(54) Title: DISPLAY PANEL ASSEMBLY AND METHOD FOR MAKING THE SAME

(57) Abstract: A display panel assembly includes: a glass panel having a peripheral edge; an adhesive; a metal film unit attached adhesively to the peripheral edge of the glass panel through the adhesive; and a plastic frame disposed along the peripheral edge of the glass panel and molded over the metal film and the peripheral edge of the glass panel.

FIG. 1

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DISPLAY PANEL ASSEMBLY AND METHOD FOR MAKING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority of United State Patent Provisional Application No. 61/409134, filed on November 2, 2010.

BACKGROUND

1. Field

The present technology relates to a display panel assembly and a method for making the same, more particularly to a display panel assembly having a metal film unit disposed between and bonded to a glass panel and a plastic frame.

2. Description of the related art

U.S. Patent Application Publication No. US 2011/0049139 discloses a device housing (or a display panel assembly) for an electronic device, such as a mobile phone. The device housing includes a glass plate and a plastic frame injection molded over a peripheral edge of the glass plate. Since the plastic frame is normally made from a plastic material that has a low bonding strength when injection molded over the glass plate, the peripheral edge of the glass plate is roughened before the injection molding so as to enhance the bonding strength between the plastic frame and the glass plate. However, since the surface area of the peripheral edge is relatively small, bonding enhancement by edge
roughening is rather limited.

The current trend is toward thinner mobile phones. Hence, it is desirable to reduce the thickness of the glass plate. Conventional glass plates normally have a thickness greater than 0.9mm for avoiding warping of the glass plate. In addition, the thinner the glass plate, the lower the mechanical strength of the glass plate will be, which can easily result in breaking of the glass plate during the manufacturing process of the device housing.

SUMMARY

With the present technology, a display panel assembly that attempts to not exhibit or present the aforesaid drawbacks associated with the prior art is presented.

The present technology also provides

a method for making a display panel assembly.

According to one aspect of the present invention, there is provided a display panel assembly that comprises: a glass panel having a peripheral edge; an adhesive; a metal film unit attached adhesively to the peripheral edge of the glass panel through the adhesive; and a plastic frame disposed along the peripheral edge of the glass panel and molded over the metal film unit and the peripheral edge of the glass panel.

According to another aspect of the present
invention, there is provided a method for making a display panel assembly. The method comprises: attaching adhesively a metal film unit to a peripheral edge of a glass panel through an adhesive; and forming a plastic frame by molding a plastic material over the peripheral edge of the glass panel and the metal film unit.

BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the invention,

Fig. 1 is a perspective view of the first preferred embodiment of a display panel assembly according to the present invention;

Fig. 2 is a sectional view taken along line \( \Pi - \Pi \) of Fig. 1;

Fig. 3 is a top view of the first preferred embodiment;

Fig. 4 is a top view of the second preferred embodiment of the display panel assembly according to the present invention; and

Figs. 5A to 5C are sectional views to illustrate consecutive steps of the preferred embodiment of a method for making a display panel assembly according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before the present invention is described in greater detail with reference to the accompanying
preferred embodiments, it should be noted herein that like elements are denoted by the same reference numerals throughout the disclosure.

Figs. 1 to 3 illustrate the first preferred embodiment of a display panel assembly for an electronic device, such as a mobile phone, according to the present invention. The display panel assembly includes: a glass panel 2 having a peripheral edge 21; an adhesive 3; a metal film unit 4 attached adhesively to the peripheral edge 21 of the glass panel 2 through the adhesive 3; and a plastic frame 5 disposed along the peripheral edge 21 of the glass panel 2 and molded over the metal film unit 4 and the peripheral edge 21 of the glass panel 2.

In this embodiment, the glass panel 2 preferably has a thickness greater than 0.6mm and less than 1mm, and further has front and back surfaces 22, 23 and a peripheral side face 24 extending from the front surface 22 to the back surface 23. The front and back surfaces 22, 23 of the glass panel 2 are parallel to each other. The peripheral side face 24 and the back surface 23 of the glass panel 2 cooperatively form an acute angle θ ranging preferably from 30 to 75 degrees so that the peripheral side face 24 of the glass panel 2 has a perimeter that is gradually enlarged from the front surface 22 to the back surface 23 of the glass panel 2.
The metal film unit 4 is adhesively attached to the peripheral side face 24 and the back surface 23 of the glass panel 2 at the peripheral edge 21 of the glass panel 2.

In this embodiment, the metal film unit 4 includes a single piece of a loop-shaped rectangular metal film strip 41 surrounding the peripheral edge 21 of the glass panel 2.

The plastic frame 5 is preferably made from a plastic material, such as polycarbonate.

Fig. 4 illustrates the second preferred embodiment of the display panel assembly according to the present invention. The second preferred embodiment differs from the previous embodiment in that the metal film unit 4 includes a plurality of straight metal film strips 42 displaced from each other and disposed around the peripheral edge 21 of the glass panel 2.

In this embodiment, the peripheral edge 21 of the glass panel 2 is substantially rectangular in shape. The straight metal film strips 42 are disposed at four sides of the peripheral edge 21 of the glass panel 2, respectively.

Figs. 5A to 5C illustrate consecutive steps of the preferred embodiment of a method for making the display panel assembly according to the present invention. The method includes attaching adhesively
a metal film unit 4 to a peripheral edge 21 of a glass panel 2 through an adhesive 3 (see Figs. 5A and 5B), followed by placing the glass panel 2 together with the metal film unit 4 in a mold 6 and forming a plastic frame 5 by injection molding a plastic material over the peripheral edge 21 of the glass panel 2 and the metal film unit 4 (see Fig. 5C). The display panel assembly thus formed passed a drop test using 133 grams of an iron ball for the glass panel having a thickness ranging from 0.7mm to 0.9mm and a size of 60mm x 45mm. The drop test was conducted by dropping the iron ball from a height of 100cm onto the glass panel 2 of the glass panel assembly.

Since the bonding strength provided by the adhesive 3 between the metal film unit 4 and the peripheral edge 21 of the glass panel 2 and the bonding strength between the plastic frame 5 and the metal film unit 4 are each greater than that between the plastic frame 5 and the peripheral edge 21 of the glass panel 2, the binding between the plastic frame 5 and the glass panel 2 of the display panel assembly can be enhanced.

The bonding of the metal film unit 4 to the peripheral edge 21 of the glass panel 2 not only enhances the binding between the plastic frame 5 and the glass panel 2 but also permits reduction of the thickness of the glass panel 2 to 0.7 mm without causing
breaking and warping of the glass panel 2, thereby alleviating the drawbacks as encountered in the prior art during manufacturing.

While the present invention has been described in connection with what are considered the most practical and preferred embodiments, it is understood that this invention is not limited to the disclosed embodiments but is intended to cover various arrangements included within the scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

All elements, parts and steps described herein are preferably included. It is to be understood that any of these elements, parts and steps may be replaced by other elements, parts and steps or deleted altogether as will be obvious to those skilled in the art.

Broadly, the foregoing description presents at least a display panel having a glass panel having a peripheral edge; an adhesive; a metal film unit attached adhesively to the peripheral edge of the glass panel through the adhesive; and a plastic frame disposed along the peripheral edge of the glass panel and molded over the metal film unit and the peripheral edge of the glass panel.
Concepts

This writing has disclosed at least the following concepts.

Concept 1. A display panel assembly comprising:
    a glass panel having a peripheral edge;
    an adhesive;
    a metal film unit attached adhesively to said peripheral edge of said glass panel through said adhesive; and
    a plastic frame disposed along said peripheral edge of said glass panel and molded over said metal film unit and said peripheral edge of said glass panel.

Concept 2. The display panel assembly of concept 1, wherein said glass panel further has front and back surfaces and a peripheral side face extending from said front surface to said back surface, said metal film unit being adhesively attached to said peripheral side face and said back surface at said peripheral edge of said glass panel.

Concept 3. The display panel assembly of concept 2, wherein said peripheral side face has a perimeter that is gradually enlarged from said front surface to said back surface.

Concept 4. The display panel assembly of concept 3, wherein said front and back surfaces are parallel to each other, said peripheral side face and said back surface cooperatively forming an acute angle.

Concept 5. The display panel assembly of concept 4, wherein said acute angle ranges from 30 to 75 degrees.

Concept 6. The display panel assembly of concept 1, wherein said
metal film unit includes a single piece of a loop-shaped metal film strip surrounding said peripheral edge of said glass panel.

Concept 7. The display panel assembly of concept 1, wherein said metal film unit includes a plurality of straight metal film strips displaced from each other and disposed around said peripheral edge of said glass panel.

Concept 8. The display panel assembly of concept 1, wherein said plastic frame is made from polycarbonate.

Concept 9. The display panel assembly of concept 1, wherein said glass panel has a thickness greater than 0.6mm and less than 1mm.

Concept 10. A method for making a display panel assembly, comprising:

attaching adhesively a metal film unit to a peripheral edge of a glass panel through an adhesive; and

forming a plastic frame by molding a plastic material over the peripheral edge of the glass panel and the metal film unit.

Concept 11. The method of concept 10, wherein the glass panel has front and back surfaces and a peripheral side face extending from the front surface to the back surface, the metal film unit being adhesively attached to the peripheral side face and the back surface at the peripheral edge of the glass panel, the peripheral side face having a perimeter that is gradually enlarged
from the front surface to the back surface.

Concept 12. The method of concept 10, wherein the plastic frame is formed by injection molding the plastic material.
What is claimed is:

1. A display panel assembly comprising:
   - a glass panel having a peripheral edge;
   - an adhesive;
   - a metal film unit attached adhesively to said peripheral edge of said glass panel through said adhesive; and
   - a plastic frame disposed along said peripheral edge of said glass panel and molded over said metal film unit and said peripheral edge of said glass panel.

2. The display panel assembly of claim 1, wherein said glass panel further has front and back surfaces and a peripheral side face extending from said front surface to said back surface, said metal film unit being adhesively attached to said peripheral side face and said back surface at said peripheral edge of said glass panel.

3. The display panel assembly of claim 2, wherein said peripheral side face has a perimeter that is gradually enlarged from said front surface to said back surface.

4. The display panel assembly of claim 3, wherein said front and back surfaces are parallel to each other, said peripheral side face and said back surface cooperatively forming an acute angle.

5. The display panel assembly of claim 4, wherein said acute angle ranges from 30 to 75 degrees.

6. The display panel assembly of claim 1, wherein said
metal film unit includes a single piece of a loop-shaped metal film strip surrounding said peripheral edge of said glass panel.

7. The display panel assembly of claim 1, wherein said metal film unit includes a plurality of straight metal film strips displaced from each other and disposed around said peripheral edge of said glass panel.

8. The display panel assembly of claim 1, wherein said plastic frame is made from polycarbonate.

9. The display panel assembly of claim 1, wherein said glass panel has a thickness greater than 0.6mm and less than 1mm.

10. A method for making a display panel assembly, comprising:

attaching adhesively a metal film unit to a peripheral edge of a glass panel through an adhesive; and

forming a plastic frame by molding a plastic material over the peripheral edge of the glass panel and the metal film unit.

11. The method of claim 10, wherein the glass panel has front and back surfaces and a peripheral side face extending from the front surface to the back surface, the metal film unit being adhesively attached to the peripheral side face and the back surface at the peripheral edge of the glass panel, the peripheral side face having a perimeter that is gradually enlarged
from the front surface to the back surface.

12. The method of claim 10, wherein the plastic frame is formed by injection molding the plastic material.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B32B 3/06 (2012.01)
USPC - 264/274
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - B29C 45/14; B32B 3/06, 17/00 (2012.01)
USPC - 40/701, 706; 264/283, 274; 349/58; 428/1.1, 14, 45, 203

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of data base and, where practicable, search terms used)
PatBase, Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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Further documents are listed in the continuation of Box C.

Date of the actual completion of the international search: 01 March 2012

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