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(54) **LIQUID CRYSTAL DISPLAY PANEL CUTTING SYSTEM AND METHOD AND LIQUID CRYSTAL DISPLAY DEVICE FABRICATING METHOD USING THE SAME**

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(57) **ABSTRACT**

A liquid crystal display panel cutting system for cutting a substrate by varying a driving condition of a cutting wheel according to characteristics the glass substrate. The system comprising a table on which the substrate is loaded, a cutting wheel for forming scribing lines at a surface of the substrate, and a controller for driving the cutting wheel by controlling a driving condition of the cutting wheel based upon the characteristics of the substrate.

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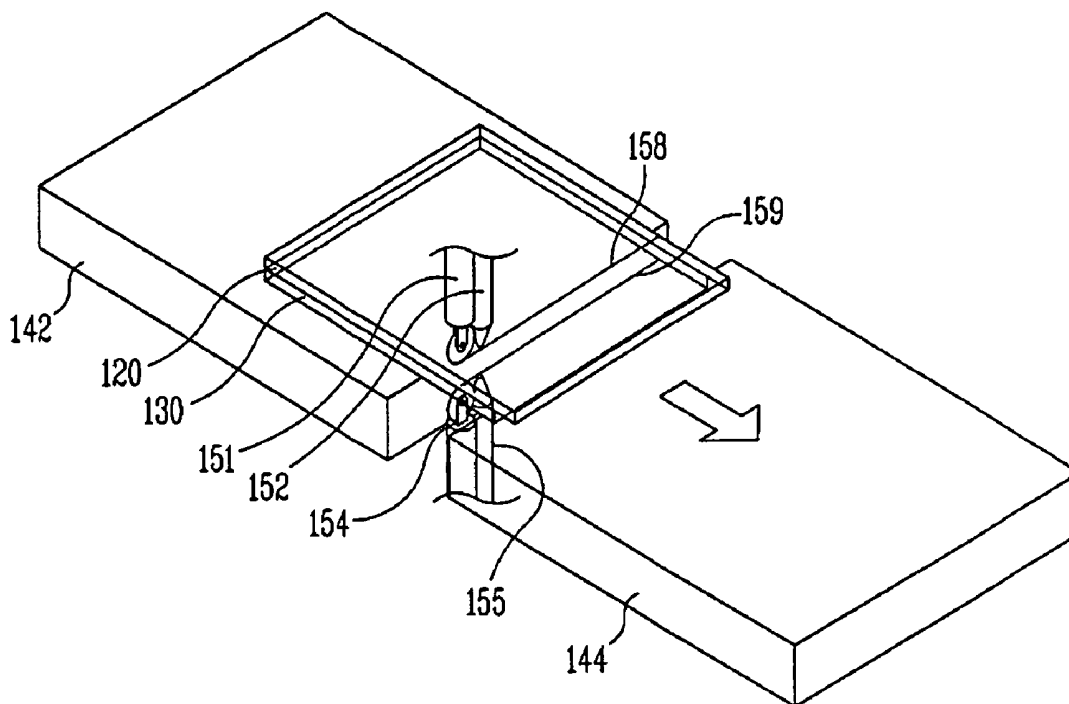


FIG. 1
RELATED ART

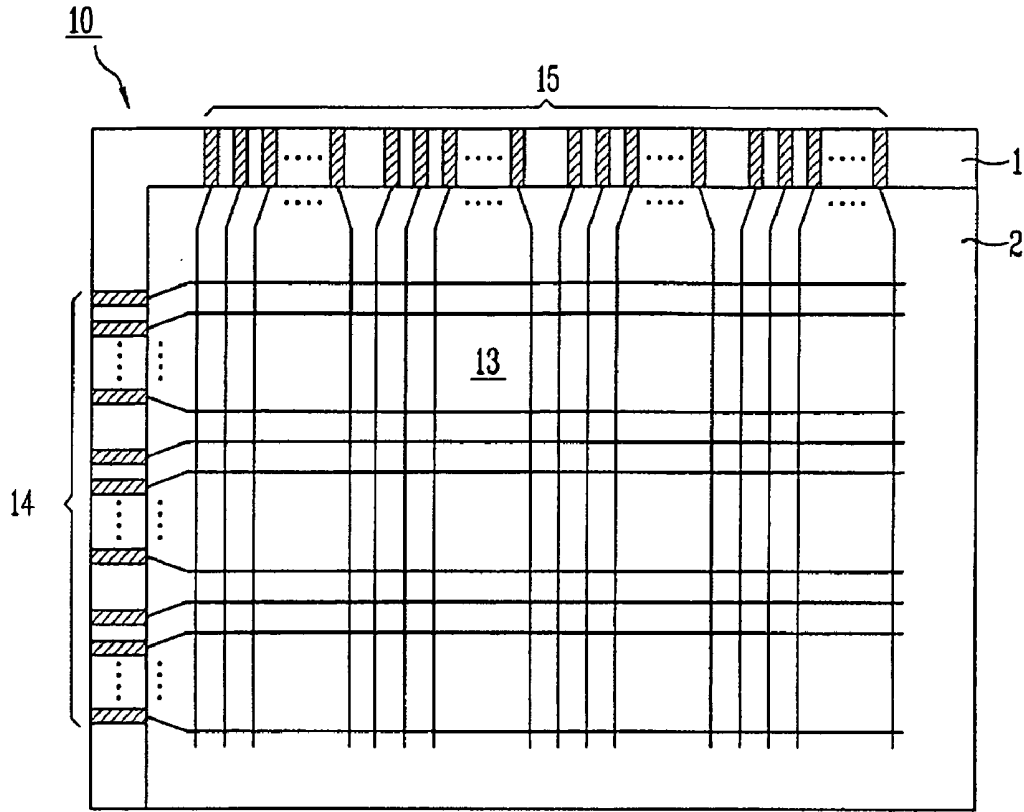


FIG. 2
RELATED ART

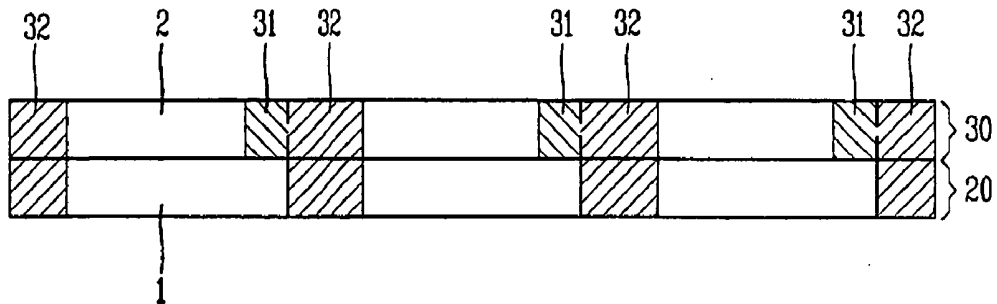


FIG. 3
RELATED ART

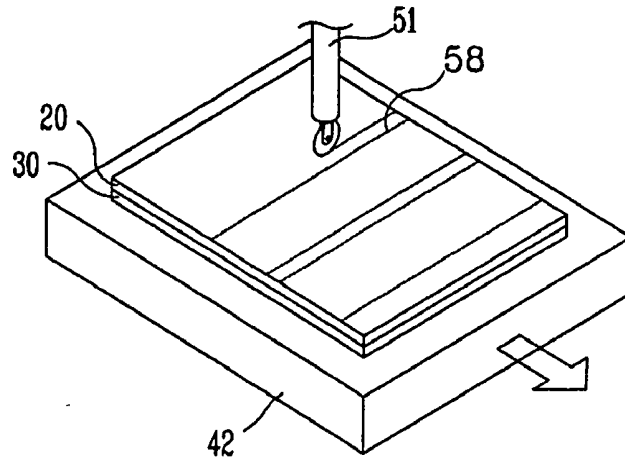


FIG. 4

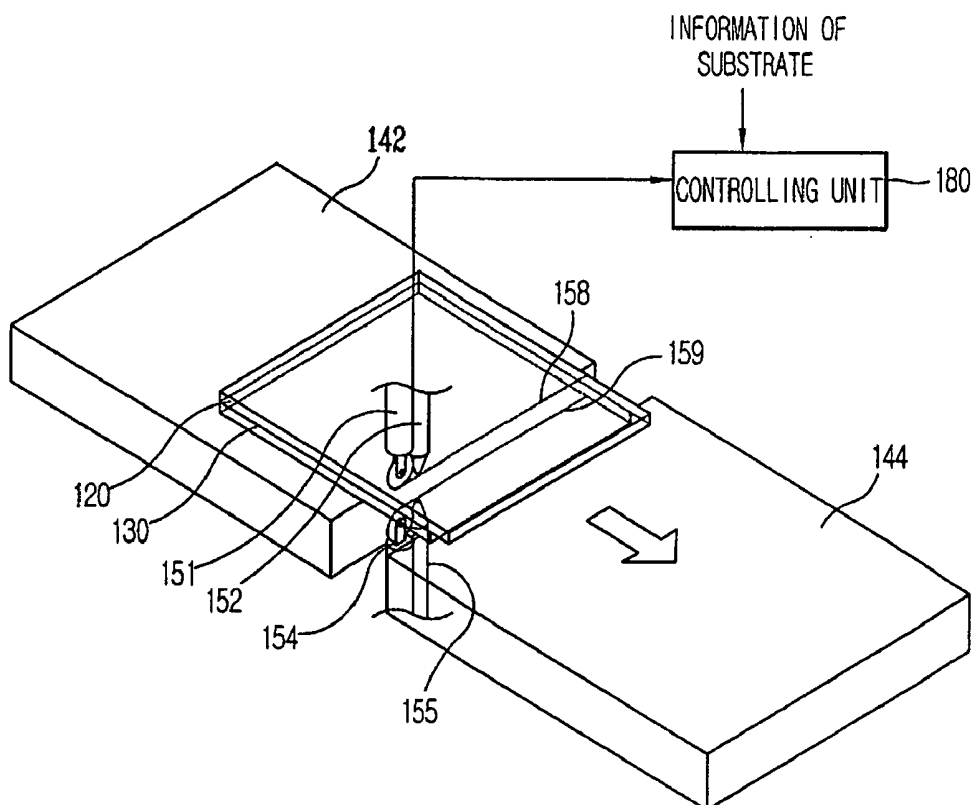


FIG. 5

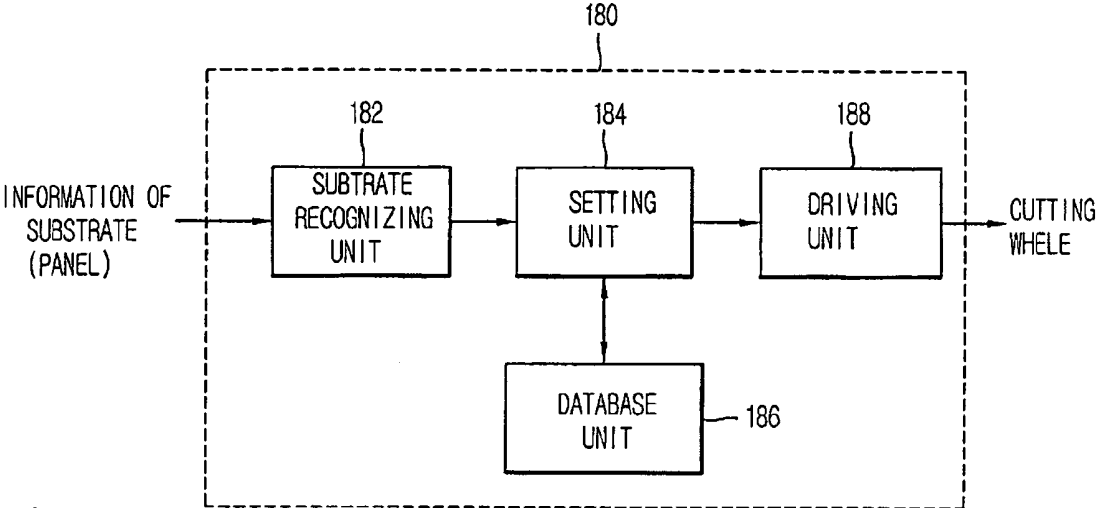


FIG. 6A

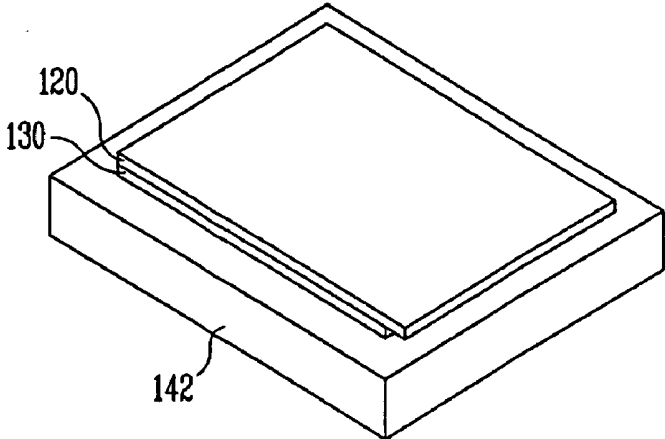


FIG. 6B

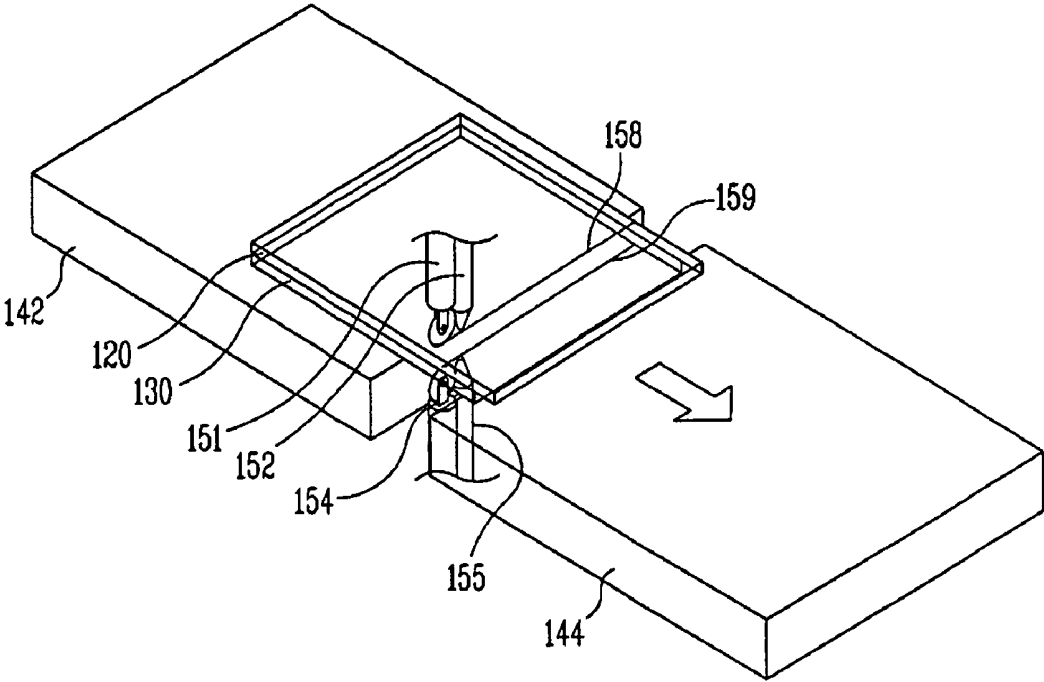


FIG. 6C

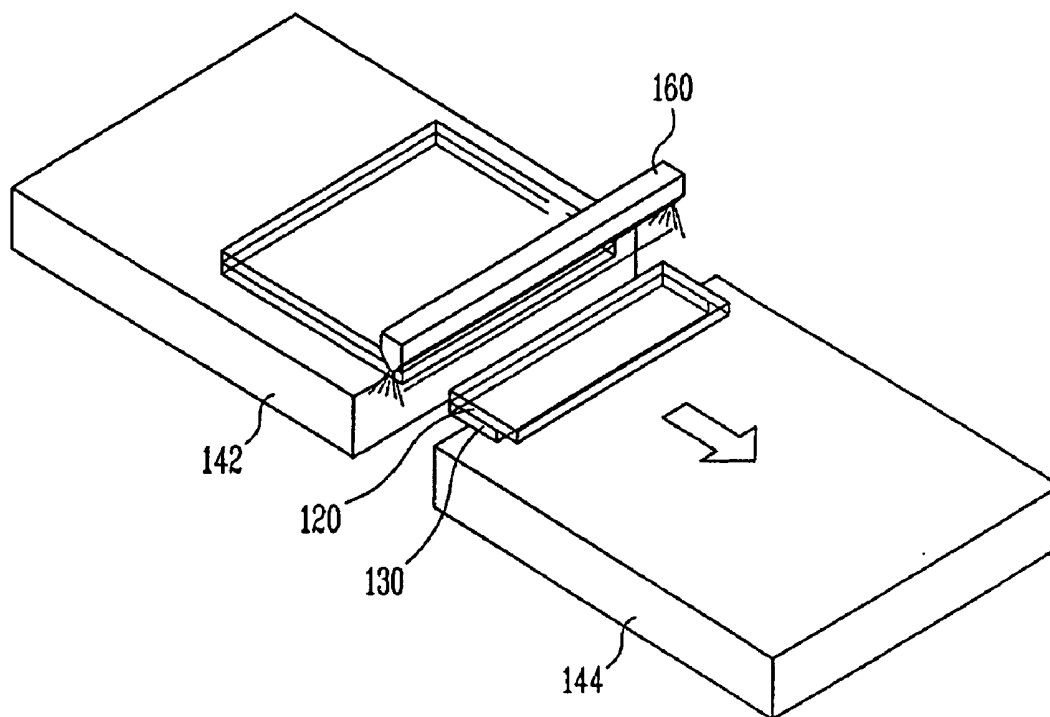


FIG. 6D

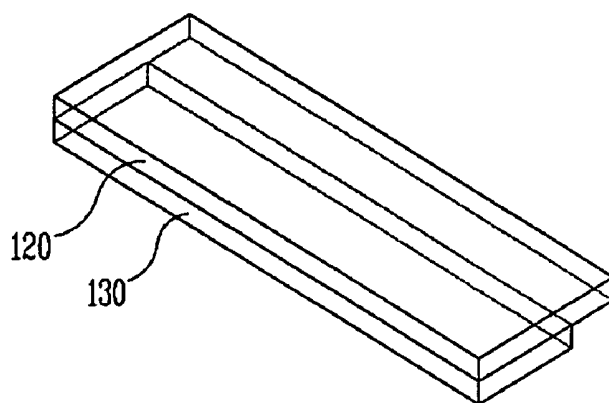


FIG. 6E

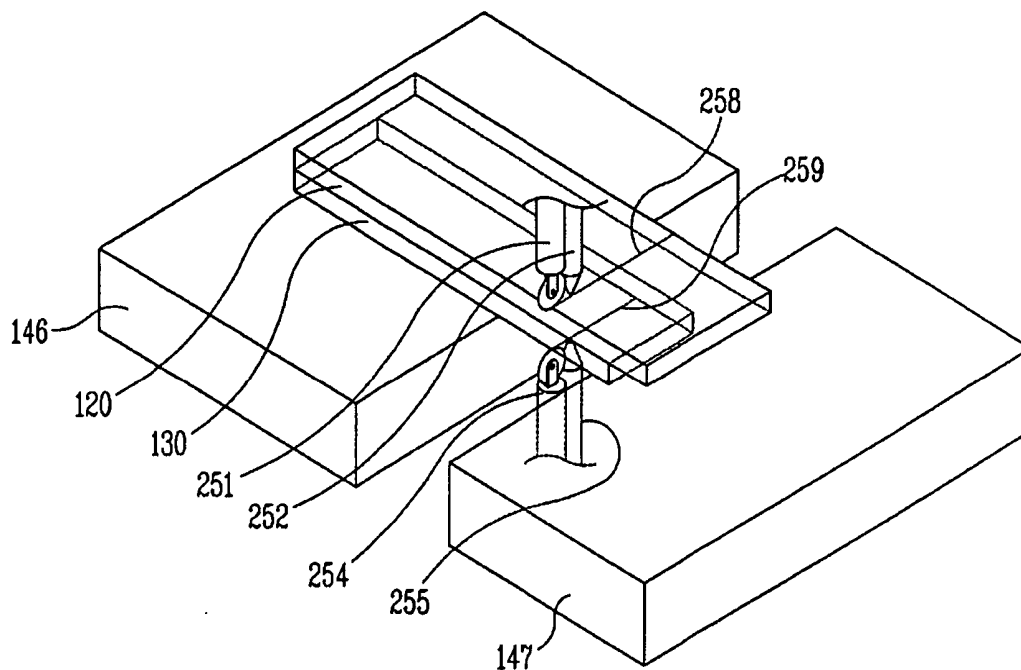
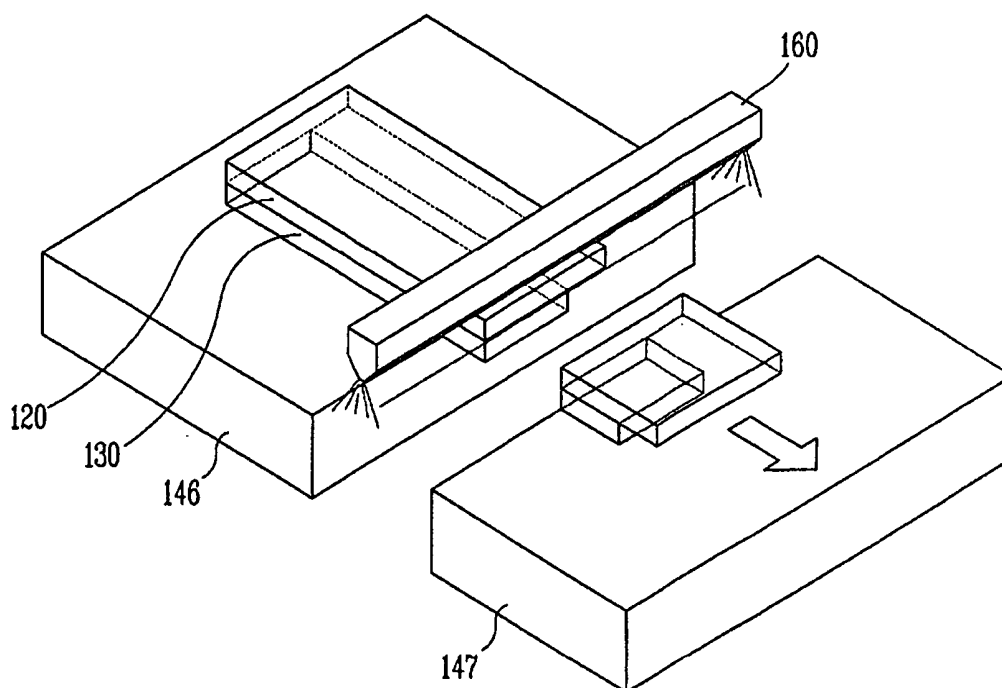


FIG. 6F



**LIQUID CRYSTAL DISPLAY PANEL CUTTING
SYSTEM AND METHOD AND LIQUID CRYSTAL
DISPLAY DEVICE FABRICATING METHOD
USING THE SAME**

[0001] This application claims the benefit of Korean Patent Application No. 2005-53203, filed on Jun. 20, 2005, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a liquid crystal display panel cutting system and a liquid crystal display device fabricating method, and particularly, to a liquid crystal display panel cutting system and a method thereof capable of preventing a cutting wheel from being damaged due to excessive cutting of a substrate by varying pressure and rotating speed of the cutting wheel which cuts substrates according to types of substrates to be cut.

[0004] 2. Discussion of the Related Art

[0005] Generally, a liquid crystal display device provides liquid crystal cells arranged in a matrix form with corresponding data signals according to image information to display a desired image by controlling light-transmittance of each liquid crystal cell.

[0006] Accordingly, the liquid crystal display device is provided with a liquid crystal display panel in which liquid crystal cells are arranged in a matrix form; and a driver integrated circuit (IC) for driving the liquid crystal cells of the liquid crystal display panel.

[0007] The liquid crystal display panel is composed of a color filter substrate and a thin film transistor array substrate facing to each other; and a liquid crystal layer formed therebetween.

[0008] On the thin film transistor array substrate of the liquid crystal display panel, a plurality of data lines that transmit data signals supplied from a data driver integrated circuit to the liquid crystal cells are perpendicular to a plurality of gate lines that transmit scan signals supplied from a gate driver integrated circuit to the liquid crystal cells. Herein, the liquid crystal cells are arranged at crossings of the data lines and the gate lines.

[0009] The gate driver integrated circuit supplies the scan signals to the plurality of gate lines sequentially so that the liquid crystal cells arranged in a matrix form can be sequentially selected line by line. Also, the data signals are supplied to the liquid crystal cells of the selected line from the data driver integrated circuit through a plurality of data lines.

[0010] A common electrode and a pixel electrode are respectively formed at the inner sides of the color filter substrate and the thin film transistor array substrate facing to each other, thereby applying an electric field to the liquid crystal layer. The pixel electrode is formed to correspond to each liquid crystal cell formed on the thin film transistor array substrate. And, the common electrode is integrally formed on an entire surface of the color filter substrate. Accordingly, light-transmittance of the liquid crystal cells can be separately controlled by controlling a voltage applied to the pixel electrode under a state that a voltage is applied to the common electrode.

[0011] Like this, a thin film transistor used as a switching device is formed at the respective liquid crystal cells to control the voltage applied to the pixel electrode formed on each liquid crystal cell.

[0012] The plurality of thin film transistor array substrates are formed on a large mother substrate and the plurality of color filter substrates are formed on another mother substrate. Then, the two mother substrates are bonded, so that a plurality of liquid crystal display panels are formed at the same time to improve yield. Herein, a process for cutting the bonded substrates into unit liquid crystal display panels is required.

[0013] Generally, the cutting process of the unit liquid crystal display panels includes forming a scribing line at a surface of the mother substrate using a diamond wheel having a hardness greater than that of glass, and breaking the substrate by applying a mechanical force thereto. Hereinafter, a general liquid crystal display panel will be explained with reference to the attached drawings.

[0014] **FIG. 1** is an exemplary view showing a schematic planar structure of a unit liquid crystal display panel prepared by bonding a thin film transistor array substrate and a color filter substrate of the liquid crystal display device to each other.

[0015] In **FIG. 1**, a liquid crystal display panel **10** comprises: an image display unit **13** having liquid crystal cells arranged in a matrix form; a gate pad unit **14** connected to gate lines of the image display unit **13**; and a data pad unit **15** connected to data lines. At this time, the gate pad unit **14** and the data pad unit **15** are formed on edge areas of a thin film transistor array substrate **1** which does not overlap a color filter substrate **2**. The gate pad unit **14** provides the gate lines of the image display unit **13** with a corresponding scan signal supplied from a gate driver integrated circuit, and the data pad unit **15** provides the data lines with image information supplied from a data driver integrated circuit.

[0016] On the thin film transistor array substrate **1** of the image display unit **13**, the data lines having the image information applied thereto are arranged to perpendicularly cross the gate lines having the scan signals applied thereto. Then, thin film transistors are formed at each crossing to switch liquid crystal cells. Pixel electrodes are connected to the thin film transistors to drive the liquid crystal cells. A passivation layer is formed on the entire surface to protect the electrodes and the thin film transistors.

[0017] Also, color filters separated by a black matrix for each cell area are formed on the color filter substrate **2** of the pixel display unit **13**. A transparent common electrode is formed on the thin film transistor array substrate **1**.

[0018] A cell gap is provided between the thin film transistor array substrate **1** and the color filter substrate **2**. The thin film transistor array substrate and color filter substrates are bonded to each other by a sealant (sealing unit) (not shown) formed at the peripheral regions of the image display unit **13**, so as to be spaced apart from each other. A liquid crystal layer (not shown) is formed in the space between the thin film transistor array substrate **1** and the color filter substrate **2**.

[0019] **FIG. 2** is an exemplary view showing a cross-sectional structure of a first mother substrate having thin film

transistor array substrate **1** and a second mother substrate having color filter substrates **2**, wherein the first and second mother substrates are bonded to each other to form a plurality of liquid crystal display panels.

[0020] Referring to **FIG. 2**, each unit liquid crystal display panel has a thin film transistor array substrate **1** longer than the color filter substrate **2**. This is because the gate pad unit **14** and the data pad unit **15** are formed, as illustrated in **FIG. 1**, at the edges of the thin film transistor array substrate **1**, which does not overlap the color filter substrate **2**.

[0021] Hence, the second mother substrate **30** and the color filter substrates **2** formed thereon are spaced apart from each other by a dummy region **31** corresponding to the protruding area of each thin film transistor array substrate **1** on the first mother substrate **20**.

[0022] Moreover, the unit liquid crystal display panels are arranged so as to maximize the use of the first and second mother substrates **20** and **30**. Although it depends on models, the unit liquid crystal display panel is generally spaced apart from each other at a distance corresponding to the area of the other dummy region **32**.

[0023] After the first mother substrate **20** having the thin film transistor array substrates **1** is bonded to the second mother substrate **30** having the color filter substrates **2**, a scribing process and a breaking process are carried out to individually cut the liquid crystal display panels.

[0024] The cutting process of the unit liquid crystal display panels will now briefly be explained.

[0025] **FIG. 3** is a view illustrating an exemplary structure of a related art cutting apparatus used in the breaking process.

[0026] In **FIG. 3**, a related art apparatus for cutting a liquid crystal display panel may include a table **42**, first and second mother substrates **20** and **30** loaded on the table **42** after completing the previous processes, and a cutting wheel **51** for processing the first and second mother substrates **20** and **30** and thus forming scribing lines thereon.

[0027] In the related art apparatus for cutting the liquid crystal display panel, when the first and second mother substrates **20** and **30**, including a plurality of liquid crystal display panels, the first and second mother substrates **20** and **30** facing and being bonded to each other, are loaded on the table **42**, the cutting wheel **51** positioned over the first and second mother substrates **20** and **30** moves in a downward direction, and then rotates under a particular applied pressure to the second mother substrate **30**, to thus form a groove-shaped scribing line on the surface of the second mother substrate **30**.

[0028] The scribing lines are also formed on the first mother substrate **20**. That is, the cutting wheel **51** is used to process the first mother substrate **20** to form the scribing lines at the same positions as the scribing lines **58** on the second mother substrate **30**. Accordingly, in the related art apparatus for cutting the liquid crystal display panel, the first and second mother substrates **20** and **30** are processed separately to form the scribing lines thereon. Thus, the second mother substrate **30** is processed first using the cutting wheel **51**. Thereafter, the first mother substrate **20** is processed using the cutting wheel **51** in a state that the first mother substrate **20** is laid upwardly by turning the liquid crystal display panel over.

[0029] Afterwards, the scribing lines (i.e., scribing lines formed on both the first and second mother substrates **20** and **30**) are pressed to divide the first and second mother substrates **20** and **30**.

[0030] However, several problems may occur in the related art apparatus for cutting the liquid crystal display panel as follows.

[0031] In the related art apparatus for cutting the liquid crystal display panel, the cutting wheel **51** does not cut the first and second mother substrates **20** and **30** completely but just forms the scribing lines thereon. Other processes are further performed to completely cut the first and second mother substrates **20** and **30**. That is, according to the later processes, the first and second mother substrates **20** and **30** are completely cut by applying an impact along the scribing lines formed thereon. Accordingly, the first and second mother substrates **20** and **30** are divided into the liquid crystal display panels.

[0032] Thus, forming the scribing lines is intended to prevent a defect from being generated when cutting the first and second mother substrates **20** and **30**. That is, in the related art cutting apparatus, the first and second mother substrates **20** and **30** are processed according to separate processes to form the scribing lines on the respective first and second mother substrates **20** and **30**. Pressure is applied to the first and second mother substrates **20** and **30** to thus cut them along their scribing lines at once. Thereby, dividing the first and second mother substrates **20** and **30**. Accordingly, when the first mother substrate **20** or the second mother substrate **30** is processed using the cutting wheel **51**, if the corresponding mother substrate is completely cut, an impact may be applied to the substrate, which faces and is bonded to the corresponding mother substrate, and thereby fabricate a defective liquid crystal display panel. Particularly, if the second mother substrate **30** is completely cut using the cutting wheel **51**, when turning over the first and second mother substrates **20** and **30** bonded to each other, an impact may be applied to the first mother substrate **20**, which may cause a defect.

[0033] In order to prevent such a defect, the scribing lines are separately formed on the first and second mother substrates **20** and **30**, and then later processes are performed to completely divide the first and second mother substrates **20** and **30**. Hence, the substrates **20** and **30** are not completely cut. Specifically, only the scribing lines are formed thereon by setting cutting conditions of the cutting wheel **51**, for example, pressure applied to the cutting wheel **51**, a rotating speed of the cutting wheel **51**, or the like.

[0034] However, the mother substrates used in the liquid crystal display device fabricating process have various characteristics. In other words, because characteristics of glass substrate may be varied according to a type or fabricating company of the glass substrate, a size of the glass substrate, or the like, if another type of mother substrate is processed in an actual cutting process of liquid crystal display panel, the mother substrate is completely cut to thereby cause a defective liquid crystal display panel.

SUMMARY OF THE INVENTION

[0035] Accordingly, the present invention is directed to a liquid crystal display panel cutting system and method and

liquid crystal display device fabricating method using the same that substantially obviate one or more of the problems due to limitations and disadvantages of the related art.

[0036] An advantage object of the present invention is to provide a liquid crystal display panel cutting system and a method thereof capable of preventing a damage on a cutting wheel caused when excessively cutting substrates by differently setting a driving condition of the cutting wheel which cuts substrates according to glass substrates.

[0037] Another advantage of the present invention is to provide a liquid crystal display device fabricating method using the liquid crystal display panel cutting system.

[0038] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided a liquid crystal display panel cutting system comprising a table on which a substrate is loaded, a cutting wheel arranged to form scribing lines on a surface of the substrate, and a controller for controlling a driving condition of the cutting wheel according to characteristics of the substrate to thus drive the cutting wheel.

[0039] In another embodiment of the present invention, a liquid crystal display panel cutting method comprises preparing a substrate having at least one liquid crystal display panel setting a driving condition of a cutting wheel according to characteristics of the substrate, and forming scribing lines on the substrate by driving the cutting wheel in accordance with the driving condition.

[0040] In another embodiment of the present invention, a liquid crystal display device fabricating method comprises providing first and second substrates, forming a thin film transistor on the first substrate, forming a color filter layer on the second substrate, setting a driving condition of a cutting wheel based on characteristics of the first and second substrates, and driving the cutting wheel according to the driving condition to divide the first and second substrates into a unit liquid crystal display panel.

[0041] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0042] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0043] In the drawings:

[0044] **FIG. 1** is a plan view illustrating an exemplary structure of a related art liquid crystal display panel;

[0045] **FIG. 2** is a cross-sectional view illustrating substrates having a plurality of liquid crystal display panels;

[0046] **FIG. 3** is a view illustrating a related art liquid crystal display panel cutting apparatus;

[0047] **FIG. 4** is a view illustrating an exemplary structure of a liquid crystal display panel cutting system according to the present invention;

[0048] **FIG. 5** is a block diagram illustrating an exemplary structure of a controller; and

[0049] **FIGS. 6A to 6F** are views illustrating an exemplary liquid crystal display panel cutting method according to the present invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0050] Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0051] In the present invention, a driving condition of a cutting wheel for cutting a liquid crystal display panel can be variably adjusted according to the types of glass substrates. Particularly, the driving condition of the cutting wheel is controlled according to characteristics of the glass substrates to effectively prevent fabrication of a defective liquid crystal display panel. Such cutting conditions are automatically varied based on information input in a cutting system, so as to enable a quick cutting process.

[0052] In the present invention, two cutting wheels for cutting the liquid crystal display panel are arranged to face each other. Thus, the first mother substrate and second mother substrate are simultaneously processed to enable quick processing of the liquid crystal display panel.

[0053] The first mother substrate is a thin film transistor array substrate, in which various signal lines and a pixel electrode are formed in a prior thin film transistor forming process. The second mother substrate is a color filter substrate, in which a color filter and a black matrix are formed in a prior color filter forming process. After performing the thin film transistor forming process and the color filter forming process, a liquid crystal layer is formed between the first and second mother substrates, which have been bonded to each other, using a vacuum injection method or a liquid crystal (LC) dispensing method (i.e., a method for spreading liquid crystal material over an entire substrate by bonding and pressing two substrates after directly dispensing liquid crystal material onto a substrate). Thereafter, a cutting process is initiated (loaded) to divide the bonded first and second mother substrates into separate liquid crystal display panels using the cutting wheels.

[0054] Hereinafter, a liquid crystal display panel cutting system according to the present invention will be explained in detail with reference to the attached drawings.

[0055] **FIG. 4** is a view illustrating an exemplary liquid crystal display panel cutting system according to the present invention. As illustrated in **FIG. 4**, a liquid crystal display panel cutting system according to the present invention may comprise first and second tables **142** and **144** being uniformly spaced apart from each other, first and second mother substrates **120** and **130** loaded on the first and second tables **142** and **144** in a space between the first and second tables **142** and **144**, first and second cutting wheels **151** and **154** for forming first and second scribing lines **158** and **159** on respective surfaces of the first and second mother substrates **120** and **130**, and first and second suction units **152** and **155** installed at side surfaces of the first and second cutting wheels **151** and **154**, for remaining glass-dust generated during the cutting process.

[0056] In the liquid crystal display panel cutting apparatus according to the present invention, after the thin film transistor forming process and the color filter forming process are performed to form the thin film transistor and the color filter on the first and second mother substrates **120** and **130**, respectively, bonded first and second mother substrates **120** and **130** that face each other and have a plurality of liquid crystal display panels are loaded on the first and second tables **142** and **144**, which are uniformly spaced apart from each other. The first and second substrates are located at spaces between the first and second tables **142** and **144**. The first and second cutting wheels **151** and **154** vertically face each other at the space between the first and second tables **142** and **144**. The first and second mother substrates **120** and **130** are positioned between the first and second wheels **151** and **154**, and are adhered on surfaces of the first and second mother substrates **120** and **130** by applying a uniform pressure thereto to thus rotate. The first and second cutting wheels **151** and **154** simultaneously form groove-shaped first and second scribing lines **158** and **159** at the surfaces of the first and second mother substrates **120** and **130**. Thereafter, pressure is applied to the first and second scribing lines **158** and **159** to divide the first and second mother substrates **120** and **130**.

[0057] In the liquid crystal display panel cutting apparatus according to the present invention, the first and second cutting wheels **151** and **154** face each other. Thus, the first and second mother substrates **120** and **130** are cut by performing only one cutting process (i.e., a turn-over process of the related art is not required to cut the upper and lower substrates). Thereby, allowing the performance of a quick cutting process.

[0058] In the meantime, a controller **180** controls the first and second cutting wheels **151** and **154**. The controller **180** does not simply drive the first and second cutting wheels **151** and **154**, but rather drives the first and second cutting wheels **151** and **154**, by varying their driving condition based upon the type of substrate (or a liquid crystal display panel) to be cut.

[0059] Referring to **FIG. 4**, the controller **180** input receives various information with respect to the substrates **120** and **130** from an exterior source. The controller **180** can control the driving condition of the first and second cutting wheels **151** and **154** (e.g., pressure applied to first and second substrates **120** and **140**, a rotating speed of the cutting wheels **151** and **154**, a driving time of the cutting wheels **151** and **154**, and the like) based on the input characteristics (information) of the substrates **120** and **130** for example, substrate type, types, sizes, fabricating companies of substrates.

[0060] The controller **180**, as illustrated in **FIG. 5**, may comprise a substrate recognizing unit **182** that recognizes the substrates **120** and **130** to be cut based on information with respect to the substrates **120** and **130** or panel input from a host computer, a database unit **186** in which cutting conditions of the first and second cutting wheels **151** and **154** corresponding to characteristics of the substrates **120** and **130** are stored, a setting unit **184** for searching for a driving condition of the first and second cutting wheels **151** and **154** corresponding to the substrate characteristics recognized by the substrate recognizing unit **182** from the database unit **186** to set the driving condition of the first and second

cutting wheels **151** and **154**, and a driving unit **188** for driving the first and second cutting wheels **151** and **154** of the liquid crystal display panel cutting apparatus in accordance with the driving condition set by the setting unit **184**.

[0061] The information for the substrates or panels input to the controller **180** is input from a host computer of an entire liquid crystal display device fabricating system. The host computer refers to a computer for controlling the entire liquid crystal display device fabricating system, in which characteristics of each substrate **120** and **130** (e.g., strengths or fabricating companies of substrates) is stored as well as conditions of each process. Such information is input from the host computer to the substrate recognizing unit **182** which thus recognizes characteristics of the substrates (e.g., types or fabricating companies of the substrates) for which the cutting process is to be performed.

[0062] The driving condition of the cutting wheels **151** and **154** for each substrate is stored in the database unit **186**. For example, a contact pressure, a rotating speed, and a driving time of the cutting wheels **151** and **154** with respect to a particular product of each fabricating company are stored in the database unit **186**. The setting unit **184** sets the driving condition of the cutting wheels **151** and **154** with respect to a corresponding substrate recognized by the substrate recognizing unit **182** on the basis of the information stored in the database unit **186**. The driving unit **188** drives the first and second cutting wheels **151** and **154** according to the set driving condition, to thus form the scribing lines for the liquid crystal display panel.

[0063] As mentioned above, in the present invention, the first and second substrates **120** and **130** are cut by varying their driving condition of the cutting wheels **151** and **154** according to the characteristics (or types) of glass substrates to be cut. Accordingly, it is possible to prevent damage on the first and second cutting wheels **151** and **154** due to the division of the first and second substrates **120** and **130**.

[0064] The first and second cutting wheels **151** and **154**, on the other hand, may be driven by driving conditions different from each other. The first substrate **120** and the second substrate **130** forming liquid crystal display panels may be formed of glass substrates having the same type or characteristics, or may be formed of glass substrates having a different type or characteristics from each other. Accordingly, the first cutting wheel **151** and the second cutting wheel **154** for processing the first substrate **120** and the second substrate **130** may be driven according to the same condition, or may be driven according to different conditions. In such manner, the first and second cutting wheels **151** and **154** controlled by the controller **180** may be integrally controlled, or may be separately controlled.

[0065] Hereinafter, a liquid crystal display panel cutting process using the liquid crystal display panel cutting apparatus of the present invention will now be explained in detail with reference to **FIGS. 6A** to **6F**.

[0066] First, as illustrated in **FIG. 6A**, the first and second mother substrates **120** and **130** on which the thin film transistor array substrate and the color filter substrate are respectively formed are loaded on the first table **142**. The first and second mother substrates **120** and **130** are facing and bonded to each other.

[0067] The first and second mother substrates **120** and **130** are loaded thereon in a state that the first mother substrate

120 having the thin film transistor array substrate is stacked on the second mother substrate **130** having the color filter substrate, which results in a more reducing of impact applied to the thin film transistor array substrate or the color filter substrate during the cutting process for the first and second mother substrates **120** and **130** as compared with stacking the two substrates vice versa.

[0068] Afterwards, as illustrated in **FIG. 6B**, when the first and second mother substrates **120** and **130** are load on the first table **142** and a second table **144** apart from the first table **142**, the first and second cutting wheels **151** and **154** are contacted with respective surfaces of the first and second mother substrates **120** and **130** by a uniform pressure at the space between the first and second tables **142** and **144** to thereafter rotate. First and second scribing lines **158** and **159** are sequentially formed on the respective surfaces of the first and second mother substrates **120** and **130** according to the rotations of the first and second cutting wheels **151** and **154**. At this time, first and second suction units **152** and **155** are installed at side surfaces of the first and second cutting wheels **151** and **154** to remove glass-dust generated during the cutting process. The first and second suction units **152** and **155** interwork with the first and second cutting wheels **151** and **154** to remove the glass-dust which is generated at the surfaces of the first and second mother substrates **120** and **130** due to friction between the first and second cutting wheels **151** and **154** and the first and second mother substrates **120** and **130**.

[0069] The controller **180** (not illustrated) controls the pressure by which the first cutting wheel **151** contacts the first substrate **120** and its rotating speed, and the pressure by which the second cutting wheel **154** contacts the second substrate **130** and its rotating speed.

[0070] Afterwards, as illustrated in **FIG. 6C**, the first and second mother substrates **120** and **130** are sequentially cut using, for example, a steam cutting device **160**. The steam of a high temperature, approximately 160-200° C. is applied to the first scribing line **158** and the second scribing line **159** to expand the first and second mother substrates **120** and **130** near the first scribing line **158** and the second scribing line **159**. As a result, the first scribing line **158** and the second scribing line **159** are separated by the expansion of the substrates **120** and **130**. Although not shown, the steam cutting device **160** interworks with the first cutting wheel **151** or the second cutting wheel **154** to apply steam along the first scribing line **158** or the second scribing line **159**, so as to effectively separate the first scribing line **158** or the second scribing line **159**.

[0071] Thereafter, as illustrated in **FIG. 6D**, the cut first and second mother substrates **120** and **130** are rotated by about 90°.

[0072] Then, as illustrated in **FIG. 6E**, the rotated first and second mother substrates **120** and **130** are moved on third and fourth tables **146** and **147** which are uniformly spaced apart from each other. The substrates are located at the space therebetween. Third and fourth cutting wheels **251** and **254** are adhered onto the respective surfaces of the first and second mother substrates **120** and **130** by a uniform pressure at the space between the third and fourth tables **146** and **147** to thereafter rotate. As a result, third and fourth scribing lines **258** and **259** are formed on the respective surfaces of the first and second mother substrates **120** and **130** according to the

rotations of the third and fourth cutting wheels **251** and **254**. At this time, the controller **180** (not pictured) also controls the third and fourth cutting wheels **251** and **254** according to the type of the substrates. Meanwhile, third and fourth suction units **252** and **255** interwork with the third and fourth cutting wheels **251** and **254** to thus remove the glass-dust which is generated at the surfaces of the first and second mother substrates **120** and **130** due to friction between the third and fourth cutting wheels **251** and **254** and the first and second mother substrates **120** and **130**.

[0073] Afterwards, as illustrated in **FIG. 6F**, the first and second mother substrates **120** and **130** are cut by applying pressure to the third and fourth scribing lines **258**, **259**, respectively, thereon using the steam cutting device **160**.

[0074] Although not shown in the drawing, the cut substrate, namely, the liquid crystal panel is transported to a later processing line using a transporting unit.

[0075] As described above, in the liquid crystal display panel cutting system according to the present invention, the driving of the cutting wheels is controlled according to the types or characteristics of the glass substrates, to thereby prevent defects caused by excessively cutting substrates. The substrates are cut by two cutting wheels that face each other, but can be cut by one cutting wheel. In this case, the cutting wheel may also be controlled by the types or characteristics of the glass substrates.

[0076] As explained above, in the present invention, the cutting wheels for cutting the liquid crystal display panel are driven by varying their driving condition based on the type or characteristics of the glass substrates. Thus, it is possible to prevent a fabrication of a defective liquid crystal display panel caused by previously cutting the mother substrates by an excessive cutting. Also, by using two cutting wheels facing each other, damage to the cutting wheels caused by directly contacting the two cutting wheels with each other by the excessive cutting can be prevented.

[0077] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A liquid crystal display panel cutting system, comprising:

a table on which a substrate is loaded;

a cutting wheel for forming scribing lines on a surface of the substrate; and

a controller for controlling a driving condition of the cutting wheel according to characteristics of the substrate.

2. The system of claim 1, wherein the cutting wheel includes a pair of cutting wheels facing each other.

3. The system of claim 1, further comprising a suction unit for removing glass-dust generated by the cutting wheel.

4. The system of claim 3, wherein the suction unit interworks with the cutting wheel.

5. The system of claim 1, further comprising a steam cutting device for applying a high temperature steam to the scribing lines.

6. The system of claim 1, wherein the controller includes:

a recognizing unit for recognizing a substrate based on input information of substrates;

a database unit in which the driving condition of the cutting wheel based upon the characteristics of the substrate is stored;

a setting unit for setting the driving condition of the cutting wheel with respect to the substrate to be processed based on the information stored in the database unit; and

a driving unit arranged to drive the cutting wheel according to the driving condition set in the setting unit.

7. The system of claim 6, wherein the characteristics of the substrate include a type, a fabricating company, and a size of the substrate.

8. The system of claim 6, wherein the driving condition of the cutting wheel includes pressure applied to the substrate by the cutting wheel, a rotating speed of the cutting wheel and a driving time of the cutting wheel.

9. A method of cutting a liquid crystal display panel, comprising:

preparing a substrate having at least one liquid crystal display panel;

setting a driving condition of a cutting wheel according to characteristics of the substrate; and

forming scribing lines on the substrate by driving the cutting wheel in accordance with the set driving condition.

10. The cutting method of claim 9, wherein the setting of the driving condition includes:

inputting information of the substrate from an exterior source; and

setting the driving condition based on the input information of the substrate.

11. The cutting method of claim 10, wherein the input information includes a type, a fabricating company, and a size of the substrate.

12. The cutting method of claim 10, wherein the driving condition includes a pressure applied to the substrate by the cutting wheel, a rotating speed of the cutting wheel and a driving time of the cutting wheel.

13. The cutting method of claim 9, further comprising dividing the substrate along the scribing lines using a steam cutting device.

14. A fabricating method of a liquid crystal display device, comprising:

providing a first substrate and a second substrate;

forming a thin film transistor on the first substrate;

forming a color filter layer on the second substrate;

bonding the first substrate and the second substrate together;

setting a driving condition of a cutting wheel according to characteristics of the first and second substrates; and

driving the cutting wheel according to the set driving condition to divide the first and second substrates into a unit liquid crystal display panel.

15. The fabricating method of claim 14, wherein the setting of the driving condition includes:

inputting information with respect to the first and second substrates from an exterior source; and

setting the driving condition based on the input information with respect to the first and second substrates.

16. The fabricating method of claim 15, wherein the driving condition includes a pressure applied to the first and second substrates by the cutting wheel, a rotating speed of the cutting wheel and a driving time of the cutting wheel.

17. The fabricating method of claim 14, wherein the dividing of the first and second substrates into the unit liquid crystal display panel includes:

using two cutting wheels facing each other to form a first scribing line and a second scribing line on the first and second substrates; and

applying a high temperature steam to the first and second scribing lines to divide the substrates.

18. The fabricating method of claim 14, wherein the dividing of the first and second substrates into the unit liquid crystal display panel includes:

forming a first scribing line on the first substrate using the cutting wheel;

turning the first and second substrates over;

forming a second scribing line on the second substrate using the cutting wheel; and

applying a high temperature steam to the first and second scribing lines to divide the substrates.

* * * * *

专利名称(译)	液晶显示面板切割系统和方法以及使用该系统的液晶显示装置制造方法		
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摘要(译)

一种液晶显示板切割系统，用于根据玻璃基板的特性通过改变切割轮的驱动条件来切割基板。该系统包括：基板装载在其上的工作台，用于在基板的表面处形成划线的切割轮，以及用于通过基于基板的特性控制切割轮的驱动条件来驱动切割轮的控制器。

