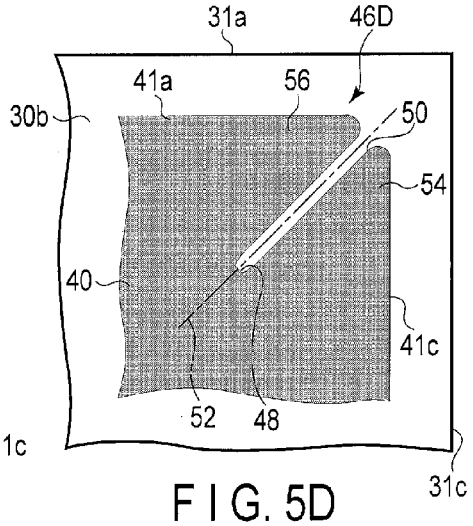


FIG. 5D

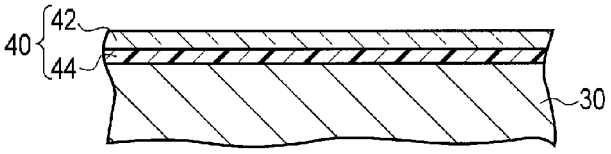


FIG. 6

PROTECTIVE SHEET AND ELECTRONIC DEVICE WITH PROTECTIVE SHEET

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/992,574, filed May 13, 2014, the entire contents of which are incorporated herein by reference.

FIELD

[0002] Embodiments described herein relate generally to a protective sheet and an electronic device with a protective sheet.

BACKGROUND

[0003] Generally, in order to efficiently peel off a protective sheet of an electronic device, a notch portion may be formed at a corner of a polygonal insulating resin member enclosing an inner element, and peeling off a protective sheet attached to the insulating resin member from a portion on the notch portion is thereby facilitated.

[0004] Such a protective sheet and an electronic device with a protective sheet are required to have no protuberance protruding from the protective sheet to the outside of an attachment surface of the electronic device.

[0005] According to one of the embodiments, a protective sheet is attached to an outer surface of a housing of an electronic device comprising at least one flat outer surface having a perimeter defined by a plurality of edges so as to protect the housing. The protective sheet comprises a sheet body comprising a material more flexible than that of the housing and comprising an external form defined by sides extending along the edges of the electronic device, an adhesive layer on one entire surface of the sheet body, a notch portion comprising a closing end in the sheet body and an opening end at one of the sides, the notch portion extending in a direction from the closing end toward the opening end, and a tab portion formed on at least one side of the sheet body with respect to the direction of the notch portion and easily peelable off from the outer surface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] A general architecture that implements the various features of the embodiments will now be described with reference to the drawings. The drawings and the associated descriptions are provided to illustrate the embodiments and not to limit the scope of the invention.

[0007] FIG. **1** is a general view showing an electronic device of an embodiment.

[0008] FIG. **2** is a diagram of the electronic device shown from the opposite side of FIG. **1**.

[0009] FIG. **3** is a general view showing the electronic device of FIG. **1** in a closed state.

[0010] FIG. **4** is an explanatory enlarged diagram showing a part of FIG. **3**.

[0011] FIG. **5**A, FIG. **5**B, FIG. **5**C and FIG. **5**D are explanatory diagrams enlarging a part of FIG. **4** to show various forms of notch portion.

[0012] FIG. **6** is a schematic cross-sectional view seen along a line VI-VI of FIG. **5**A.

DETAILED DESCRIPTION

[0013] Various embodiments will be described hereinafter with reference to the accompanying drawings. In the drawings, the same portions are represented by the same reference numbers.

[0014] FIG. **1** to FIG. **4** show a portable computer **10** as an example of an electronic device. The portable computer **10** is formed in a notebook size and comprises an apparatus body **12** and a display unit **14** held at an end of the apparatus body **12** so as to be freely rotatable. The display unit **14** can be freely rotated between a closed position overlying the apparatus body **12** shown in FIG. **1** and an open position shown in FIG. **2** and FIG. **3** by a hinge portion **16**. The display unit **14** can be held in an arbitrary rotated position with respect to the apparatus body **12** by the user hooking their fingers under a front side of the display unit **14** and rotating the display unit **14** about the hinge portion **16**.

[0015] As shown in FIG. **2**, the apparatus body **12** comprises a main housing **18** having a thin box-shaped structure. A keyboard **20** is arranged in an approximately central area of an upper surface **18***a* of the main housing **18**, i.e., a surface covered with the display unit **14** when the display unit **14** is set in the closed position. A touchpad **22***a*, a click button **22***b* and an armrest portion **22***c* are arranged on a front side which is positioned on the user's side when the display unit **14** is opened. An indicator **24** is provided on an innermost side adjacent to the hinge portion **16**. A switch button, a microphone or other arbitrary necessary means can be also provided on the upper surface **18***a*.

[0016] The main housing **18** accommodates various elements necessary for functions of the portable computer **10** or functional members such as a hard disk drive, a battery, a main circuit board, various subsidiary circuit boards, a speaker, an optical drive, a cooling system, etc. (not shown). Such internal members can execute required processing in accordance with signals sent via input interfaces such as the keyboard **20**, the touchpad **22***a*, the click button **22***b*, etc., and display a necessary image on the display unit **14**.

[0017] As shown in FIG. **3**, various forms of openings **26**, for example, various connection ports for connectors, openings for ventilation, openings for emitting sound from the speaker, etc., are formed on a rear end surface **18***b* adjacent to the upper surface **18***a* on a side of the hinge portion **16**. Furthermore, a plurality of protruding portions **28** are formed on an innermost side of an under surface **18***c* of the main housing **18**. When the computer **10** is placed on the flat surface of a desk, etc., ventilation in the main housing **18** can be secured through a space formed between the desk and the under surface **19***c*, and the upper surface **18***a* can be positioned obliquely with respect to the desk.

[0018] As especially clearly shown in FIG. **2**, the display unit **14** comprises a sub-housing **30** having a flat structure and accommodating a liquid crystal panel. A display window **32***a* defined by a frame portion **32** is formed on an inner surface **30***a* of the sub-housing **30** which covers the upper surface **18***a* of the apparatus body **12** when the display unit **14** is closed. An image display portion **34** of the liquid crystal panel accommodated in the sub-housing **30** is exposed to the outside through the display window **32***a*. A camera lens **36** is arranged on the frame portion **32**.

[0019] As shown in FIG. **1**, when the display unit **14** is closed, i.e., when the display unit **14** and the apparatus body **12** overlap each other, the portable computer **10** of the present embodiment is comprised of the main housing **18** and the

sub-housing **30**, and totally forms a housing **38** having a plate-like or low-profile (low height) box-shaped form. Since the apparatus body **12** overlaps the display unit **14**, the upper surface **18***a* of the apparatus body **12** and the inner surface **30***a* of the display **14** are opposed to each other. For example, an outer periphery portion of the upper surface **18***a* abuts on the frame portion **32** of the inner surface **30***a*, and various means such as the keyboard **20**, etc., arranged on the upper surface of the apparatus body **12** and the display portion **34** are protected without being in contact with each other between the upper surface **18***a* and the inner surface **30***a*. Instead of the above structure, a stopper portion (not shown) which prevents the members in the upper surface **18***a* and the display portion **34** of the inner surface **30***a* from directly being in contact with each other may be provided on at least one of these surfaces.

[0020] An outer surface **30***b* of the display unit **14** is positioned on the opposite side of the inner surface **30***a* on which the display window **32***a* is formed, and forms a top surface of the housing **38**. When the display unit **14** is closed, a height of side surfaces of the low-profile housing **38** is small, and the outer surface **30***b* of the display unit **14** forms the most conspicuous surface as a top surface of the portable computer **10**. The outer surface **30***b* is flat as a whole and a logotype indicating, for example, a trade name, a manufacturer, etc., may be marked thereon. Such a logotype is represented by the letters "ABCDEFG" in FIG. **1**.

[0021] As described above, the outer surface **30***b* of the display unit **14** which attracts people's attention the most is totally formed as a decorative surface. Accordingly, if the outer surface **30***b* is damaged by, for example, a scratch, etc., the damage is conspicuous. In particular, when the outer surface **30***b* is covered with a coating and formed as a glossy surface, the outer surface **30***b* can be easily damaged. Such damage decreases the value of the portable computer **10** as a product. Therefore, a protective sheet **40** is attached to the entire outer surface **30***b* of the display unit **14** to prevent the outer surface **30***b* from being damaged before the portable computer **10** is packaged for shipping.

[0022] As shown in FIG. **1**, in the present embodiment, the outer surface **30***b* of the display unit **14** which forms the top surface of the housing **38** is defined by four edges **31***a* to **31***d* with respect to four side surfaces (i.e., surfaces between the inner surface **30***a* and the outer surface **30***b*) of the sub-housing **30**. The outer surface **30***b* or the top surface of the housing **38** as a whole has a rectangular form as seen from the above. The edges **31***b* and **31***c* linearly extend on both sides of the hinge portion **16**. The edge **31***a* linearly extends on a side opposite to the hinge portion **16** and is joined to the edges **31***b* and **31***c*. The edge **31***d* is positioned on the side of the hinge portion **16**, and is formed as a bent structure in which the edge **31***d* is slightly recessed along side portions **16***a* of the hinge portion **16** which belong to the main housing **18** and joined to the edges **31***b* and **31***c*, and a central portion between both the side portions **16***a* projects from the edge **31***a* to the opposite side.

[0023] The protective sheet **40** has a rectangular external form corresponding to the outer surface **30***b* of the display unit **14** and is defined by four sides **41***a* to **41***d*, which are positioned so as to overlap the corresponding edges **31***a* to **31***b* of the outer surface **30***b* or to be inside the corresponding edges **31***a* to **31***d*. Accordingly, the protective sheet **40** covers approximately all the region of the flat outer surface **30***b*, and does not protrude to the outside of the outer surface **30***b*. Therefore, the protective sheet **40** is not obstructive, but can reliably protect the outer surface **30***b* regardless of whether the display unit **14** is set in the closed position shown in FIG. **1** or the open position shown in FIG. **2** to FIG. **4**.

[0024] FIG. **4** to FIG. **6** show details of the protective sheet **40**.

[0025] As shown in FIG. **6**, the protective sheet **40** of the present embodiment is formed as a laminated body comprised of a sheet body **42** and an adhesive layer **44** applied to one entire surface of the sheet body **42**. The sheet body **42** and the adhesive layer **44** are formed of a material sufficiently more flexible than that of a material of the sub-housing **30** and attached firmly to the outer surface **30***b*. The adhesive layer **44** is formed so as to reliably keep the protective sheet **40** on the outer surface **30***b* without unintentionally separating the protective sheet **40** from the outer surface **30***b* and to allow the protective sheet **40** to be cleanly peeled off later without leaving adhesive on the outer surface **30***b*. The sheet body **42** and the adhesive layer **44** should preferably be transparent or semitransparent such that the outer surface **30***b* is visible from the outside through the protective sheet **40**.

[0026] As shown in FIG. **4**, the protective sheet **40** further comprises a notch portion **46** obtained by cutting out a part of the sheet body **42** together with the adhesive layer **44** so as to facilitate the peeling off of the protective sheet **40** from the outer surface **30***b* of the housing **38**. The notch portion **46** comprises a closing end **48** positioned in the sheet body **42** and an opening end **50** opening to the outside in the outer peripheral sides **41***a* and **41***c*. FIG. **4** shows the notch portion **46** positioned at a corner portion between the edges **31***a* and **31***c* on the upper side when the display unit **14** is stood. However, the notch portion **46** can be formed at a plurality of arbitrary portions if the peeling off of the protective sheet **40** can be facilitated.

[0027] Various forms of notch portions **46**A to **46**D are exemplified in FIG. **5**A to FIG. **5**D.

[0028] A notch portion **46**A shown in FIG. **5**A extends in an extending direction connecting the closing end **48** and the opening end **50** along a bisector **52** of a corner portion between the sides **41***a* and **41***c*. The notch portion **46**A is comprised of a circular opening portion on the side of the closing end **48** and a rectangular opening portion on the side of the opening end **50**. A width W**2** (in a direction orthogonal to the line **52**) of the rectangular opening portion on the side of the opening end **50** is smaller than a maximum width W**1**, i.e., a diameter of the circular opening portion on the side of the closing end **48**. A length L between the closing end **48** and the opening end **50** is longer than the maximum width W**1**. It should be noted that W and L indicating the width and the length are omitted in FIG. **5**B to FIG. **5**D so as to clarify diagrammatic representation.

[0029] A notch portion **46**B shown in FIG. **5**B is formed in a rectangular form having a constant width from the closing end **48** to the opening end **50**. A notch portion **46**C shown in FIG. **5**C is formed in a triangular form having a width narrowed from an intermediate portion in the length direction to the closing end **48**. A notch portion **46**D shown in FIG. **5**D as a whole is formed in an elongated rectangular form and the length of the notch portion **46**D is longer than the length of the notch portion **46**B.

[0030] The notch portion **46** can be formed in arbitrary forms and sizes in addition to the exemplified forms, but it is preferable to make the area for protecting the upper surface

30*b* as large as possible by making the area of the notch portion **46** as small as possible.

[0031] Tab portions **54** and **56** of which adhesive force against the outer surface **30***b* is decreased and which are easily peeled off from the outer surface **30***b* are formed on at least one side with respect to the extending direction of the notch portion **46**.

[0032] In the present embodiment, since the notch portion **46** is formed at the corner portion of the protective sheet **40**, the tab portions **54** and **56** are formed in a triangular form substantially equal in size or area on both sides sandwiching the extending direction of the notch portion **46**.

[0033] As exemplified by the tab portion **54** in FIG. **5**B, each tab **54** has a width B gradually increased from a top portion **54***a* of a region adjacent to the opening end **50** to a bottom portion **54***b* adjacent to the closing end **48**, and is integrated with the sheet body **42** in the bottom portion **54***b*. It should be noted that the bottom portion **54***b* is a region on an imaginary line extending from the closing end **48** in the direction orthogonal to the line **52**.

[0034] In such a tab **54**, the width B of the top portion **54***a* of the notch portion **46**B is the narrowest and the adhesive force between the top portion **54***a* and the upper surface **30***b* is the weakest. Therefore, for example, when the user peels the protective sheet **40** off before using the portable computer **10**, the top portion **54***a* of the tab **54** can be easily peeled off by turning over the top portion **54***a* by the fingers.

[0035] When the top portion **54***a* is moved toward the closing end **48** of the notch portion **46**, the adhesive force is gradually increased, but the width B of the tab portion **54** is also gradually increased. The tab portion **54** can be thereby easily peeled off to the bottom portion **54***b* without being broken in midstream. Although the adhesive force is increased when the tab portion **54** is peeled off to the bottom portion **54***b*, stress is not concentrated at the closing end **48** owing to the form, and the force applied to the bottom portion **54***b* is sufficiently transmitted to the adjacent portion. The strength of the sheet body **42** in the region adjacent to the bottom portion **54***b* is also increased and the protective sheet **40** is easily peeled off from the upper surface **30***b*.

[0036] As described above, the tab portions **54** and **56** formed adjacent to the notch portion **46**, in particular, the top portions **54***a* and **56***a* of the tab portions **54** and **56** are held on the upper surface **30***b* by the adhesive force without protruding to the outside of the edges **31***a* to **31***d* of the upper surface **30***b*. In addition, since the top portions **54***a* and **56***a* are held on the upper surface **30***b* by the adhesive force, the tab portions **54** and **56** are not lifted from the upper surface **30***b*.

[0037] Therefore, inconvenience of snagging the tab portions **54** and **56** of the protective sheet **40** on the other members, turning up the tab portions **54** and **56**, etc., during handling at manufacturing does not occur. Therefore, work efficiency at manufacturing is increased and damage to a product is efficiently avoided. In addition, since the tab portions **54** and **56** are arranged inside the sides **41***a* to **41***d* of the protective sheet **40** without protruding therefrom, a yield at manufacturing the protective sheet **40** is high and a manufacturing cost can be reduced.

[0038] The example of forming the notch portion **46** at one corner portion of the protective sheet **40** is described, but a plurality of notch portions **46** can also be provided. In particular, when the area of a surface to be protected such as the upper surface **30***b*, etc., of the housing **38** is large, the protective sheet **40** can be easily peeled off by providing a plurality of notch portions **46** and tab portions **54** and **56** adjacent to each of these notch portions **46**. Such a protective sheet **40** is not limited to the portable computer **10**, but can also be used for protecting glossy and attractive surfaces of cellphones, home electric appliances, furniture, etc., and protecting glass surfaces.

[0039] By the above-described protective sheet **40** and the electronic device **10** of the present embodiment, operations in handling products can be efficiently conducted and damage to products in handling can be efficiently avoided at low cost.

[0040] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

LIST OF REFERENCE NUMERALS

[0041] **10** . . . electronic device
[0042] **12** . . . apparatus body
[0043] **14** . . . display unit
[0044] **16** . . . hinge portion
[0045] **18** . . . main housing
[0046] **20** . . . keyboard
[0047] **22***a* . . . touchpad
[0048] **22***b* . . . click button
[0049] **22***c* . . . armrest portion
[0050] **24** . . . indicator
[0051] **26** . . . opening
[0052] **28** . . . protruding portion
[0053] **30** . . . sub-housing
[0054] **30***a* . . . inner surface
[0055] **30***b* . . . outer surface
[0056] **31***a*-**31***d* . . . edge
[0057] **32** . . . frame portion
[0058] **32***a* . . . display window
[0059] **34** . . . display portion
[0060] **36** . . . camera lens
[0061] **38** . . . housing
[0062] **40** . . . protective sheet
[0063] **41***a*-**41***d* . . . side
[0064] **42** . . . sheet body
[0065] **44** . . . adhesive layer
[0066] **46**, **46**A, **46**B, **46**C, **46**D . . . notch portion
[0067] **48** . . . closing end
[0068] **50** . . . opening end
[0069] **52** . . . bisector
[0070] **54**, **56** . . . tab portions
[0071] **54***a* . . . top portion
[0072] **54***b* . . . bottom portion
[0073] B . . . width of tab
[0074] L . . . length
[0075] W . . . width

What is claimed is:

1. A protective sheet attached to an outer surface of a housing of an electronic device comprising at least one flat outer surface comprising a perimeter defined by a plurality of edges protective of the housing, the protective sheet comprising:

a sheet body comprising a material more flexible than that of the housing, and comprising an external form defined by sides extending along the edges of the electronic device;

an adhesive layer on one entire surface of the sheet body;

a notch portion comprising a closing end in the sheet body and an opening end at one of the sides, the notch portion extending in a direction from the closing end toward the opening end; and

a tab portion formed on at least one side of the sheet body with respect to the direction of the notch portion, and easily peelable off from the outer surface.

2. The protective sheet of claim **1**, wherein

the sides of the sheet body are positioned inside the edges of the outer surface of the housing, in the outer surface.

3. The protective sheet of claim **1**, wherein

the sheet body comprises a rectangular form, and the notch portion is formed at at least one corner portion.

4. The protective sheet of claim **1**, wherein

the tab portion is formed between the notch portion and the side adjacent to the notch portion, a dimension between the notch portion and the side is gradually decreased toward the opening end, and the tab portion comprises a rounded top.

5. The protective sheet of claim **1**, wherein

the notch portion comprises a length along the direction, and the length is greater than a width of the opening end orthogonal to the direction.

6. An electronic device comprising:

a housing comprising at least one flat outer surface comprising a perimeter defined by a plurality of edges; and

a protective sheet attached to the outer surface of the housing and protecting the housing,

the protective sheet comprising:

a sheet body comprising a material more flexible than that of the housing, and comprising an external form defined by sides extending along the edges of the housing;

an adhesive layer on an entire surface of the sheet body on a side of the outer surface;

a notch portion comprising a closing end in the sheet body and an opening end at one of the sides, the notch portion extending in a direction from the closing end toward the opening end; and

a tab portion formed on at least one side of the sheet body with respect to the direction of the notch portion, and easily peelable off from the outer surface.

7. The electronic device of claim **6**, wherein

the sides of the sheet body are positioned inside the edges of the outer surface of the housing, in the outer surface.

8. The electronic device of claim **6**, wherein

the sheet body comprises a rectangular form, and the notch portion is formed at at least one corner portion.

9. The electronic device of claim **6**, wherein

the tab portion is formed between the notch portion and the side adjacent to the notch portion, a dimension between the notch portion and the side is gradually decreased toward the opening end, and the tab portion comprises a rounded top.

10. The electronic device of claim **6**, wherein

the notch portion comprises a length along the direction, and the length is greater than a width of the opening end orthogonal to the direction.

11. The electronic device of claim **6**, wherein

the sheet body and the adhesive layer are transparent.

* * * * *