Title: METHOD OF CUTTING LARGE TFT-LCD PANEL AND LIQUID CRYSTAL DISPLAY DEVICE USING THE SAME

Abstract: The present invention relates to a cutting method of a large size TFT-LCD panel and a liquid crystal display unit to enhance a simplicity of process facility and a speediness through solving a problem of an increase of facilities due to fabrication of TFT-LCD panels of respective sizes and reducing a subsequently increased cost by enabling a mass production of a various size of TFT-LCD panels in one manufacturing line through using a TFT-LCD panel cut in a desired size that is manufactured in large size, thereby devising a simplicity in process and a profitability through solving a spatial enlargement and other costs increase due to an increase of facilities, having an advantage of possibly producing a various size of the TFT-LCD panel asked by a user purpose or a user taste in a simple and convenient way, and solving an abandonment and reduction of the facilities due to a change in consumption dependent on the TFT-LCD panel size.
Description

METHOD OF CUTTING LARGE TFT-LCD PANEL AND LIQUID CRYSTAL DISPLAY DEVICE USING THE SAME

Technical Field

[1] The present invention relates to a cutting method of a large size TFT-LCD panel and a liquid crystal display unit to enhance a simplicity of process facility and a speediness through solving a problem of an increase of facilities due to manufacturing TFT-LCD panels of respective sizes and reducing a subsequently increased cost by enabling a mass production of a various size of TFT-LCD panels in one manufacturing line through using a TFT-LCD panel cut in a desired size that is manufactured in large size.

Background Art

[2] Generally, it is well known that various flat panel display units replacing a cathode ray tube (CRT) which has been used so far are developed and being distributed as many interests are concentrated on a display unit of larger size and better quality as a medium for screen image information.

[3] It is also well known that a liquid crystal display unit, one of these flat panel display units, has developed in a level equal or better than CRT in screen color tone quality aspect.

[4] A manufacturing process of general liquid crystal display (LCD) panel included in the LCD unit is as follows.

[5] Most of all as an outline, one pixel (composed of R. G. B. three sub-pixels) in the thin film transistor (TFT) - LCD is approximately as fine as 0.3 mm wide.

[6] Of course, the TFT included in the pixel is smaller than the pixel. Moreover, in order to meet a resolution of 1600x1200, 1,920,000 pixels are required and 5,760,000 TFTs are necessary if the sub-pixels are considered. Therefore, an overall process is very precise and demands a level of semiconductor process.

[7] Meanwhile, a manufacturing process of TFT-LCD panel is mainly divided into a TFT process, a color filter (CF) process, a cell process and a module process. The cell process makes one panel with two glasses undergone the TFT process and the CF process. Then, the module process completes the manufacturing process by mounting the one TFT-LCD panel undergone the cell process in a real monitor or TV.

[8] First, the TFT process is the most basic core process for forming the most basic electrodes that provides an electrode for each cell. The process includes five process steps in order of forming a gate electrode, an insulating film, a semiconductor film, a data electrode, a protective film, and a pixel electrode that requires one or more pattern processes for each process step. Not only this pattern process that may be called a core
process in the processes of manufacturing the TFT-LCD panel is necessary in the TFT process but also a similar pattern process is necessary in the CF process.

Next, the CF process is composed of black matrix (BM) process (requires pattern processes of vapor deposition, cleaning, PR process, exposure, development, etching, and stripping), each pixel process and Indium Tin Oxide (ITO) process (Indium Tin Oxide is an excellent transparent electrode material of good light transmittance, electrical conductivity, chemical and thermal stability).

After forming a liquid crystal layer between a TFT substrate and a CF substrate in the TFT-LCD panel formed as hereinabove, the TFT-LCD panel is completed by providing a polarized plate on a surface of the TFT substrate and the CF substrate.

The TFT-LCD panel of size demanded by a user may be produced in a large amount but the other TFT-LCD panel of less demand may be produced in only a limited amount since various sizes of the TFT-LCD panels completed as hereinabove require a difference in production line and in each process of the production line dependent on the sizes of the TFT-LCD panels.

Disclosure of Invention

Technical Problem

Accordingly, if produced in a small amount as hereinabove, there are many problems in productivity and profitability which result in waste and abandonment of the facilities. The present invention is provided to overcome an inconvenience and a limit in mass production by a production dependent on the respective sizes.

Technical Solution

The cutting method of a large size TFT-LCD panel of the present invention, provided to solve the hereinabove problems, has an object of enhancing a simplicity of process facility and speediness through solving a problem of an increase of facilities due to manufacturing TFT-LCD panels of different sizes and reducing a subsequently increased cost by enabling a mass production of a various size of TFT-LCD panels in one manufacturing line through using a TFT-LCD panel cut in a desired size that is manufactured in large size.

Advantageous Effects

The cutting method of a large size TFT-LCD panel formed as hereinabove can devise a simplicity in process and a profitability through solving a spatial enlargement and other costs increase due to an increase of facilities by equipping a facility's process dependent on a size according to a production of TFT-LCD panels in various sizes, having an advantage of possibly producing a various size of the TFT-LCD panel asked by a user purpose or a user taste in a simple and convenient way, and solving an abandonment and reduction of the facilities due to a change in consumption dependent
on the TFT-LCD panel size.

Brief Description of the Drawings

[15] FIG. 1 is a flowchart of a cutting method of a large size TFT-LCD panel of the present invention.

[16] FIG. 2 is a flowchart of a cutting method of a large size TFT-LCD panel according to other exemplary embodiment of the present invention.

[17] FIG. 3 illustrates a course of stripping a polarized plate in the cutting method of a large size TFT-LCD panel of the present invention.

[18] FIG. 4 illustrates a state of a scribe line set into a mid-depth of a color filter substrate and a thin film transistor substrate by diamond wheel in the cutting method of a large size TFT-LCD panel of the present invention.

[19] FIG. 5 illustrates a cut state after undergoing a tempering step in the cutting method of a large size TFT-LCD panel of the present invention.

[20] FIG. 6 illustrates a state completed after processing sealing a cut portion in the cutting method of a large size TFT-LCD panel of the present invention.

[21] FIG. 7 is a cross sectional view illustrating a state of a light blocking tape attached on a surface above the cut portion of the color filter substrate and the thin film transistor substrate.

[22] FIG. 8 is a cross sectional view different from FIG. 7 illustrating a state of a light blocking tape attached on outer surfaces of the polarized plate bonded above the color filter substrate and the polarized plate bonded below the thin film transistor substrate at the respective cut portions.

[23] FIG. 9 is a cross sectional view illustrating other exemplary embodiment.

[24] FIG. 10 is a brief exploded perspective view of a liquid crystal display unit.

[25] FIG. 11 is a brief cross sectional view of FIG. 10.

Best Mode for Carrying Out the Invention

[26] Specific solutions to accomplish the object are:

[27] In a completed large size TFT-LCD panel formed in a sequentially coupled configuration of a polarized plate, a color filter (CF) substrate, a liquid crystal layer, a thin film transistor (TFT) substrate and a polarized plate below the TFT substrate, a polarized plate stripping step that removes a portion of a predetermined width to be cut from the each polarized plate provided on a surface and an opposite surface of the large size TFT-LCD panel, a cutting location setting step that sets a portion not damaging a gate line and a data line of the TFT substrate through investigating a portion stripped in the polarized plate stripping step by microscope, a scribe line setting step that sets a first scribe line cutting the CF substrate into its mid-depth along the portion set in the cutting location setting step using a diamond wheel, a turning
over step that turns over the large size TFT-LCD panel to a side opposite from a side
where a portion of the first scribe line is set after chucking one end of the large size
TFT-LCD panel, a scribe line setting step that sets a second scribe line cutting the TFT
substrate into its mid-depth in the stripped polarized plate portion along the portion set
in the cutting location setting step which precisely corresponds with the set first scribe
line using a diamond wheel after turning over the large size TFT-LCD panel, a
tempering step that tempers for 30 minutes to form a natural crack in the scribe lines
formed on the CF substrate and the TFT substrate of the large size TFT-LCD panel, a
cutting step that cuts the CF substrate and the TFT substrate naturally cracked after the
30 minutes tempering step, and a sealing process step that sealing a cut portion formed
in the cutting step, and

[28] In a completed large size TFT-LCD panel formed in a sequentially coupled con-
figuration of a polarized plate, a color filter (CF) substrate, a liquid crystal layer, a thin
film transistor (TFT) substrate and a polarized plate, a cutting location setting step that
sets a portion to be cut, a scribe line setting step that sets a first scribe line cutting the
CF substrate into its mid-depth along the portion set in the cutting location setting step
using a diamond wheel, a turning over step that turns over the large size TFT-LCD
panel to a side opposite from a side where a portion of the first scribe line is set after
chucking one end of the large size TFT-LCD panel, a scribe line setting step that sets a
second scribe line cutting the TFT substrate into its mid-depth along the portion set in
the cutting line setting step which precisely corresponds with the set first scribe line,
using a diamond wheel after turning over the large size TFT-LCD panel, a tempering
step that tempers for 30 minutes to form a natural crack in the scribe lines formed on
the CF substrate and the TFT substrate of the large size TFT-LCD panel, a cutting step
that cuts the CF substrate and the TFT substrate naturally cracked after the 30 minutes
tempering step, and a sealing process step that sealing a cut portion formed in the
cutting step may accomplish the present invention object.

[29] Further, the present invention comprises a scribe line setting step that sets scribe lines
simultaneously cutting the CF substrate and the TFT substrate into their mid-depths
along the portions set in the cutting location setting step using a diamond wheel.

[30] The cutting method of a large size TFT-LCD panel further comprises a blocking off a
light illuminated from a backlight through attaching a light blocking tape along a cut
portion selected between the CF substrate and the TFT substrate or the both substrates
or between the polarized plates located above the CF substrate and below the TFT
substrate or the both polarized plates.

[31] Further, the present invention comprising the cutting performed by using any one
among a diamond needle, laser, and a diamond wheel in the first and second scribe line
setting step or in the simultaneous scribe line setting step may accomplish the
hereinabove object.

Mode for the Invention

[32] Hereinafter, a cutting method of a large size TFT-LCD panel is described in detail referring to the drawings.

[33] (1st Exemplary Embodiment)

[34] [Polarized Plate Stripping Step]

[35] The present step is a first step of the present invention. A completed large size TFT-LCD panel 100 is formed in structure sequentially coupled of, a polarized plate 10, a color filter (CF) substrate 11, a liquid crystal layer 12, a thin film transistor (TFT) substrate 13 and a polarized plate 14.

[36] In order to cut the large size TFT-LCD panel 100 completed as hereinabove, a polarized plate stripping step is initially performed that removes a portion of a predetermined width to be cut from the each polarized plate 10 provided on a surface above the CF substrate 11 and an opposite surface below the TFT substrate 13.

[37] [Cutting Location Setting Step]

[38] The TFT substrate 13 is exposed if the polarized plates 10 and 14 around the cutting portion are removed by its lengthwise direction. Since gate lines transferring a scanning signal and data line transferring a screen image signal are configured by innumerably crossing with each other and difficult to perceive by naked eyes, a cutting location setting step sets a portion not damaging the gate line and the data line of the TFT substrate through investigating a portion stripped on the polarized plate stripping step by microscope.

[39] [1st Scribe Line Setting Step]

[40] 1st scribe line setting step refers to a step of cutting the CF substrate 11 into its mid-depth along the portion set in the cutting location setting step using a diamond wheel. This step is very difficult and requires a skill of high precision determined by an experience of a technician.

[41] Preferably, the cutting may be performed by using a diamond needle, laser besides the diamond wheel.

[42] [TFT-LCD Turning Over Step]

[43] To process a side opposite from a side where a portion of the first scribe line is set, the present step turns over the large size TFT-LCD panel 100 after chucking one end of the large size TFT-LCD panel 100.

[44] [2nd Scribe Line Setting Step]

[45] The present step sets a 2nd scribe line setting step cutting the TFT substrate 13 into its mid-depth in the portion of the stripped polarized plate 14 bonded with the TFT substrate 13 below along the portion set in the cutting location setting step which
precisely corresponds with the set first scribe line, using a diamond wheel after turning
over the large size TFT-LCD panel 100. This step is also difficult and requires a skill
of high precision to correspond with the set first scribe line.

Preferably, the cutting may be performed by using a diamond needle, laser besides
the diamond wheel.

[Tempering Step]

A natural crack is made if tempered for 30 minutes to form a natural crack in the
scribe lines formed on the CF substrate 11 and the TFT substrate 13 of the large size
TFT-LCD panel 100. Then, the air flows into a liquid crystal layer 12. If there is the air
flow into the liquid crystal layer 12, the liquid crystal layer 12 is temporarily restricted
from flowing out by the flowed in air.

[Cutting Step]

After the 30 minutes tempering step, the CF substrate 11 and the TFT substrate 13
are naturally cracked along the first scribe line and the second scribe line and the
present step externally applies a certain amount of force in order to cut the large size
TFT-LCD panel 100 along the scribe lines.

[Sealing Process Step]

The present step is the last step that applies a sealant 30 on a cut portion in the large
size TFT-LCD panel 100 and the present invention is completed by applying the
sealant 30.

Through undergoing the process hereinafter, the large size TFT-LCD panel 100 is
possible to be cut into a plural or multiple numbers without a many numbers of
equipment and to meet a desired size of a demander or an operator.

(2nd Exemplary Embodiment)

Meanwhile, different from the first exemplary embodiment, process steps of the
present invention may proceed without the polarized stripping step.

That is, in a large size TFT-LCD panel 100 completed of forming sequentially
coupled, a polarized plate 10, a color filter (CF) substrate 11, a liquid crystal layer 12,
a thin film transistor (TFT) substrate 13 and a polarized plate 14 below the TFT
substrate 13, a cutting location setting step that sets a portion to be cut, a scribe line
setting step that sets a first scribe line cutting the CF substrate 11 into its mid-depth
along the portion set in the cutting location setting step using a diamond wheel, a
turning over step that turns over the large size TFT-LCD panel 100 to a side opposite
from a side where a portion of the first scribe line is set after chucking one end of the
large size TFT-LCD panel 100, a scribe line setting step that sets a second scribe line
cutting the TFT substrate 13 into its mid-depth along the portion set in the cutting
location setting step corresponds with the set first scribe line, using a diamond wheel
after turning over the large size TFT-LCD panel 100, a tempering step that tempers for
30 minutes to form a natural crack in the scribe lines formed on the CF substrate 11 and the TFT substrate 13 of the large size TFT-LCD panel 100, a cutting step that cuts the CF substrate 11 and the TFT 13 substrate naturally cracked after the 30 minutes tempering step, and a sealing process step that sealing a cut portion formed in the cutting step may configure the present invention.

(3rd Exemplary Embodiment)

Meanwhile, different from the above exemplary embodiments, the first and the second scribe lines setting steps which sequentially proceed in the respective first and second exemplary embodiments may be singly unified to realize the present invention.

For example, after undergoing the sequentially processed cutting location setting steps of the first or the second exemplary embodiments through the polarized plate stripping step that removes a corresponding portion of a predetermined width to be cut from the polarized plates 10 and 14 provided on a surface of the CF substrate 11 and an opposite surface of the TFT substrate 13 like the first exemplary embodiment or without the polarized plate stripping step like the second exemplary embodiment, a scribe line setting step sets scribe lines simultaneously cutting the CF substrate 11 and the TFT substrate 13 into their mid-depths along the portion set in the cutting location setting step using a diamond wheel.

Simultaneous application of the scribe line setting job on the CF substrate 11 and the TFT substrate 13 by applying the same scribe line depth and the like enables not only an abridgement of the operation process but also a precise setting job.

The present exemplary embodiment may or may not include the polarized plate stripping step like the first or second exemplary embodiment, and the subsequent steps may proceed in the same sequence as tempering step for the natural crack, cutting step cutting the CF substrate 11 and the TFT substrate 13 and sealing process step.

Meanwhile, when a light from the back light unit through the TFT-LCD panel 100 processed by the respective exemplary embodiments is illuminated to display a corresponding image, the image may be displayed with an image quality relatively unclear at a portion corresponding to the cutting portion.

Considering this, a light blocking tape 20 may be provided to accomplish the object of the present invention by covering a certain region including the cutting portion against the light illuminated from the back light unit and realizing a clear screen quality at the display region corresponding to the cutting portion.

Here, the light blocking tape 20 may be attached in a range covering any cut portions of the CF substrate 11 and the TFT substrate 13 or the both substrates 11 and 13 as shown in FIG. 7.

Further, as shown in FIG. 8 different from the above covering range, an additional process, that is attaching the light blocking tape 20 at a periphery of the polarized plate.
bonded above with the CF substrate 11 or at a periphery of the polarized plate 14 bonded below with the TFT substrate 14 which are removed with the set cutting portion, may maximize a clearness of the screen quality when the light from the back light unit is illuminated on the cut portion of the TFT-LCD panel 100 completed by cutting into a desirable size.

Here, a width of the light blocking tape 20 between 2-60 mm is most preferable.

Meanwhile, as shown in FIG. 9 of other exemplary embodiment, a transparent tape is used to cover an outer peripheral edge of the CF substrate 11 and the TFT substrate 13 after sealing the outer peripheral edge with an ultraviolet sealant 31 while the CF substrate 11 and the TFT substrate 13 are in bonded state.

Further, though not shown in the drawings, the peripheries of the CF substrate 11 and the TFT substrate 13 may be covered by tape-processing or may be fixed by clipping and the like.

The present invention may be realized by variously selecting these examples according to a work condition and a product.

Further, FIG. 10 and FIG. 11 illustrate an application of the TFT-LCD panel according to the cutting method provided by the present invention. FIG. 10 is a brief exploded perspective view of a liquid crystal display unit. FIG. 11 is a brief cross sectional view of FIG. 10.

As shown in FIG. 10 and FIG. 11, the cut processed TFT-LCD panel 100 equipped with the backlight unit (not shown in drawing) below undergoes a series of course coupling a top sash 2 corresponding to an upper frame with an accommodating frame 3 accommodating the TFT-LCD panel 100 and the backlight unit to be used for the liquid crystal display unit.

Here, when the TFT-LCD panel 100 cut processed in a desired size according to the present invention is received in the top sash 2 and the accommodating frame 3, a realization of a clear screen may be difficult since a slight difference may be produced, not accurately fixing the TFT-LCD panel 100, and producing a flowing phenomena because of the internal difference.


Accordingly, in order to prevent the flowing phenomena, that is the flowing phenomena of the received TFT-LCD panel 100, attaching a plurality of both-faces tape 4 at the outer peripheral edge on the top sash 2 surface and attaching a plurality of both-faces tape 4 at the outer peripheral edge on the accommodating frame 3 surface as well is preferable to completely prevent the flowing phenomena.

Herein so far, though the present invention is described by illustrating preferable embodiments as examples, the present invention is not restricted to the exemplary embodiment hereinabove but may be variously modified and changed by persons.
skilled in the arts corresponding to the technical field of the present invention without deviating from the spirit of the present invention.

Industrial Applicability

[76] Therefore, since a large size TFT-LCD panel may be miniaturized for an application to various video games, monitors or cell phone liquid crystal displays through cut processing the large size TFT-LCD panel without a separate manufacturing line for manufacturing process according to present invention, an industrial applicability expecting an effective reduction of manufacturing facility and its value may be recognized.

[77]
Claims

A cutting method of a large size TFT-LCD panel, wherein the TFT-LCD panel is completed through sequentially coupling, a polarized plate, a color filter (CF) substrate, a liquid crystal layer, a thin film transistor (TFT) substrate and a polarized plate below the TFT substrate, comprising:

1. A polarized plate stripping step that removes a portion of a predetermined width to be cut from the each polarized plate provided on a surface and an opposite surface of the large size TFT-LCD panel,
2. A cutting location setting step that sets a portion not damaging a gate line and a data line of the TFT substrate through investigating a portion stripped in the polarized plate stripping step by microscope,
3. A scribe line setting step that sets a first scribe line cutting the CF substrate into its mid-depth along the portion set in the cutting location setting step using a diamond wheel,
4. A turning over step that turns over the large size TFT-LCD panel to a side opposite from a side where a portion of the first scribe line is set after chucking one end of the large size TFT-LCD panel,
5. A scribe line setting step that sets a second scribe line cutting the TFT substrate into its mid-depth in the stripped polarized plate portion along the portion set in the cutting location setting step which precisely corresponds with the set first scribe line using a diamond wheel after turning over the large size TFT-LCD panel,
6. A tempering step that tempers to form a natural crack in the scribe lines formed on the CF substrate and the TFT substrate of the large size TFT-LCD panel,
7. A cutting step that cuts the CF substrate and the TFT substrate naturally cracked after the tempering step, and
8. A sealing process step that applies a sealant formed on a cut portion in the cutting step.

A cutting method of a large size TFT-LCD panel, wherein the TFT-LCD panel is completed through sequentially coupling, a polarized plate, a color filter (CF) substrate, a liquid crystal layer, a thin film transistor (TFT) substrate and a polarized plate, comprising:

1. A cutting location setting step that sets a portion to be cut,
2. A scribe line setting step that sets a first scribe line cutting the CF substrate into its mid-depth along the portion set in the cutting location setting step using a diamond wheel,
3. A turning over step that turns over the large size TFT-LCD panel to a side
opposite from a side where a portion of the first scribe line is set after chucking one end of the large size TFT-LCD panel, a scribe line setting step that sets a second scribe line cutting the TFT substrate into its mid-depth along the portion set in the cutting location setting step which precisely corresponds with the set first scribe line, using a diamond wheel after turning over the large size TFT-LCD panel, a tempering step that tempers to form a natural crack in the scribe lines formed on the CF substrate and the TFT substrate of the large size TFT-LCD panel, a cutting step that cuts the CF substrate and the TFT substrate naturally cracked after the tempering step, and a sealing process step that applies a sealant on a cut portion formed in the cutting step.

A cutting method of a large size TFT-LCD panel, wherein the TFT-LCD panel is completed through sequentially coupling, a polarized plate, a color filter (CF) substrate, a liquid crystal layer, a thin film transistor (TFT) substrate and a polarized plate below the TFT substrate, comprising: a polarized plate stripping step that removes a portion of a predetermined width to be cut from the each polarized plate provided on a surface and an opposite surface of the large size TFT-LCD panel, a cutting location setting step that sets a portion not damaging a gate line and a data line of the TFT substrate through investigating a portion stripped in the polarized plate stripping step by microscope, a scribe line setting step that sets scribe lines simultaneously cutting the CF substrate and the TFT substrate into their mid-depths along the portion set in the cutting location setting step using a diamond wheel, a tempering step that tempers to form a natural crack in the scribe lines formed on the CF substrate and the TFT substrate of the large size TFT-LCD panel, a cutting step that cuts the CF substrate and the TFT substrate naturally cracked after the tempering step, and a sealing process step that applies a sealant on a cut portion formed in the cutting step.

A cutting method of a large TFT-LCD panel, wherein the TFT-LCD panel is completed through sequentially coupling, a polarized plate, a color filter (CF) substrate, a liquid crystal layer, a thin film transistor (TFT) substrate and a polarized plate, comprising: a cutting location setting step that sets a portion to be cut, a scribe line setting step that sets scribe lines simultaneously cutting the CF substrate and the TFT substrate into their mid-depths along the portion set in the
cutting location setting step using a diamond wheel,
a turning over step that turns over the large size TFT-LCD panel to a side
opposite from a side where a portion of the first scribe line is set after chucking
one end of the large size TFT-LCD panel,
a tempering step that tempers to form a natural crack in the scribe lines formed
on the CF substrate and the TFT substrate of the large size TFT-LCD panel,
a cutting step that cuts the CF substrate and the TFT substrate naturally cracked
after the tempering step, and
a sealing process step that applies a sealant on a cut portion formed in the cutting
step.

[5] The cutting method of a large size TFT-LCD panel according to any one of claim
1 through claim 4 wherein the tempering step is continued for 30 minutes to form
the natural crack.

[6] The cutting method of a large size TFT-LCD panel according to any one of claim
1 through claim 5 wherein the cutting in the each scribe line setting step is
performed by using any one among a diamond needle, laser, and a diamond
wheel.

[7] The cutting method of a large size TFT-LCD panel according to any one of claim
1 through claim 5 further comprising a blocking off a light illuminated from a
backlight through attaching a light blocking tape along a cut portion selected
between the CF substrate and the TFT substrate or the both substrates.

[8] The cutting method of a large size TFT-LCD panel according to any one of claim
1 through claim 5 further comprising a blocking off a light illuminated from a
backlight through attaching a light blocking tape along a cut portion selected
between the polarized plates located above the CF substrate and below the TFT
substrate or the both polarized plates.

[9] The cutting method of a large size TFT-LCD panel according to any one of claim
1 through claim 5 wherein a width of the light blocking tape is between 2-60
mm.

[10] The cutting method of a large size TFT-LCD panel according to any one of claim
1 through claim 4 wherein the sealing process step, a transparent tape is used to
cover an outer peripheral edge of the CF substrate and the TFT substrate after
sealing the outer peripheral edge with an ultraviolet sealant while the CF
substrate and the TFT substrate are in bonded state.

[11] A liquid crystal display unit that includes a top sash and an accommodating
frame accommodating a thin film transistor (TFT) - liquid crystal display (LCD)
panel, a backlight unit and the like, comprising:
the TFT-LCD panel cut-processed according to any one of claim 1 through claim
attached at the outer peripheral edges on the top sash surface above and the accommodating frame surface below through attaching a plurality of both-faces tapes at the outer peripheral edges on the top sash surface and the accommodating frame surface.
[Fig. 1]

- polarized plate stripping step
- cutting location setting step
- first scribe lines setting step
- TFT-LCD panel turning over step
- second scribe line setting step
- tempering step
- cutting step
- sealing process step

[Fig. 2]

- polarized plate stripping step
- cutting location setting step
- scribe lines setting step
- tempering step
- cutting step
- sealing process step
A. CLASSIFICATION OF SUBJECT MATTER

G02F 1/13(2006.01)1

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 B23K, B26D, G02F

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

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS(KIPO internal) & Keywords cutting, crack, scribing, substrate, and polarizing

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>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 2005-0056127 A1 (YAMABUCHI, KOJI et al ) 17 MARCH 2005 abstract, figures 1-3 and their corresponding descriptions</td>
<td>1-4, 10</td>
</tr>
<tr>
<td>A</td>
<td>US 2004-0169809 A1 (YAMABUCHI, KOJI et al ) 02 SEPTEMBER 2004 abstract, figures 3, 10 and their corresponding descriptions</td>
<td>1-4, 10</td>
</tr>
<tr>
<td>A</td>
<td>US 2006-001 1593 A1 (FUKUYO, FUMITSUGU et al ) 19 JANUARY 2004 abstract, figures 1-6 and their corresponding descriptions</td>
<td>1-4, 10</td>
</tr>
<tr>
<td>A</td>
<td>KR 10-2005-01 13918 A (LG PHILIPS LCD CO , LTD ) 05 DECEMBER 2005 abstract, figures 5-8 and their corresponding descriptions</td>
<td>1-4, 10</td>
</tr>
</tbody>
</table>

See patent family annex

Further documents are listed in the continuation of Box C

* Special categories of cited documents
  * "A" document defining the general state of the art which is not considered to be of particular relevance
  * "E" earlier application or patent but published on or after the international filing date
  * "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
  * "O" document referring to an oral disclosure, use, exhibition or other means
  * "P" document published prior to the international filing date but later than the priority date claimed
  * "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  * "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  * "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  * "&" document member of the same patent family

Date of the actual completion of the international search

10 OCTOBER 2007 (10 10 2007)

Date of mailing of the international search report

10 OCTOBER 2007 (10.10.2007)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea

Facsimile No 82-42-472-7140

Authorized officer

BAE, Kyung Hwan

Telephone No 82-42-481-5768
### Box No. II  Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. **Claims Nos**
   - Because they relate to subject matter not required to be searched by this Authority, namely

2. **Claims Nos**
   - Because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically

3. **Claims Nos 5-9, H**
   - Because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 64(a)

### Box No. III  Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. **As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.**
2. **As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.**
3. **As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.**
4. **No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims, it is covered by claims Nos.**

**Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2007)
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