



(12) Invention Patent Application



(10) Pub. No.: CN 104808843 A

(43) Pub. Date: July 29, 2015

(21) Appl. No.: 201510156560.0

(22) Filed on: April 3, 2015

(71) Applicant: INTERFACE OPTOELECTRONICS SHENZHEN CO. LTD.

Address: 1.5 floor, Building 3, Zone H, Foxconn Technology Group, No. 2, Donghuan
2nd Road, Longhua New District, Shenzhen, Guangdong, 518109

Applicant: GENERAL INTERFACE SOLUTION LIMITED

(72) Inventor(s): KANG Jialin

(74) Patent Firm or Agency: Shenzhen ScienBiziP Intellectual Property Agency Co. Ltd.
44334

Agent: WANG Feiya

(51) Int. Cl.

G06F 3/041 (2006.01)

Claims 2 pages, Description 10 pages, Drawings 12 pages

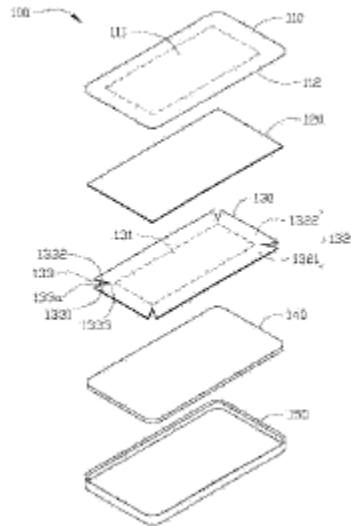
(54) Title of Invention

Touch panel and touch display panel

(57) Abstract of Disclosures

A touch panel and a touch display device are disclosed. The touch display device includes the touch panel and a display panel. The touch panel includes a cover plate and an optical film set. The cover plate includes a touch surface and an inner surface opposite to the touch surface. The inner surface is a three-dimensional curved surface. The optical film set is fixed on the inner surface. The optical film set includes a touch area and a peripheral area

surrounding the touch area. The peripheral area includes at least one notch. The touch panel and the touch display panel of the present invention are provided with a notch(es) on the optical film set, which can effectively solve the problem caused by the bonding of the optical film set and the curved cover plate.



CN 104808843 A

1. A touch panel, an optical film set the touch panel comprising: a cover plate and an optical film set, the cover plate comprising a touch surface and an inner surface opposite to the touch surface, the inner surface being a three-dimensional curved surface, the optical film set being fixed on the inner surface, the optical film set comprising a touch area and a peripheral area surrounding the touch area, and the peripheral area comprising at least one notch.

2. The touch panel according to claim 1, characterized in that the notch is an open notch.

3. The touch panel according to claim 1, characterized in that the notch and the touch area are not adjacent to each other.

4. The touch panel according to claim 1, characterized in that the touch surface and the inner surface have the same shape and are parallel to each other.

5. The touch panel according to claim 4, characterized in that the inner surface is a curved surface recessed toward a side of the touch surface.

6. The touch panel according to claim 4, characterized in that the inner surface is a curved surface that protrudes toward a side away from the touch surface.

7. The touch panel according to claim 1, characterized in that the notch is of a fan shape and is located at a corner of the peripheral area of the optical film set.

8. The touch panel according to claim 5, characterized in that a vertex has an arc-shaped chamfer.

9. The touch panel according to claim 1, characterized in that the notches are located between two adjacent corners of the peripheral area of the optical film set.

10. The touch panel according to claim 1, characterized in that the notches are arranged at corners and between two adjacent corners of the peripheral area of the optical film set.

11. The touch panel according to claim 1, characterized in that the optical film set is at least one of a touch sensing electrode layer, an anti-reflection film, an explosion-proof film, or another functional film.

12. A touch display device, the touch display device comprising: a touch panel and a display panel arranged in a stacking manner, characterized in that the touch panel adopts the touch panel according to any one of claims 1 to 11.

Touch panel and touch display panel

Technical Field

[0001] The present invention relates to a touch panel and a touch display device, in particular to a touch panel and a touch display panel having a touch surface that is a three-dimensional curved surface.

Background Art

[0002] Touch display devices have been widely used in recent years due to their features of low power consumption, low cost, lack of radiation and easy operation. More and more touch display devices have been employed in people's work and everyday lives. A touch display device usually includes a touch panel and a display module that are stacked together. The touch panel is used to receive and recognize user touch operations, and the display module is used to display images. With the continuous development in the technologies, three-dimensional curved touch screens are increasingly used in touch display devices.

[0003] In a touch module with a three-dimensional curved surface, the cover is a three-dimensional curved surface. However, the traditional touch sensing electrode layer and various optical films are all flat. As a result, many undesirable problems may occur during the bonding process.

Summary of the Invention

[0004] In view of the above problems, it is necessary to provide a touch panel and a touch display device having the touch panel as follows.

[0005] A touch panel includes a cover plate and an optical film set, the cover includes a touch surface and an inner surface opposite to the touch surface, the inner surface is a three-dimensional curved surface, the optical film set is fixed on the inner surface, the optical film set includes a touch area and a peripheral area surrounding the touch area, and the peripheral area includes at least one notch.

[0006] A touch display device is provided, the touch display device includes a touch panel and a display panel stacked together, and the touch panel adopts the touch panel as described above.

[0007] Compared with the existing technology, the touch panel and touch display device according to the present invention are provided with a notch(es) in the peripheral area of the optical film set, which reduces the area of the peripheral area of the optical film set during the bonding process, and effectively solves the problems caused during the bonding of the optical film set and the curved cover plate.

Brief Description of Drawings

[0008] Fig. 1 is a schematic view of a three-dimensional assembly of a touch display device 100 provided in a preferred embodiment of the present invention.

[0009] Fig. 2 is a front exploded schematic view of the touch display device shown in Fig. 1.

[0010] Fig. 3 is a schematic cross-sectional view taken along III-III in Fig. 1.

[0011] Fig. 4 is a schematic cross-sectional view taken along IV-IV in Fig. 1.

[0012] Fig. 5 is a schematic view in a reverse direction of the cover plate and the optical film set shown in Fig. 2 after being bonded.

[0013] Fig. 6 is a schematic view of an optical film set provided by a second embodiment of the present invention.

[0014] Fig. 7 is a schematic view of an optical film set provided by a third embodiment of the present invention.

[0015] Fig. 8 is a schematic view of an optical film set provided by a fourth embodiment of the present invention.

[0016] Fig. 9 is a schematic view of an optical film set provided by a fifth embodiment of the present invention.

[0017] Fig. 10 is a schematic view of an optical film set provided by a sixth embodiment of the present invention.

[0018] Fig. 11 is a schematic view of an optical film set provided by a seventh embodiment of the present invention.

[0019] Fig. 12 is a schematic view of an optical film set provided by an eighth embodiment of the present invention.

[0020] Fig. 13 is a schematic view of an optical film set provided by a ninth embodiment of the present invention.

[0021] Fig. 14 is a schematic view of an optical film set provided by a tenth embodiment of the present invention.

[0022] Fig. 15 is a schematic view of an optical film set provided by an eleventh embodiment of the present invention.

[0023] Fig. 16 is a schematic cross-sectional view of one side of an optical film set provided by a twelfth embodiment of the present invention.

[0024] Description of the main element symbols

Touch display device	100, 600
Touch display area	101
Non-touch display area	102
Cover plate	110, 610
Glue layer	120, 620
Optical film set	130, 230, 330, 430, 530, 630
Display module	140, 640
Frame	150, 650
Touch surface	111, 611
Inner surface	112, 612
Side wall	151
Touch area	131, 231, 331, 431, 531
Peripheral area	132, 232, 332, 432, 532
Notch	133, 233, 333, 433, 533
First lateral side	1321, 2321, 3321, 4321, 5321
Second lateral side	1322, 2322, 3322, 4322, 5322
First side	1331, 2331
Second side	1332, 2332
Vertex	1333, 2333
Angle	133a, 233a, 333a
Arc-shaped chamfer	2334, 5334

The following specific embodiments will further illustrate the present invention in conjunction with the above-mentioned drawings.

Description of the Embodiments

[0025] Reference is made to Fig. 1, which is a schematic view of a three-dimensional assembly of a touch display device 100 according to a preferred embodiment of the present invention. The touch display device 100 can be used as a touch screen display device in the fields of game entertainment, multimedia interaction, mobile device display and interaction, simulation, and simulation teaching. The touch display device 100 includes a touch display area 101 and a non-touch display area 102 surrounding the touch display area 101.

[0026] Reference is made to Fig. 2, which is an exploded perspective view of the touch display device 100 shown in Fig. 1. The touch display device 100 includes a cover plate 110, a glue layer 120, an optical film set 130, a display module 140, and a frame 150. The cover plate 110, the glue layer 120, the optical film set 130, and the display module 140 are sequentially arranged in a stacking manner. Specifically, the optical film set 130 is configured to be bonded to the cover plate 110 via the glue layer 120, and the display module 140 is arranged on a side of the optical film set 130 that is away from the cover plate 110. The cover plate 110 is arranged above the frame 150. The cover plate 110 is used to form a receiving space with the frame 150 to receive the optical film set 130 and the display module 140. The cover plate 110, the glue layer 120 and the optical film set 130 together form a touch panel. The optical film set 130 is at least one of a touch sensing electrode layer, an anti-reflection film, an explosion-proof film, or another functional film. In this embodiment, the optical film set 130 is described with the touch sensing electrode layer as an example.

[0027] The cover plate 110 includes a touch surface 111 and an inner surface 112 opposite to the touch surface 111. The inner surface 112 is a smooth three-dimensional curved surface, and the touch surface 111 and the inner surface 112 have the same shape and are parallel to each other. The touch surface 111 is used to allow a user to perform a touch operation on the touch display device 100.

[0028] Furthermore, reference is made to Fig. 3 and Fig. 4 together. Fig. 3 is a schematic cross-sectional view taken along III-III shown in Fig. 1, and Fig. 4 is a schematic cross-sectional view taken along IV-IV shown in Fig. 1. Regardless of whether viewed from the X-axis direction or the Y-axis direction, the cross section of the inner surface 112 is a parabolic curved surface, the center point of the inner surface 112 is the focal point of the parabola, and the inner surface 112 is a curved surface recessed toward the side of the touch surface 111. In this embodiment, a

height difference between the center point of the inner surface 112 and edges on both sides of the inner surface 112 is not greater than 1 mm.

[0029] The frame 150 includes four side walls 151 connected end to end. The cover plate 110 is arranged above the side walls 151 of the frame 150, and forms a receiving space with the frame 150 to receive the optical film set 130 and the display module 140. The optical film set 130 is bonded to the inner surface 112 of the cover plate 110 via the glue layer 120. The display module 140 is fixed to an inner side of the side wall(s) 151 of the frame 150, and is located on a side away from the cover plate 110 of the optical film set 130.

[0030] The optical film set 130 includes a touch area 131, a peripheral area 132, and a notch 133. The touch area 131 is of a rectangular shape, located in the center of the optical film set 130 and corresponding to the touch display area 101. The peripheral area 132 includes two parallel first lateral sides 1321 and two parallel second lateral sides 1322. The first lateral sides 1321 and the second lateral sides 1322 are connected end to end to form a ring frame. The peripheral area 132 surrounds the touch area 131 and is arranged corresponding to the non-touch display area 102. The notch 133 is an open-type notch, which is arranged in the peripheral area 132 and is located at a corner(s) of the peripheral area 132 of the optical film set 130. The notch 133 is configured in a fan shape. The notch 133 includes a first side 1331, a second side 1332 and a vertex 1333, in which the first side 1331, the second side 1332 and the vertex 1333 jointly enclose the notch 133 to form the shape of a fan. The notch 133 has an angle 133a. The lengths of the first side 1331 and the second side 1332 are the same. The vertex 1333 is defined by the intersection of the first side 1331 and the second side 1332. The vertex 1333 is located in the peripheral area 132 and is not in contact with the touch area 131. There is a certain distance between the vertex 1333 and the touch area 131, that is, the notch 133 and the touch area 131 are not adjacent to each other. In this embodiment, the distance between the vertex 1333 and the touch area 131 is 0.15 to 0.3 mm, and the angle 133a is less than 90 degrees. In addition, in this embodiment, the number of the notches is four, and they are all located at the corners of the peripheral area 132 of the optical film set 130.

[0031] In the traditional touch display panel, both the touch panel and the display panel are flat, so there is generally no defect when the optical film set of the touch panel is bonded to the cover plate. However, the cover plate 110 in this embodiment is a three-dimensional curved cover. Therefore, when the traditional optical film set is attached to it, as the stress cannot be

released, wrinkles may appear on the edge of the optical film set, gaps may be generated between the optical film set and the cover plate, and there will be other issues such as bubbles in the glue layer. The foregoing problems will affect the performance of the touch display device.

[0032] Reference is made to Fig. 5. Fig. 5 is a bottom view of the cover plate 110 and the optical film set 130 shown in Fig. 2 after being bonded. In this embodiment, notches 133 are provided at the corners of the optical film set 130, and the size of the peripheral area 132 is reduced. When the optical film set 130 is bonded and fixed to the cover plate 110 via the glue layer 120, the touch area 131 and the touch display area 101 can be attached to each other without any problem. When the peripheral area 132 is correspondingly attached to the non-touch display area 102, the first side 1331 and the second side 1332 shrink and overlap with each other, and the angle 133a becomes 0 degrees. The notches 133 can release the stress generated at the edge corners of the optical film set 130 caused by the bonding, so that the optical film set 130 and the cover plate 110 can be completely bonded together. Accordingly, there is no stress-induced gap produced between the optical film set and the cover plate 110, which may result in bubble generation in the glue layer. In addition, due to the arrangement of the notches 133, the area of the peripheral region 132 is reduced, and no wrinkles are generated at the edge corners.

[0033] In this embodiment, it is set forth that the angle 133a of the notch 133 is less than 90 degrees, and the height difference between the center point of the touch surface 111 and the two lateral sides of the touch surface 111 is not more than 1 mm. However, the present invention is not limited thereto. In some other embodiments, the angle of the notch on the optical film set may also be 90 degrees or even greater than 90 degrees. The size of the angle needs to be adjusted according to the curvature of the cover plate, and the curvature of the cover plate needs to be adjusted based on the height difference between the center point of the touch surface of the cover plate and the edges on both sides of the touch surface of the cover plate. Thus, it can be predicted that the height difference between the center point of the touch surface of the cover plate and the edges of both sides of the touch surface of the cover plate can be adjusted; the greater the height difference, the greater the curvature of the cover plate. When the curvature of the cover plate is relatively large, the angle of the notch on the optical film set needs to be correspondingly large. That is to say, the larger the notches, the greater the number of the notches, and vice versa, the smaller the notches on the optical film set, the less the number of the notches.

[0034] In this embodiment, the touch display device 100 is composed of a three-dimensional curved touch panel and a traditional flat display panel. However, the present invention is not limited thereto. In some other embodiments, a flexible display panel may also be used.

[0035] Reference is made to Fig. 6. Fig. 6 is a schematic view of an optical film set 230 provided by a second embodiment of the present invention. The optical film set 230 includes a touch area 231, a peripheral area 232 and notches 233. The touch area 231 has a rectangular shape and is located at the center of the optical film set 230. The peripheral area 232 includes two parallel first lateral sides 2321 and two parallel second lateral sides 2322. The first lateral sides 2321 and the second lateral sides 2322 are connected to each other to form a ring frame, and are arranged around the touch area 231. The notches 233 are an open-type notch, which are arranged in the peripheral area 232 and located at the corner of the peripheral area 232 of the optical film set 230. The notches 233 are configured in a fan shape. The notch 233 includes a first side 2331, a second side 2332, and a vertex 2333. The first side 2331, the second side 2332, and the vertex 2333 together form the notch 233 in the shape of a fan. The notch 233 has an angle 233a. The lengths of the first side 2331 and the second side 2332 are the same. The vertex 2333 is defined by the intersection of the first side 2331 and the second side 2332. The vertex 2333 is located in the peripheral area 232 and is not in contact with the touch area 231. There is a certain distance between the vertex 2333 and the touch area 231, that is, the notches 133 and the touch area 131 are not adjacent to each other. Its difference from the optical film set 130 in the touch display device 100 is that the vertex 2333 of the optical film set 230 is provided with an arc shaped chamfer 2334. In this embodiment, the distance between the vertex 2333 and the touch area 231 is 0.15 to 0.3 mm, and the angle 233a is less than 90 degrees. In this embodiment, the number of the notches is four, and they are all located at the corners of the peripheral area 132 of the optical film set 130. However, the present invention is not limited thereto. The number of the notches 233 and the size of the notches 233 can be adjusted according to the curvature of the cover plate.

[0036] Reference is made to Fig. 7, which is a schematic view of an optical film set 330 provided by a third embodiment of the present invention. The optical film set 330 includes a touch area 331, a peripheral area 332 and notches 333. The touch area 331 has a rectangular shape and is located at the center of the optical film set 330. The peripheral area 332 includes

two parallel first lateral sides 3321 and two parallel second lateral sides 3322. The first lateral sides 3321 and the second lateral sides 3322 are connected to each other to form a ring frame, and are arranged around the touch area 331. It is different from the optical film set 130 in that the notches 333 of the optical film set 330 in the third embodiment of the present invention are provided in the peripheral area 332, and are located between two adjacent corners of the peripheral area 332 of the optical film set 330, that is, on the first lateral sides 3321 and the second lateral sides 3322. In this embodiment, each of the first lateral sides 3321 is provided with three notches 333, and each of the second lateral sides 3322 is provided with two notches 333. However, the present invention is not limited thereto. The number of the notches 333 and the size of the angle 333a of the notches 333 can be adjusted according to the curvature of the cover plate. In this embodiment, each of the notches 333 is an isosceles triangle. However, the present invention is not limited thereto. In some other embodiments, the shape of the notches 333 may also be an arc shape or a square shape, as shown in Fig. 8 and 9, where Fig. 8 is a schematic view of an optical film set provided by a fourth embodiment of the present invention, and Fig. 9 is a schematic view of an optical film set provided by a fifth embodiment of the present invention.

[0037] Reference is made to Fig. 10. Fig. 10 is a schematic view of an optical film set 430 according to a sixth embodiment of the present invention. The optical film set 430 includes a touch area 431, a peripheral area 432 and notches 433. The touch area 431 has a rectangular shape and is located at the center of the optical film set 430. The peripheral area 432 includes two parallel first lateral sides 4321 and two parallel second lateral sides 4322. The first lateral sides 4321 and the second lateral sides 4322 are connected to each other to form a ring frame, and the peripheral area 432 is arranged around the touch area 431. The notches 433 are arranged in the peripheral area 432. It is different from the optical film set 130 in that the notches 433 are not only provided at the corners of the peripheral area 432 of the optical film set 430, but also are provided between the corners of the peripheral area 432 of the optical film set 430. That is, both the first lateral sides 4321 and the second lateral sides 4322 are provided with the notches 433. In addition, the notches 433 and the touch area 431 are not adjacent to each other. In this embodiment, the notches 433 are provided at each corner of the peripheral area 432 of the optical film set 430; moreover, each first lateral side 4321 is provided with three notches 433, and each second lateral side 4322 is provided with two such notches 433. However, the present invention

is not limited thereto. The number of the notches 433 and the size of the notches 433 can be adjusted according to the curvature of the cover plate. In this embodiment, each of the notches 433 on the first lateral sides 4321 and the second lateral sides 4322 is an isosceles triangle. However, the present invention is not limited thereto. In other embodiments, the shape of the notches 433 on the first lateral sides 4321 and the second lateral sides 4322 may also be an arc shape or a square shape, as shown in Fig. 11 and 12, where Fig. 11 is a schematic view of an optical film set provided by a seventh embodiment of the present invention, and Fig. 12 is a schematic view of an optical film set provided by an eighth embodiment of the present invention.

[0038] Reference is made to Fig. 13. Fig. 13 is a schematic view of an optical film set 530 according to a ninth embodiment of the present invention. The optical film set 530 includes a touch area 531, a peripheral area 532 and notches 533. The touch area 531 has a rectangular shape and is located at the center of the optical film set 530. The peripheral area 532 includes two parallel first lateral sides 5321 and two parallel second lateral sides 5322. The first lateral sides 5321 and the second lateral sides 5322 are connected to each other to form a ring frame, and the peripheral area 532 is arranged around the touch area 531. The notches 533 are provided in the peripheral area 532. It is different from the optical film set 430 of the sixth embodiment in that the optical film set 530 is provided with an arc shaped chamfer 5334 at the vertexes of the notches 533 at the corners. In this embodiment, each of the notches 533 on the first lateral sides 5321 and the second lateral sides 5322 is an isosceles triangle. However, the present invention is not limited thereto. In some other embodiments, the shape of the notches 533 may also be an arc shape or a square shape, as shown in Fig. 14 and 15, where Fig. 14 is a schematic view of the optical film set provided by a tenth embodiment of the present invention, and Fig. 15 is a schematic view of an optical film set provided by an eleventh embodiment of the present invention.

[0039] In the above-mentioned embodiments, a convex surface is taken as an example of the touch surface in the description. That is, in the example, the inner surface is a curved surface recessed toward the touch surface. However, the present invention is not limited thereto. When the touch surface of the touch display device is an inwardly concave surface, that is, the inner surface is a curved surface protruding away from the touch surface, the structure according to the present invention can also be applied to such a case, as shown in Fig. 16, where Fig. 16 is a

schematic cross-sectional view of one side of the touch display device 600 according to a twelfth embodiment of the present invention.

[0040] The touch display device 600 includes a cover plate 610, a glue layer 620, an optical film set 630, a display module 640, and a frame 650. The cover plate 610, the glue layer 620, the optical film set 630, and the display module 640 are sequentially arranged in a stacking manner. Specifically, the optical film set 630 is configured to be bonded to the cover plate 610 via the glue layer 620, and the display module 640 is arranged on a side of the optical film set 630 away from the cover plate 610. The cover plate 610 is arranged above the frame 650, and the cover plate 610 is used to form a receiving space with the frame 650 to receive the optical film set 630 and the display module 640. The cover plate 610, the glue layer 620, and the optical film set 630 together form a touch panel. The cover plate 610 includes a touch surface 611 and an inner surface 112 opposite to the touch surface 611. The cross section of the inner surface 612 is a parabolic curved surface. Unlike the touch display device 100, the inner surface 612 is a curved surface protruding toward the side away from the touch surface 611.

[0041] The above embodiments are only used to illustrate the technical solutions of the present invention, but not to limit the present invention. Although the present invention has been described in detail with reference to the preferred embodiments, a person of ordinary skill in the art should understand that the technical solutions of the present invention can be modified or equivalently replaced without departing from the principle and scope of the technical solutions of the present invention.

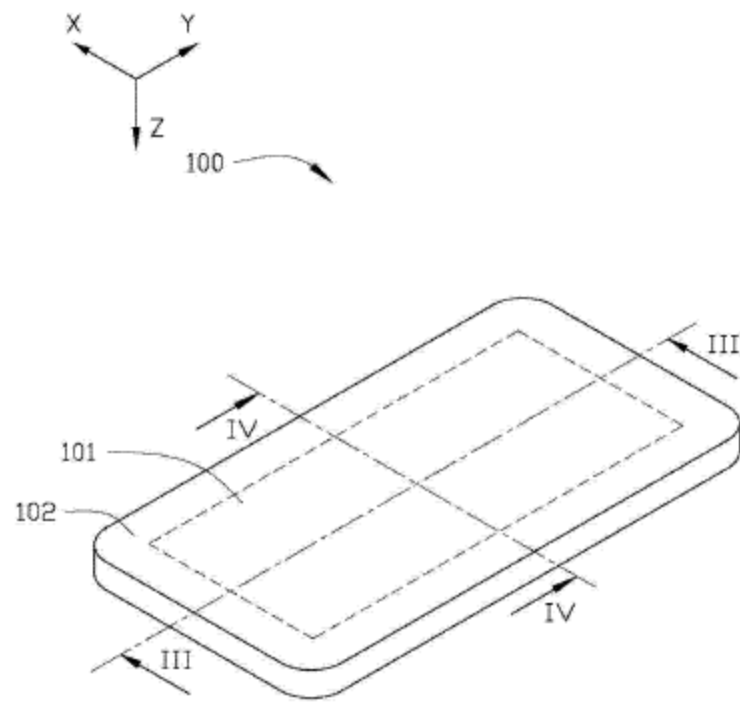


Fig. 1

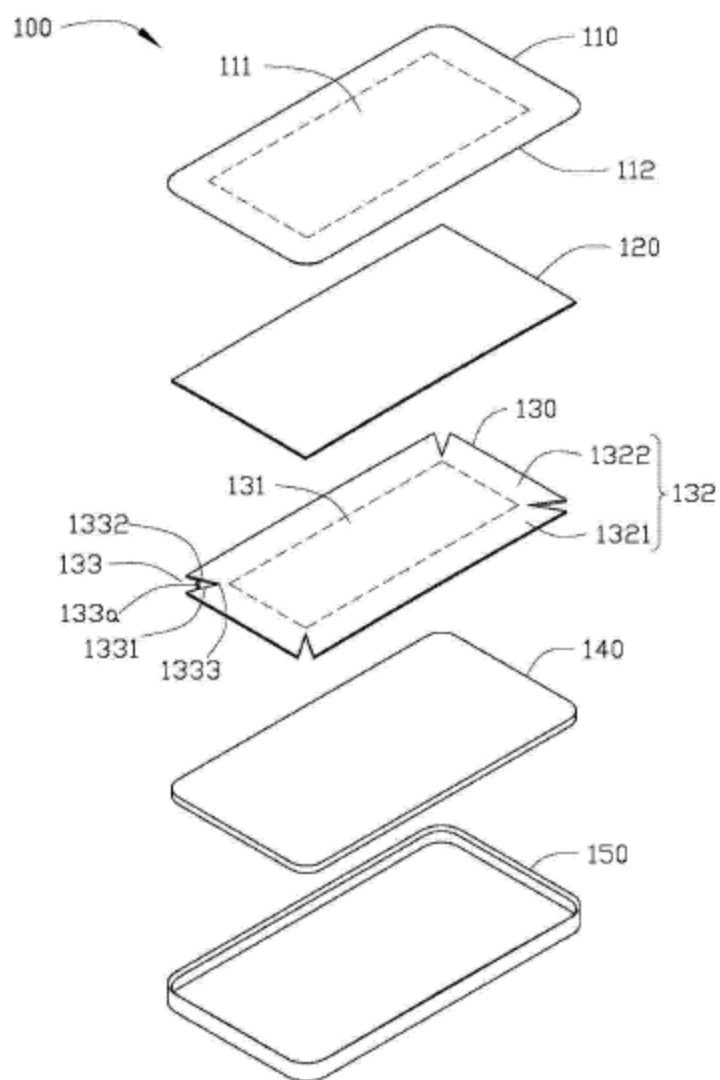


Fig. 2

100

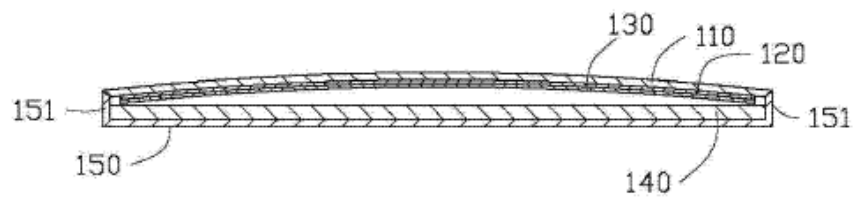


Fig. 3

100

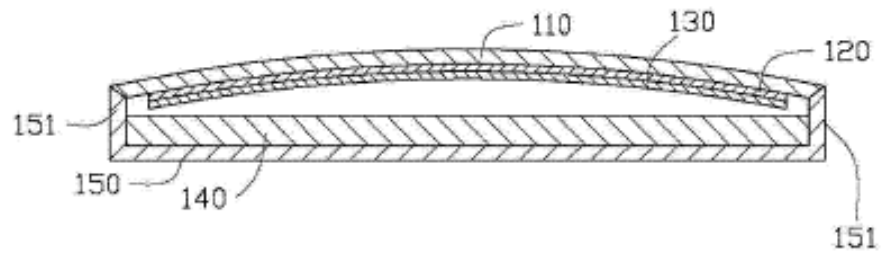


Fig. 4

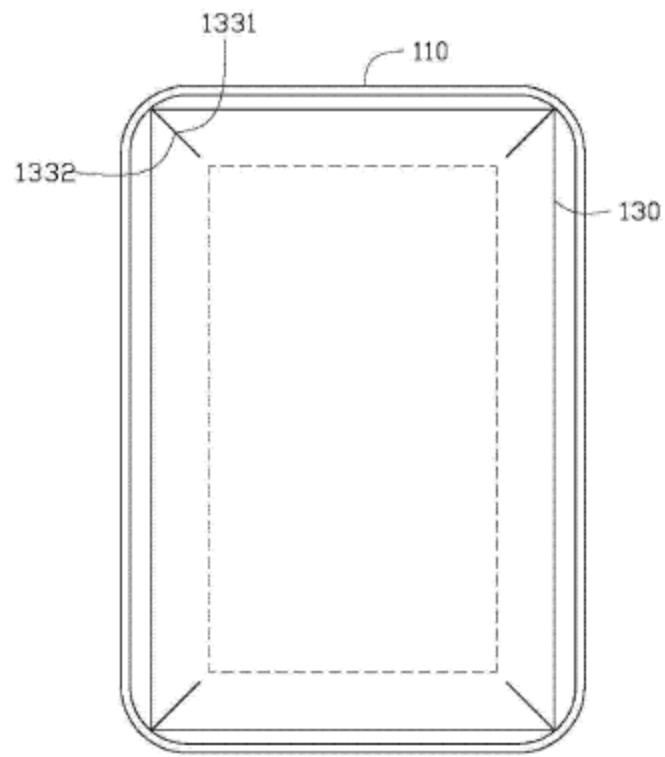


Fig. 5

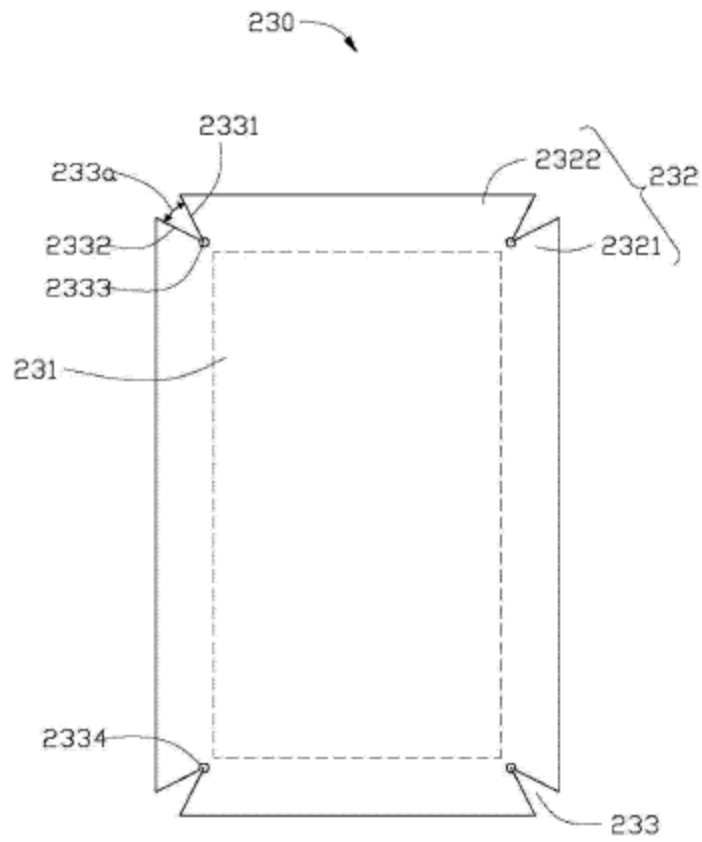


Fig. 6

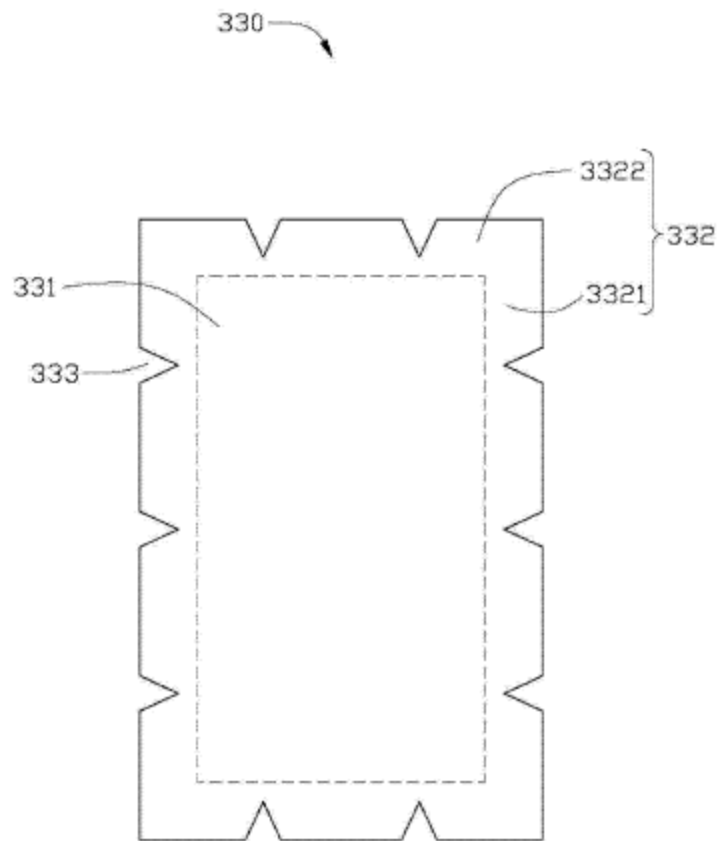


Fig. 7

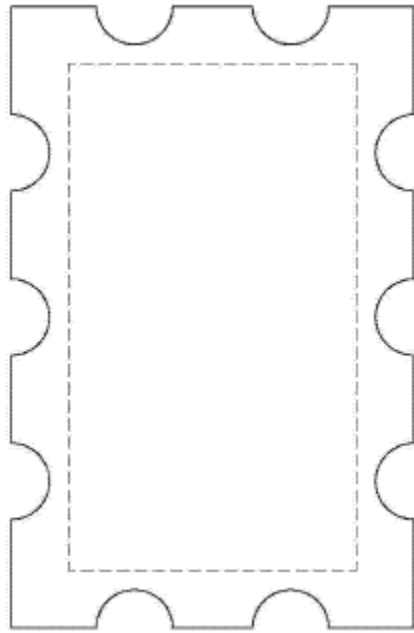


Fig. 8

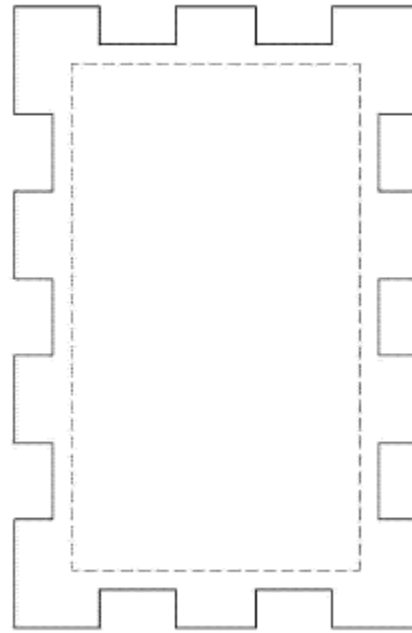


Fig. 9

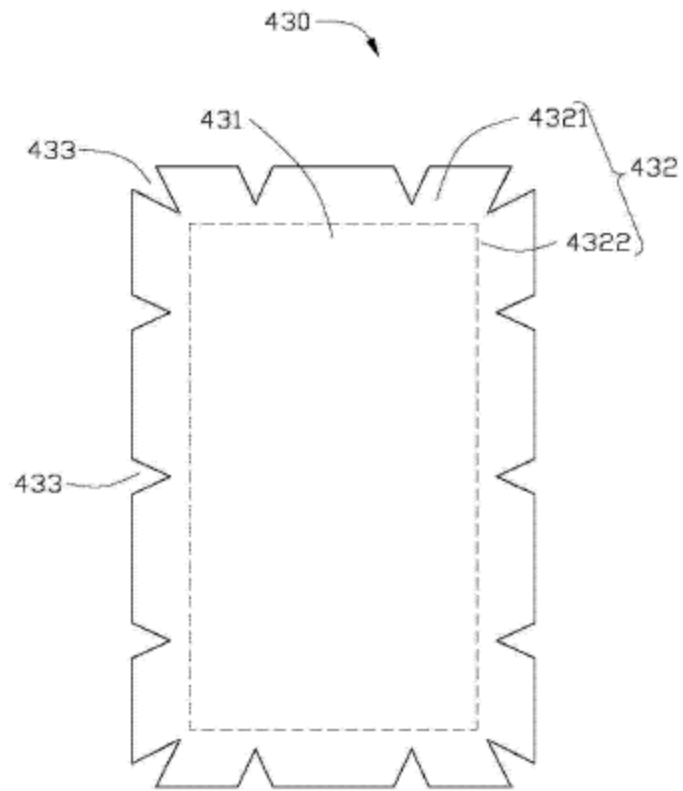


Fig. 10

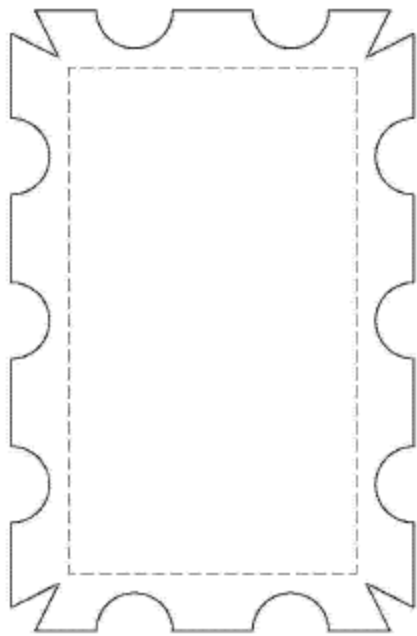


Fig. 11

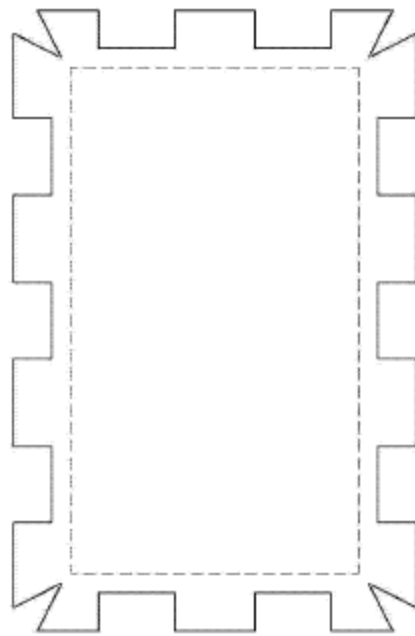


Fig. 12

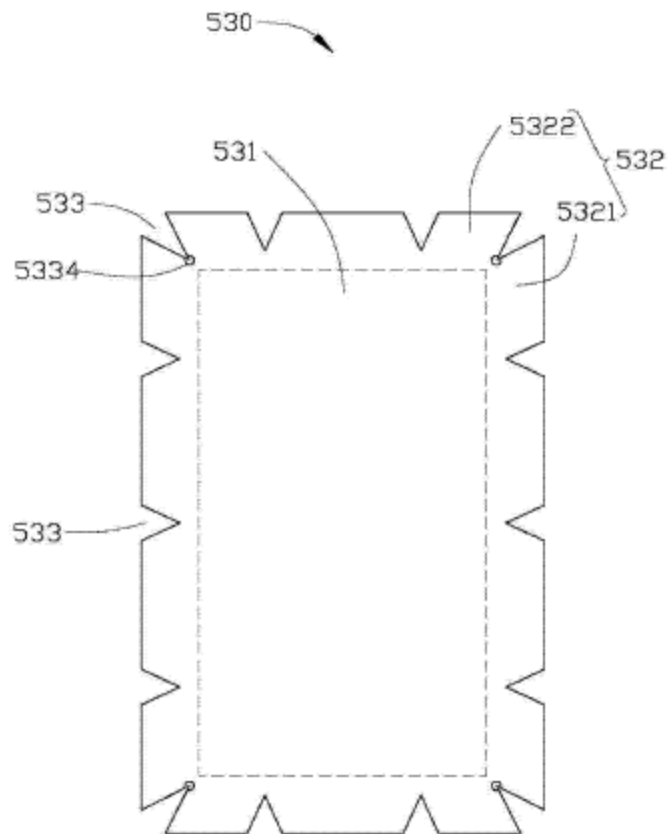


Fig. 13

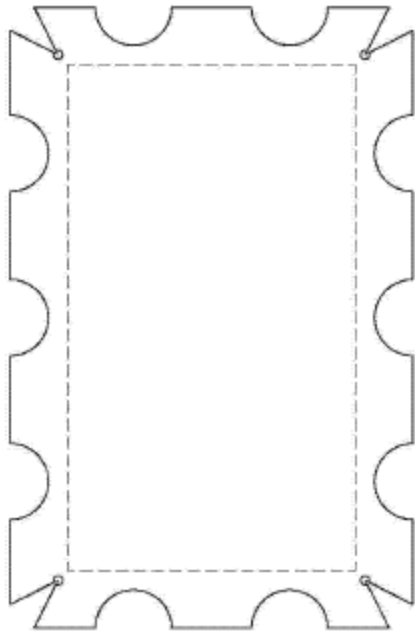


Fig. 14

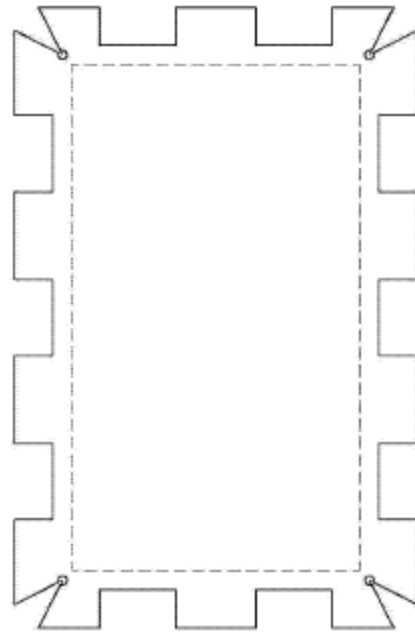


Fig. 15

600 →

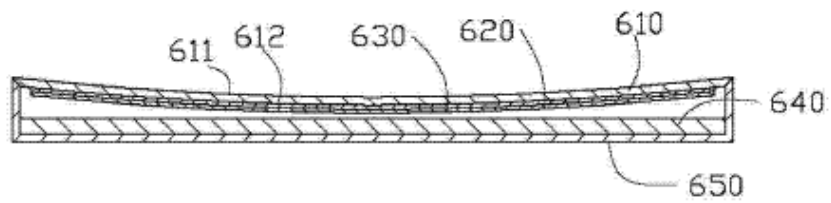


Fig. 16

AFFIDAVIT OF QIANG LI

I, Qiang Li, hereby declare that I am competent in both Chinese and English and that the attached translation is, to the best of my knowledge and belief, a true and accurate translation from Chinese to English of CN104808843A

I declare under penalty of perjury that all statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under and may jeopardize the validity of the application or any patent issuing thereon.



Executed on October 7, 2021