US Patent & Trademark Office
Patent Public Search | Text View

United States Patent	12393083
Kind Code	B2
Date of Patent	August 19, 2025
Inventor(s)	Huang; Lingju et al.

Liquid crystal display panels and methods of manufacturing the same

Abstract

The present disclosure provide methods of manufacturing a liquid crystal display panel and the liquid crystal display panels. In a process of forming a motherboard of the display panel, a second sealant portion and a third sealant portion with a lower height than that of a first sealant portion are temporarily formed outside the first sealant portion, so that a smooth transitional support surface is formed between the first sealant portion, the second sealant portion, the third sealant portion and a support column inside the panel.

Inventors: **Huang; Lingju (Jiangsu, CN), Zhu; Hongjun (Jiangsu, CN)**

Applicant: **SUZHOU CHINA STAR OPTOELECTRONICS TECHNOLOGY CO., LTD.** (Jiangsu, CN)

Family ID: **1000008763411**

Assignee: **SUZHOU CHINA STAR OPTOELECTRONICS TECHNOLOGY CO., LTD. (Suzhou, CN)**

Appl. No.: **18/622982**

Filed: **March 31, 2024**

Prior Publication Data

Document Identifier	Publication Date
US 20240272488 A1	Aug. 15, 2024

Foreign Application Priority Data

CN	202310097070.2	Feb. 10, 2023

Related U.S. Application Data

continuation parent-doc US 18175558 20230228 US 11971630 child-doc US 18622982

Publication Classification

Int. Cl.: **G02F1/1339** (20060101)

U.S. Cl.:

CPC **G02F1/1339** (20130101);

Field of Classification Search

CPC: G02F (1/133351); G02F (1/1339)

USPC: 349/153

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
6831725	12/2003	Niiya	349/190	G02F 1/1339
11971630	12/2023	Huang	N/A	G02F 1/133351
2003/0160935	12/2002	Lee	349/187	G02F 1/1341
2012/0327355	12/2011	Cheng	349/153	G02F 1/1339
2021/0333587	12/2020	Zhang	N/A	G02F 1/13398

Primary Examiner: Caley; Michael H

Assistant Examiner: Chung; David Y

Attorney, Agent or Firm: PV IP PC

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

(1) This application claims priority to and the benefit of Chinese Patent Application No. 202310097070.2, filed on Feb. 10, 2023, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

(2) The present disclosure relates to the field of display panel manufacturing, and in particular, to methods of manufacturing a liquid crystal display panel and liquid crystal display panels manufactured thereby.

BACKGROUND

(3) In a liquid crystal display (LCD) panel, due to the existence of a sealant portion in a frame area, height difference between an upper color filter substrate and a lower array substrate may exceed cell gap in a display area. A difference in cell gap may lead to a difference in liquid crystal deflection during driving, which may in turn lead to deviation in display uniformity of the panel

and whitening of the peripheral frame due to light leakage. Especially, in a product that is designed to cover a photo spacer (PS) in order to prevent a gate driver on array (GOA) circuit from being short-circuited, heights of the sealant portion and the PS in the frame area may be accumulated so that the height difference is greater and the whitening of the frame is more obvious.
(4) As mentioned above, in the LCD panel of the related art, the height of the sealant portion in the frame area may be greater than cell gap in the display area. This may result in obvious height difference in the transition area that may result in poor flatness of the upper and lower substrates and poor sealing of the panel, which may in turn affect the liquid crystal deflection and lead to bad phenomenon of whitening of the frame. This phenomenon needs to be addressed in the process of manufacturing the panel.
SUMMARY
(5) In view of the above, an embodiment of the present disclosure provides a method of manufacturing a liquid crystal display panel, which comprises: providing an upper cover plate defining at least one daughter board area and a cutting area located outside the daughter board area on the upper cover plate; arranging a first sealant portion at an edge of the daughter board area close to the cutting area; arranging a second sealant portion and a third sealant portion in the cutting area, wherein a long side of each of the second sealant portion and the third sealant portion is in a same direction as the edge of the daughter board area; arranging a lower substrate on an opposite side of the upper cover plate; the lower substrate covering at least the daughter board area and the cutting area located outside the daughter board area; forming a motherboard, cutting and removing film layers in the cutting area to form at least one daughter board independent from each other; and wherein the at least one daughter board area comprises at least a first daughter board area, the second sealant portion and the at least one third sealant portion are arranged along both short sides of the first daughter board area.
(6) An embodiment of the present disclosure further provides a liquid crystal display panel manufactured by the above method, the panel comprising: a lower substrate; an upper cover plate arranged opposite to the lower substrate; and, a liquid crystal layer arranged between the lower substrate and the upper cover plate; wherein a deformation height difference of the upper cover plate is less than 0.6 mm.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a schematic flowchart of a method of manufacturing a liquid crystal display panel according to an embodiment of the present disclosure.
(2) FIG. **2** is a schematic plan view of a motherboard according to an embodiment of the present disclosure.
(3) FIG. **3** is a schematic plan view of another arrangement of sealant portions according to an embodiment of the present disclosure.
(4) FIG. **4** is a schematic plan view of further another arrangement of sealant portions according to an embodiment of the present disclosure.
(5) FIG. **5** is a schematic diagram showing comparison of respective effects when cutting a liquid crystal display panel in the related art and in an embodiment of the present disclosure.
DETAILED DESCRIPTION
(6) The following description of various embodiments is provided with reference to the accompanying drawings to illustrate specific embodiments that can be practiced in the present disclosure. Directions terms mentioned in the present disclosure, for example, [upper], [lower], [front], [back], [left], [right], [inner], [outer], [side], and the like, are only directions referring to the accompanying drawing. Therefore, the directional terms are used to explain and understand the

present disclosure, not to limit the present disclosure. In the drawings, units with similar structures are denoted by the same reference numerals.
(7) The terms "first", "second" are used for descriptive purposes only and cannot be understood as indicating or implying relative importance or implicitly indicating the number of indicated technical features. Therefore, the features defined as "first" and "second" may include one or more of these features explicitly or implicitly. In description of the present disclosure, "a plurality of" means two or more, unless otherwise specified.
(8) Some embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.
(9) As mentioned above in the background, in a liquid crystal display panel, due to the existence of sealant portion in frame area, height difference between an upper substrate and a lower substrate may exceed cell gap in the display area, which leads to a difference in liquid crystal deflection during driving and in turn causes deviation in display uniformity of the panel and whitening of the peripheral frame due to light leakage. This may deteriorate display effect and comprehensive performance of the display panel.
(10) As shown in FIG. **1**, a method of manufacturing a liquid crystal display panel according to an embodiment of the present disclosure may comprise the following steps: S**101**: providing an upper cover plate defining at least one daughter board area and a cutting area located outside the daughter board area on the upper cover plate; S**102**: arranging a first sealant portion at an edge of the daughter board area close to the cutting area; S**103**: arranging a second sealant portion and a third sealant portion in the cutting area, wherein a long side direction of the second sealant portion and the third sealant portion is the same as an edge direction of the adjacent daughter board area; S**104**: arranging a lower substrate opposite to the upper cover plate to cover at least the daughter board area and the cutting area, to form a motherboard; and S**105**: cutting the motherboard to remove the cutting area, to form at least one independent daughter board.
(11) The third sealant portion is conductive and, upon being powered on, is cut off together with the second sealant portion.
(12) During the process of manufacturing and forming a liquid crystal display panel, in order to simplify the manufacturing process and improve the production efficiency of the liquid crystal display panel, each film layer is usually first formed directly on a large-size substrate, each different film layer is correspondingly arranged in different areas, and each area is finally cut to obtain a panel with a required size.
(13) Referring to a structure of a motherboard according to an embodiment of the present disclosure as shown in FIG. **2**, the upper cover plate **101** may include a plurality of different areas. The plurality of different areas may be arranged according to the requirements of different products, for example, the entire upper cover plate **101** can be divided into a plurality of different areas, and one or more daughter board areas may be correspondingly arranged in each area. The daughter board areas may be arranged in an array along the row and column directions of the upper cover plate, or may be arranged according to sizes and specifications of different panels, which will not be described in detail herein.
(14) In the following embodiments, for actual products, the upper cover plate **101** is described with a size of 1000 mm in both length and width. In this size, the upper cover plate **101** can be divided into a plurality of different daughter board areas, such as daughter board area A, daughter board area B, daughter board area C, and daughter board area D to daughter board area I.
(15) In an embodiment of the present disclosure, the daughter board areas may be arranged to have the same size, or may be arranged to have different sizes. Specifically, daughter board area A, daughter board area B and daughter board area C has the same size such as S1. The six daughter board areas D to I are arranged to have the same size such as S2. In embodiments of the present disclosure, the area $S1>S2$ is taken as an example for description.
(16) Optionally, daughter board area A, daughter board area B, and daughter board area C are

arranged in the same column. Meanwhile, daughter board area D to daughter board area I are arranged in the same column, and are arranged on the same side of daughter board area A, thus finally forms the structure provided in embodiments of the present disclosure.
(17) Further, daughter board area A may have an area of larger than a sum of areas of daughter board area D and daughter board area E, and a straight-line distance between daughter board area A and a side of daughter board area D close to daughter board area A is equal to that between and daughter board area A and a side of daughter board area E. Meanwhile, the upper cover plate is further provided with a motherboard glue, which is arranged around all the defined daughter board areas.
(18) In embodiments of the present disclosure, a cutting area **301** is further provided outside each daughter board area. Meanwhile, each of the daughter board areas includes a display area **303**, and a frame area **302** arranged around the display area **303**, wherein the frame area **302** may be correspondingly arranged at an edge position of each daughter board area. A first sealant portion **202** is further provided in the frame area **302**, and is arranged around the display area **303**, so that two different substrates are combined to form a panel.
(19) Meanwhile, a second sealant portion **203** is provided in each daughter board area. In embodiments of the present disclosure, the second sealant portion **203** is correspondingly arranged in the cutting area **301** of each daughter board area. Further, a spacing between the second sealant portion **203** and the first sealant portion **202** is set to be 5 mm˜15 mm, for example, 5 mm, 8 mm, 10 mm, or 15 mm. Optionally, the spacing can be set according to different products, which will not be described in detail herein.
(20) In embodiments of the present disclosure, the first sealant portion **202** and the second sealant portion **203** are arranged firstly, then the third sealant portion **201** is arranged in each daughter board area. Specifically, the third sealant portion **201** can be correspondingly arranged in the cutting area **301** of each daughter board area. Meanwhile, the third sealant portion **201** can be arranged at different positions of the cutting area **301**. In embodiments of the present disclosure, the third sealant portion **201** is mainly a conductive sealant portion, and the third sealant portion **201** is arranged in a strip structure. Conductive particles, such as conductive carbon nanomaterials or conductive metal materials, such as metal copper, are provided in the third sealant portion **201**, so as to achieve the conductive function.
(21) Meanwhile, the third sealant portion **201** can be arranged at at least one side of each daughter board area. When it is necessary to align liquid crystal molecules in the daughter board area, a current or a voltage is applied to the third sealant portion, and the third sealant portion **201** forms an electric field in each daughter board area, so that the liquid crystal molecules in the liquid crystal cell are deflected to a certain extent, and alignment function is realized.
(22) Further, during the arrangement of the second sealant portion **203** and the third sealant portion **201**, as shown in FIG. **2**, the second sealant portion **203** and the third sealant portion **201** are arranged on the same straight line, and both the second sealant portion **203** and the third sealant portion **201** are parallel to one side of the first sealant portion **202**, for example, parallel to one side of the first sealant portion **202** adjacent to the second sealant portion **203**. In embodiments of the present disclosure, when the second sealant portion **203** and the third sealant portion **201** are arranged on the same straight line, a gap is arranged between the second sealant portion **203** and the third sealant portion **201**, and a length of the gap may be set as from 4 mm to 18 mm. Optionally, the length of the gap is set as 7 mm, 10 mm, or as desired.
(23) Further, referring to another arrangement of sealant portions according to an embodiment of the present disclosure as shown in FIG. **3**, arrangement structure of sealant portions on the left side of the daughter board area A is taken as an example for description. Both the second sealant portion **203** and the third sealant portion **201** are arranged on one side of the first sealant portion **202**, and are correspondingly arranged in the cutting area **301**. The third sealant portion **201** may has a length smaller than that of the second sealant portion **203**, so that the second sealant portion **203**

may be provided with a longer length. When the daughter board area A is cut in the cutting area, the second sealant portion **203** may support the substrate in a larger range, thus preventing the substrate from being deformed during the cutting process, and resulting in a light leakage in the frame area due to deformation.

(24) At this time, the third sealant portion **201** is arranged on a side close to the first sealant portion **202**, and the spacing distance between the third sealant portion **201** and the second sealant portion **203** is set to be from 5 mm to 15 mm, for example, 10 mm or 14 mm, thereby preventing light leakage caused by severe deformation at the frame area during cutting.

(25) Further, in order to prevent deformation during cutting, the third sealant portion **201** can be further arranged on a perpendicular bisector between the first sealant portion **202** and the second sealant portion **203**, thereby ensuring good supporting force on both sides to prevent deformation during cutting.

(26) Referring to further another arrangement of sealant portions according to an embodiment of the present disclosure as shown in FIG. **4** as compared with the structure in FIG. **3**, the relative location relationship between the second sealant portion **203** and the third sealant portion **201** can be changed, for example, the second sealant portion **203** and the third sealant portion **201** can be arranged on the same vertical line. In addition, both the second sealant portion **203** and the third sealant portion **201** are arranged in parallel with the first sealant portion **202**, so that area of the cutting area can be further shortened, thereby maximizing the utilization of the upper cover plate and reducing production cost of the display panel. Meanwhile, the height of the first sealant portion is greater than that of the second sealant portion.

(27) Further, when the second sealant portion **203** and the third sealant portion **201** are arranged according to the position shown in FIG. **4**, the width of the second sealant portion **203** may be the same as that of the third sealant portion **201**, and the width of the second sealant portion **203** and the width of the third sealant portion **201** may be smaller than that of the first sealant portion **202**, thereby ensuring packaging effect of the first sealant portion **202** and ensuring supporting performance of the second sealant portion **203**.

(28) Further, in an embodiment of the present disclosure, referring to the arrangement structure in FIG. **2**, the third sealant portion **201** and the second sealant portion **203** may be arranged in a plurality. For daughter board area A, there may be two third sealant portions **201** arranging on both the left and right sides of the daughter board area A respectively, and two pieces of the third sealant portions parallel to each other may be arranged at a right edge of the daughter board area D at the corresponding position of the daughter board area D with a smaller area. For example, the third sealant portion **201** includes a third sub-sealant portion **2011** and a fourth sub-sealant portion **2012**. Straight-line distance between the third sub-sealant portion **2011** and the second sealant portion **203** is different from that between the fourth sub-sealant portion **2012** and the second sealant portion **203**. In this way, when the daughter board area D is cut in the cutting area, the two sub-sealant portions can supporting different cutting areas since they are arranged at different positions respectively, thus ensuring the supporting effect.

(29) Meanwhile, for the third sealant portion **201** between the daughter board area A and the daughter board area D, the length of the third sealant portion **201** may be greater than that of the third sub-sealant portion **201** or the fourth sub-sealant portion **2012**. Meanwhile, and the third sealant portion **201** and the second sealant portion **203** are arranged at at ½ of a distance between the daughter board area A and the daughter board area D, so that the second sealant portion **203** and the third sealant portion **201** can simultaneously support the daughter boards on both sides and prevent large deformation at the edges.

(30) Further, in embodiments of the present disclosure, after arrangement of each sealant portion on the upper cover plate is completed, a lower substrate is arranged on the upper cover plate to form a panel. In embodiments of the present disclosure, the above lower substrate is provided with a corresponding color resistance structure and different functional film layers, such as a buffer layer,

an array substrate, an alignment layer and the like, and a driving functional layer is formed to ensure normal operation of the liquid crystal display panel, wherein the specific functional film layers are not specifically shown in FIG. **2**. Meanwhile, after arrangement of the upper cover plate and the lower substrate is completed, the entire upper cover plate is cut in the cutting area, wherein the cutting line is close to an edge position of each daughter board area, thereby obtaining l liquid crystal display panel with narrow-frame.

(31) FIG. **5** shows comparison of respective effects when cutting the liquid crystal display panel in the related art and in an embodiment of the present disclosure. Specifically, FIG. **5**(*a*) shows that in the related art, the upper cover plate **101** and the lower substrate **556** are combined to form a panel through a support column **555** and the first sealant portion **202**, wherein, the support column **555** is correspondingly arranged in the display area **303**, and the first sealant portion **202** is arranged in the frame area **302**. After the film layers such as the upper cover plate and the lower substrate **556** are arranged, large-sized substrate needs to be cut, for example, the cutting area **301** outside the frame area needs to be cut. A cutting force is applied to the substrate during cutting, and it will cause deformation of the substrate. Meanwhile, since the heights of the support column **555** and the first sealant portion **202** are different, a seesaw structure will be formed in the panel, which will further causes deformation such as warping after cutting, as can be seen from the standard height line **22** and the deformation height line **24** in FIG. **5**. The standard height line **22** is a position where the deformation is not caused after cutting in an ideal state, and the deformation height line is a position where deformation is caused actually after cutting.

(32) In the related art, after the panel is cut, the height of the deformation height line **24** is H1, and the height of the standard height line **22** is H. At this time, the deformation height difference between them is $\delta A=H1-H$. In the related art, the deformation height difference δA is generally greater than 0.7 mm. In contrast, in an embodiment of the present disclosure, referring to FIG. **5**(*b*) showing deformation effect when cutting the panel, a second sealant portion **203** is further arranged outside the frame area **302** of the display panel, and the height of the second sealant portion **203** can be smaller than that of the first sealant portion **202**.

(33) Under this structure, the panel is cut, wherein the cutting line is located between the first sealant portion **202** and the second sealant portion **203**. At this time, since the first sealant portion **202** is arranged on the left side of the cutting line, and the second sealant portion **203** is arranged on the right side of the cutting line, a new seesaw structure is formed among the support column **555**, the first sealant portion **202**, and the second sealant portion **203**. The second sealant portion **203** can effectively support and push upward the lower substrate or the upper cover plate on the right side of the cutting line, thus reducing the deformation degree of each substrate during the cutting process. Specifically, the height of the standard height line **22** is H, and the height of the corresponding deformation height line **24** after deformation is H3. In embodiments of the present disclosure, when defining the above-mentioned height and the corresponding deformation height line, the plane in the display area corresponding to the lower substrate **556** is taken as a reference, and the plane in this display area may be regarded as not being deformed after cutting. Therefore, this plane corresponding to this display area is the bottom plane. Specifically, for example, after the cutting is completed, the upper cover plate **101** is at an edge position, and the plane corresponding to a position, where the maximum deformation of the upper surface or the lower surface of the upper cover plate **101** occurs, corresponds to the deformation height line **24**. Meanwhile, the height between this plane and the bottom plane corresponding to the lower substrate **556** is the specific value of the deformation height line. Similarly, the plane corresponding to the upper cover plate **101** after cutting without deformation is the plane corresponding to the standard height line **22**. In embodiments of the present disclosure, the standard height line **22** can be understood as the height value of the liquid crystal cell between the upper cover plate **101** and the lower substrate **556**. The parameter values are measured. In embodiments of the present disclosure, the height H of the standard height line ranges from 3.3 mm to 3.4 mm, and the height H3 of the deformation height

line ranges from 3.8 mm to 4 mm after cutting is completed.
(34) At this time, the deformation height difference between them is δB=H3−H. Specifically, the deformation height difference δB is less than 0.6 mm, which is less than the deformation height difference in the related art. Thus, it can be seen that the deformation height difference is effectively reduced, and the parallelism between the two different film layers of the upper cover plate and the lower substrate at the edge area is ensured. In embodiments of the present disclosure, there is a parallelism between the upper cover plate **101** and the lower substrate **556**. This parallelism is the deformation height difference between the upper cover plate **101** and the lower substrate **556**.
(35) In embodiments of the present disclosure, since the second sealant portion **203** is arranged, the height corresponding to the deformation height line is smaller than that in the related art. Therefore, the deformation height difference δB in embodiments of the present disclosure is less than the value of δA. Therefore, in embodiments of the present disclosure, after cutting is completed, the deformation of the panel in the cutting area around the panel is smaller, thereby effectively improving the flatness of the entire area after the panel is cut, and preventing the panel from light leakage and the like in the frame area.
(36) Further, embodiment of the present disclosure also provides liquid crystal display panels, which are manufactured and formed through the above manufacturing process and method. The peripheral edge of the liquid crystal display panel has a better flatness, thereby effectively preventing the problem of light leakage caused by easy deformation of the peripheral edge of the panel in the process of manufacturing the panel, and improving the comprehensive performance of the liquid crystal display panel.
(37) In embodiments of the present disclosure, the liquid crystal display panel and the corresponding display device may be any product or component with display function, touch control function, or the like, such as a mobile phone, a computer, an electronic paper, a display, or the like, and the specific type thereof is not specifically limited.
(38) Embodiments of the present disclosure provide methods of manufacturing a liquid crystal display panel and the liquid crystal display panels. In the process of forming motherboard of the display panel, a second sealant portion and a third sealant portion with a lower height than that of the first sealant portion are temporarily formed outside the sealant portion, the height of the third sealant portion is less than that of the first sealant portion, and the third sealant portion is arranged outside the first sealant portion. In this way, a smooth transition support surface is formed among the first sealant portion, the third sealant portion and PS inside the panel. When the panel is cut, the smooth transition support surface can repair the flatness of the lower substrate in the light leakage area of the liquid crystal display panel, thereby improving the light leakage defect, and effectively improving the uniformity of the display effect of the liquid crystal display panel.
(39) In view of the foregoing, methods of manufacturing a liquid crystal display panel and the liquid crystal display panels provided in embodiments of the present disclosure have been described in detail above, and the principles and embodiments of the present disclosure are described by using specific examples herein. Descriptions of the above embodiments are merely intended to help understand the methods and core ideas of the present disclosure, but not intended to limit the present disclosure. Those skilled in the art can make various changes or modifications without departing from the present disclosure. Therefore, the scope of protection of the present disclosure is defined by the claims.

Claims

1. A method of manufacturing a liquid crystal display panel, comprising: providing an upper cover plate of which at least one daughter board area and a cutting area located outside the daughter board area are defined; arranging a first sealant portion at an edge of the daughter board area close

to the cutting area; arranging a second sealant portion and at least one third sealant portion in the cutting area, wherein a long side of each of the second sealant portion and the third sealant portion is in a same direction as the edge of the daughter board area; arranging a lower substrate opposite to the upper cover plate to cover at least the daughter board area and the cutting area, to form a motherboard; and cutting the motherboard to remove the cutting area, to form at least one independent daughter board; wherein the at least one daughter board area comprises at least a first daughter board area, the second sealant portion and the at least one third sealant portion are arranged along both short sides of the first daughter board area; wherein the at least one daughter board area comprises a second daughter board area and a third daughter board area close to a short side of the first daughter board area, the first daughter board area is larger than a sum of the second daughter board area and the third daughter board area, and a side of each of the second daughter board area and the third daughter board area close to the first daughter board area has an equal straight-line distance from the first daughter board area.
2. The method according to claim 1, wherein a height of the first sealant portion is greater than that of the second sealant portion, and a height of the first sealant portion is greater than that of the third sealant portion.
3. The method according to claim 1, wherein the third sealant portion is conductive and, upon being powered on, is cut off together with the second sealant portion.
4. The method according to claim 3, wherein conductive particles are provided in the third sealant portion.
5. The method according to claim 4, wherein conductive particles are conductive carbon nanomaterials or conductive metal materials.
6. The method according to claim 4, wherein the conductive metal material is metal copper.
7. The method according to claim 1, wherein the third sealant portion and the second sealant portion are arranged on a same straight line, and both the second sealant portion and the third sealant portion are parallel to an edge line of the cutting area.
8. The method according to claim 7, wherein a width of the second sealant portion is same as that of the third sealant portion, and the width of the second sealant portion and the width of the third sealant portion are smaller than that of the first sealant portion.
9. The method according to claim 7, wherein there is a gap between the second sealant portion and the third sealant portion, and a length of the gap is set to 4 mm˜18 mm.
10. The method according to claim 7, wherein the third sealant portion is in contact with the second sealant portion, and conductive particles are added into the third sealant portion.
11. The method according to claim 1, wherein the at least one third sealant portion comprises a plurality of third sealant portions respectively having a plurality of straight-line distances from the second sealant portion, the plurality of straight-line distances being not equal to each other.
12. The method according to claim 1, wherein the third sealant portion is arranged, close to the first daughter board area, at ½ of a distance between the first daughter board area and the second daughter board area.
13. The method according to claim 1, wherein the third sealant portion comprises a third sub-sealant portion and a fourth sub-sealant portion parallel to each other.
14. The method according to claim 13, wherein the third sub-sealant portion and the fourth sub-sealant portion are arranged at a right edge of the second daughter board area and the third daughter board area.
15. The method according to claim 13, wherein the length of the third sealant portion is greater than that of the third sub-sealant portion or the fourth sub-sealant portion.
16. The method according to claim 1, wherein motherboard glue is arranged on the upper cover plate to surround all the at least one daughter board area.
17. A liquid crystal display panel manufactured by the method of claim 1, comprising: a lower substrate; an upper cover plate arranged opposite to the lower substrate; and a liquid crystal layer

arranged between the lower substrate and the upper cover plate, wherein a deformation height difference of the upper cover plate is less than 0.6 mm.

18. A method of manufacturing a liquid crystal display panel, comprising: providing an upper cover plate of which at least one daughter board area and a cutting area located outside the daughter board area are defined; arranging a first sealant portion at an edge of the daughter board area close to the cutting area; arranging a second sealant portion and at least one third sealant portion in the cutting area, wherein a long side of each of the second sealant portion and the third sealant portion is in a same direction as the edge of the daughter board area; arranging a lower substrate opposite to the upper cover plate to cover at least the daughter board area and the cutting area, to form a motherboard; and cutting the motherboard to remove the cutting area, to form at least one independent daughter board; wherein the at least one daughter board area comprises at least a first daughter board area, a second daughter board area and a third daughter board area close to a short side of the first daughter board area, the second sealant portion and the at least one third sealant portion are arranged along both short sides of the first daughter board area; wherein the first daughter board area is larger than a sum of the second daughter board area and the third daughter board area, and a side of each of the second daughter board area and the third daughter board area close to the first daughter board area has an equal straight-line distance from the first daughter board area.

19. The method according to claim 18, wherein a height of the first sealant portion is greater than that of the second sealant portion, and a height of the first sealant portion is greater than that of the third sealant portion.