US 20040090591A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2004/0090591 A1

Jung (43) Pub. Date: May 13, 2004

(54) DISPENSER SYSTEM FOR LIQUID CRYSTAL DISPLAY PANEL, DISPENSING METHOD USING THE SAME, AND METHOD OF FABRICATING LIQUID CRYSTAL DISPLAY PANEL USING DISPENSER SYSTEM AND DISPENSING METHOD

(75) Inventor: **Sung-Su Jung**, Daegu (KR)

Correspondence Address:
MORGAN LEWIS & BOCKIUS LLP
1111 PENNSYLVANIA AVENUE NW
WASHINGTON, DC 20004 (US)

(73) Assignee: **LG. Philips LCD Co., Ltd**

(21) Appl. No.: **10/691,662**

(22) Filed: **Oct. 24, 2003**

(30) **Foreign Application Priority Data**

Nov. 13, 2002 (KR) 70489/2002

Publication Classification

(51) **Int. Cl.**[7] **G02F 1/13**

(52) **U.S. Cl.** **349/187**

(57) **ABSTRACT**

A dispenser system for a liquid crystal display panel includes at least one table upon which a substrate having a plurality of image display parts is loaded, a plurality of syringes each having a nozzle at one end portion for supplying a dispensing material onto the substrate, and a plurality of robot arms having the plurality of syringes arranged at both sides of the table.

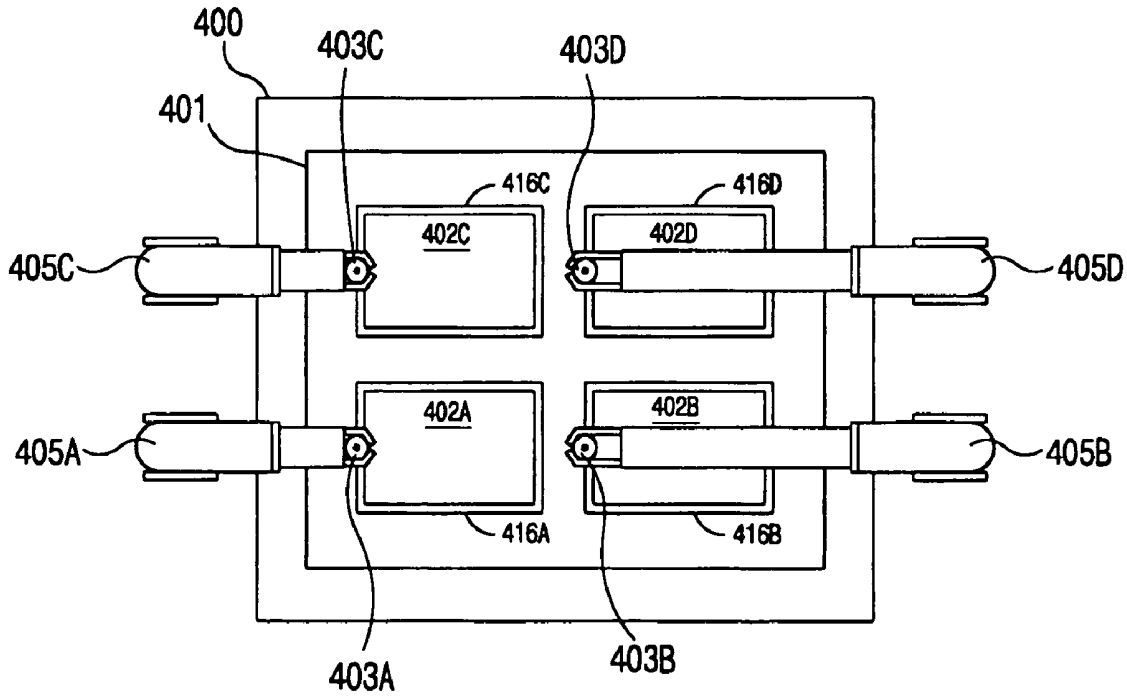


FIG. 1
RELATED ART

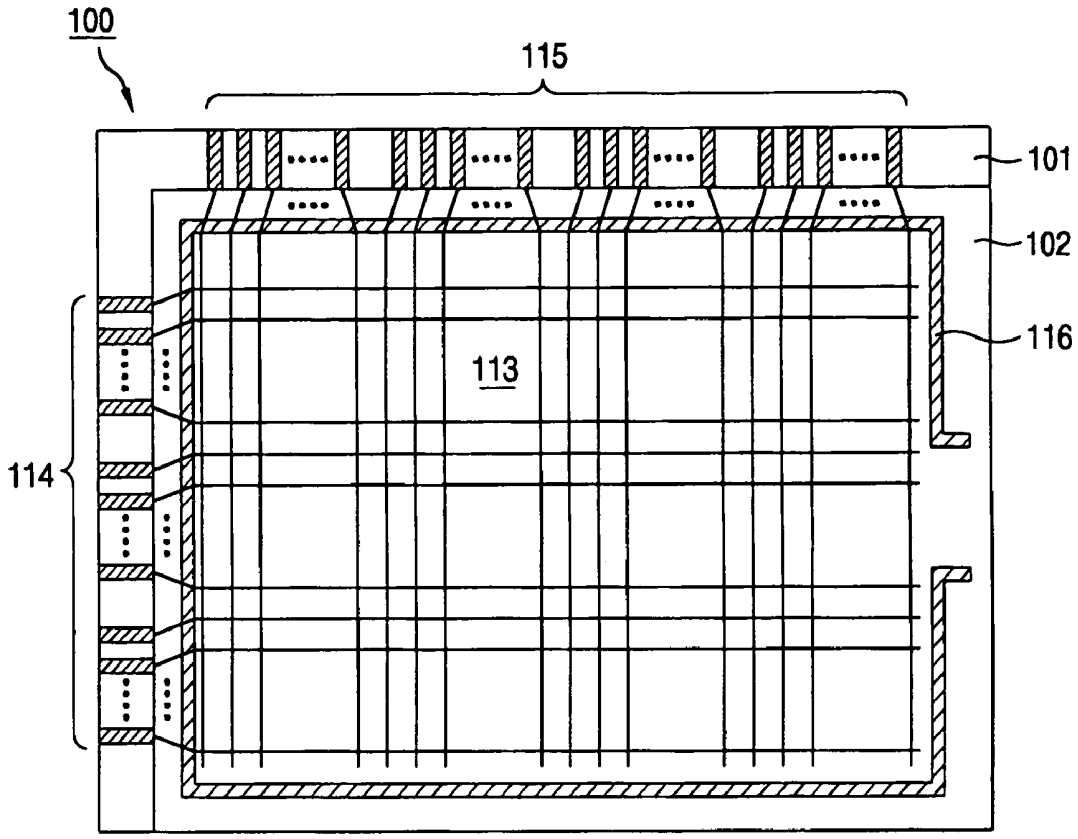


FIG. 2A
RELATED ART

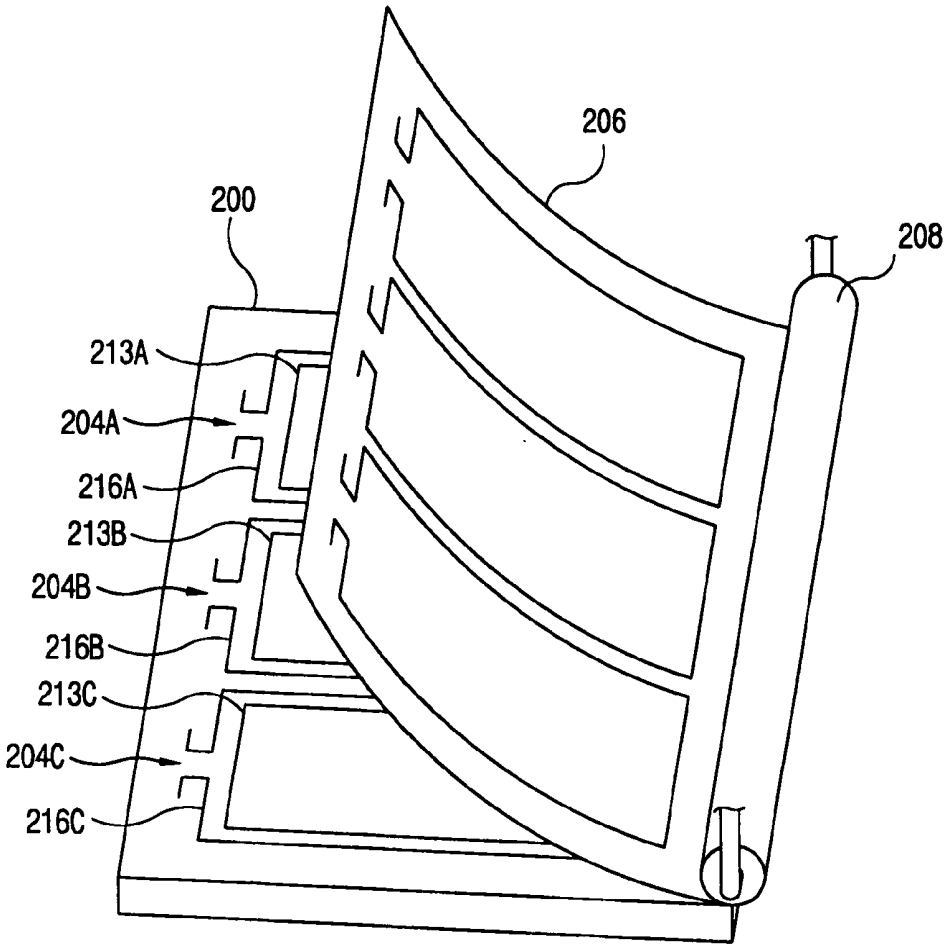


FIG. 2B
RELATED ART

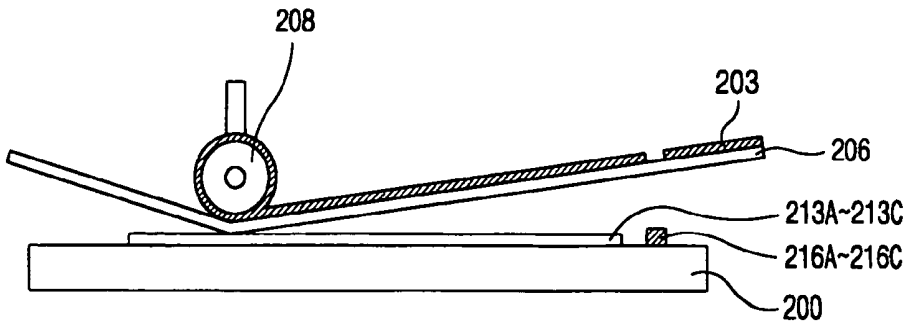


FIG. 3
RELATED ART

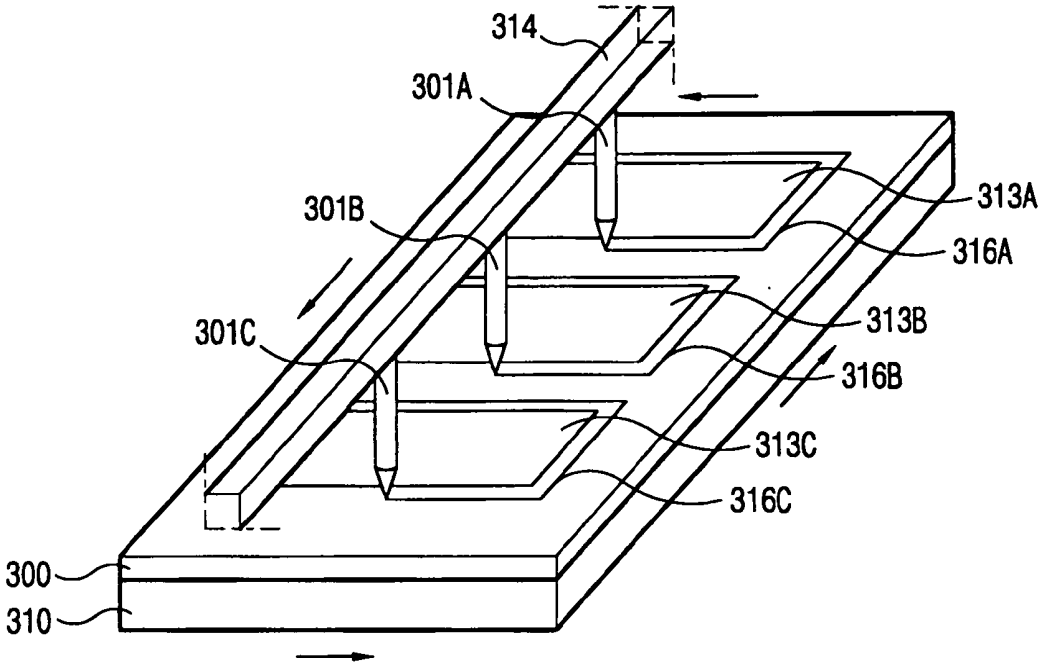


FIG. 4

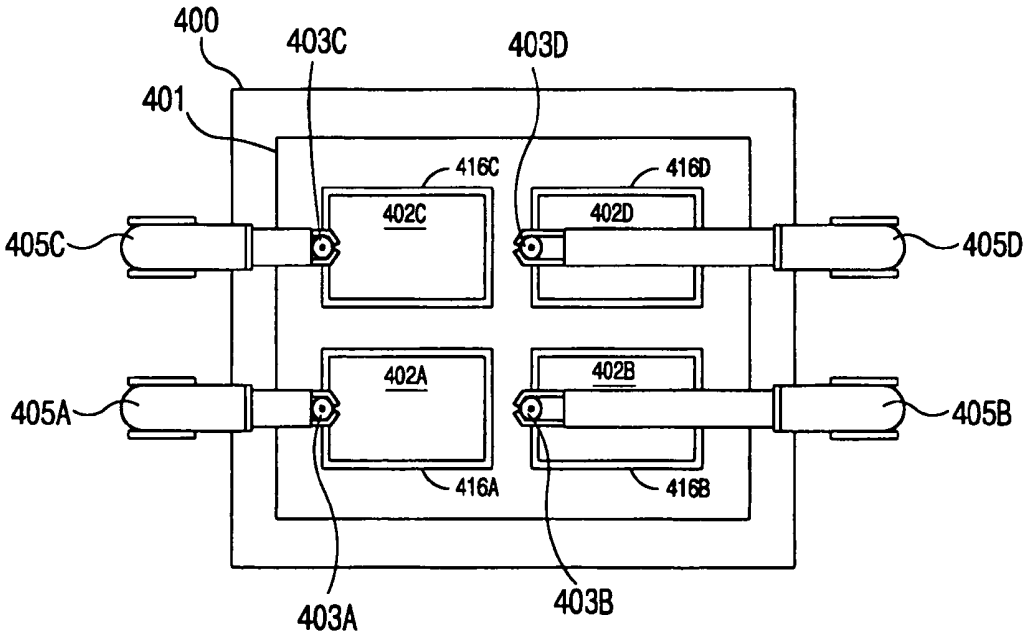


FIG. 5A

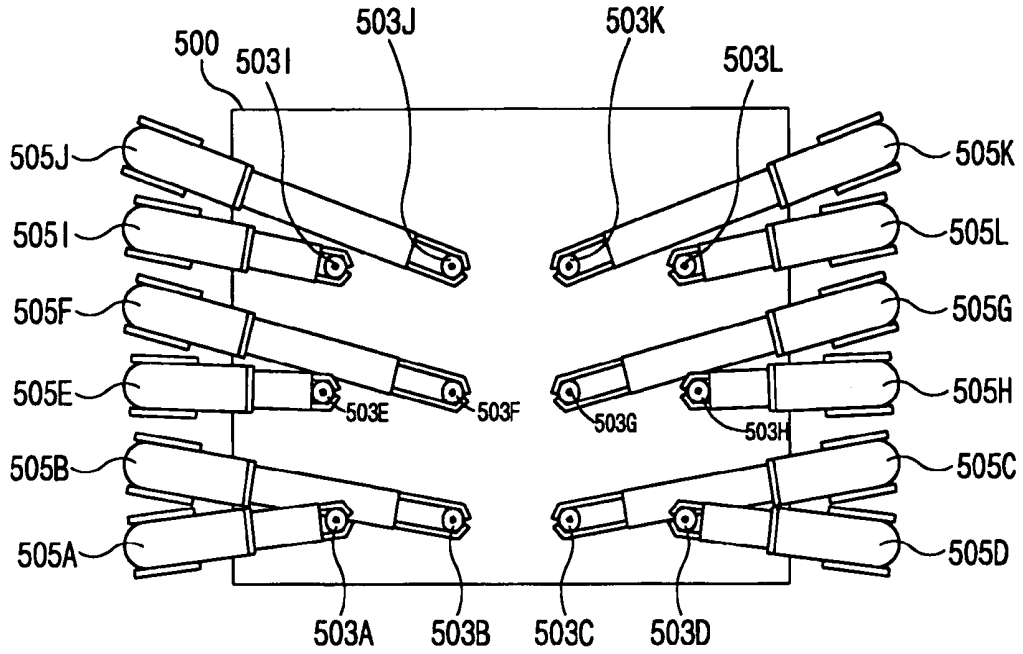

500
503I
503J
503K
503L
505J
505I
505F
505E
505B
505A
505K
505L
505G
505H
505C
505D
503E
503F
503G
503H
503A
503B
503C
503D

FIG. 5B

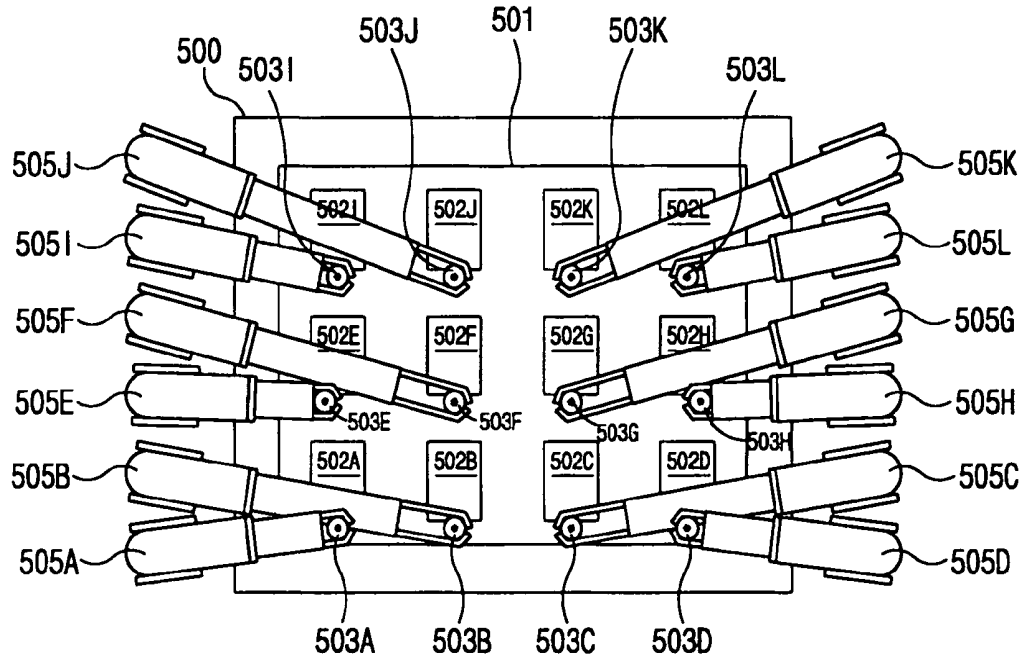

500
503I
503J
501
503K
503L
505J
505I
505F
505E
505B
505A
505K
505L
505G
505H
505C
505D
502I
502J
502K
502L
502E
502F
502G
502H
502A
502B
502C
502D
503E
503F
503G
503H
503A
503B
503C
503D

FIG. 5C

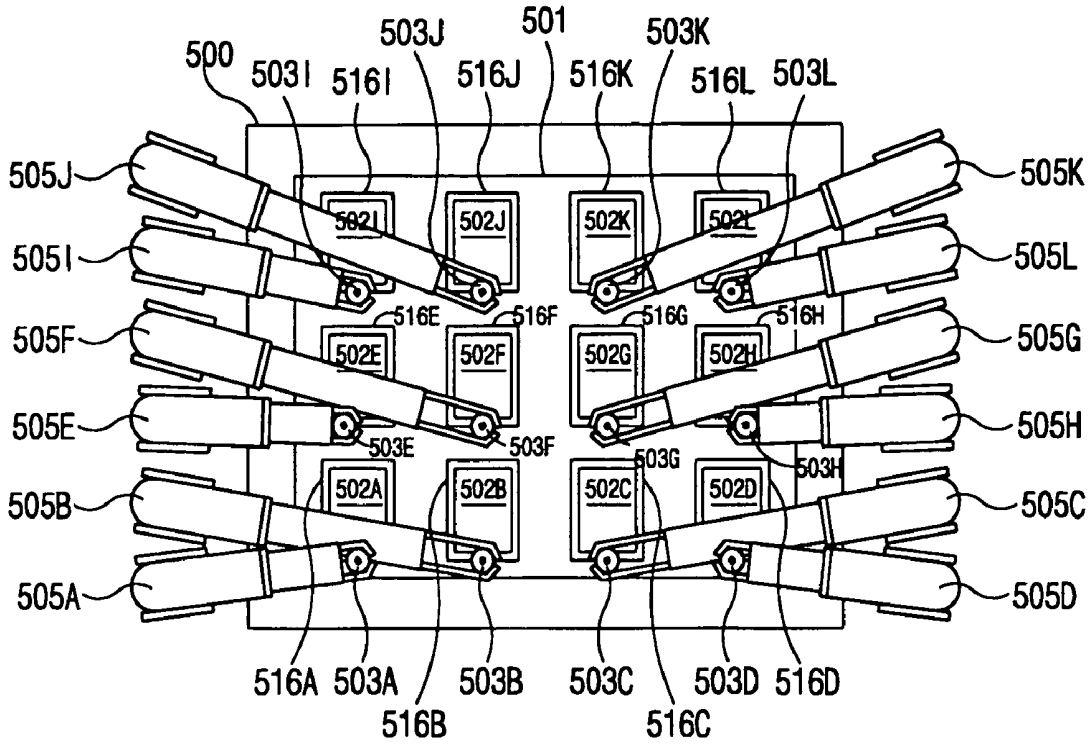

500
501
503I
503J
503K
503L
516I
516J
516K
516L
505J
505I
505F
505E
505B
505A
505K
505L
505G
505H
505C
505D
502I
502J
502K
502L
502E
502F
502G
502H
502A
502B
502C
502D
516E
516F
516G
516H
503E
503F
503G
503H
516A
503A
516B
503B
503C
516C
503D
516D

FIG. 6A

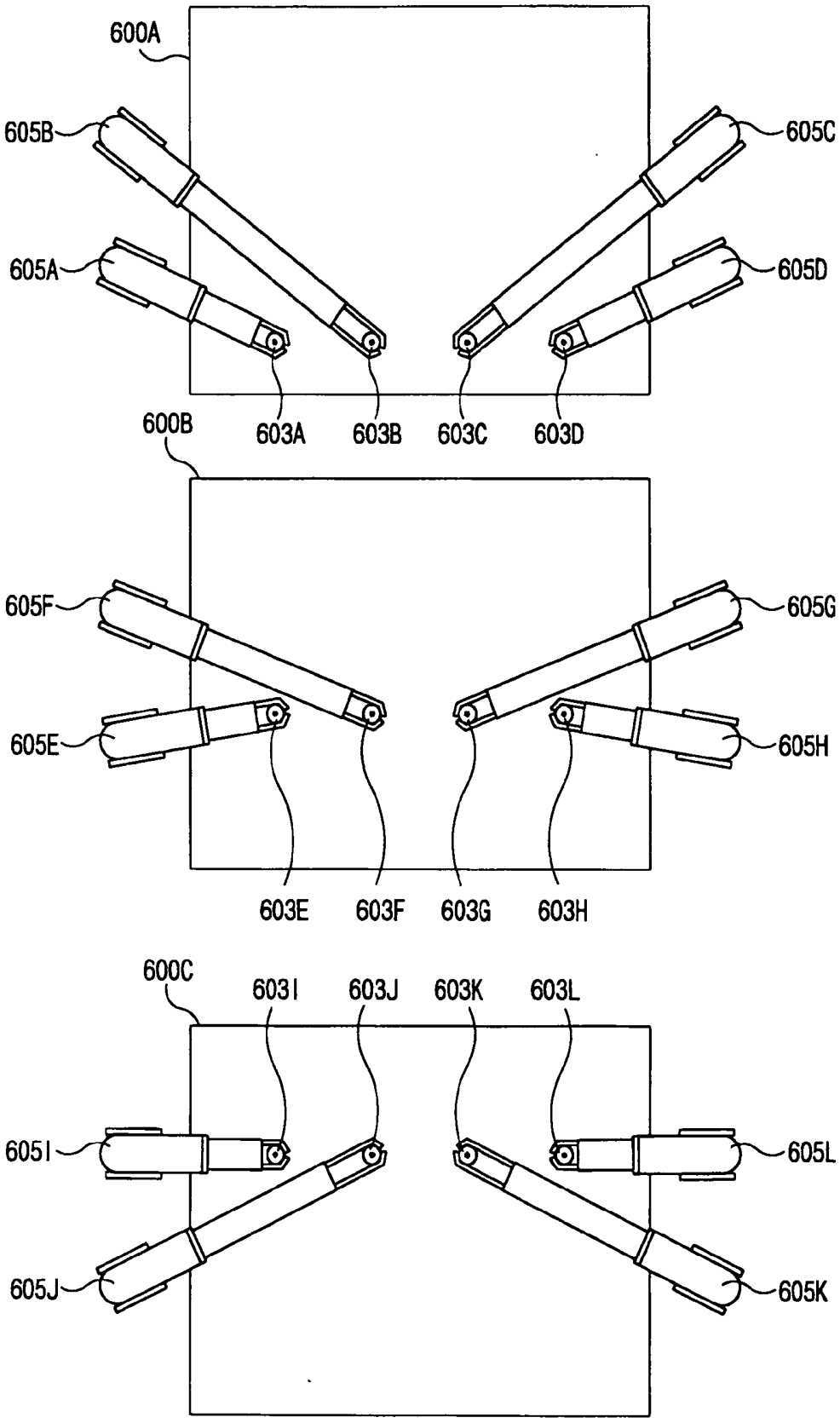

600A
605B
605C
605A
605D
603A
603B
603C
603D
600B
605F
605G
605E
605H
603E
603F
603G
603H
600C
603I
603J
603K
603L
605I
605L
605J
605K

FIG. 6B

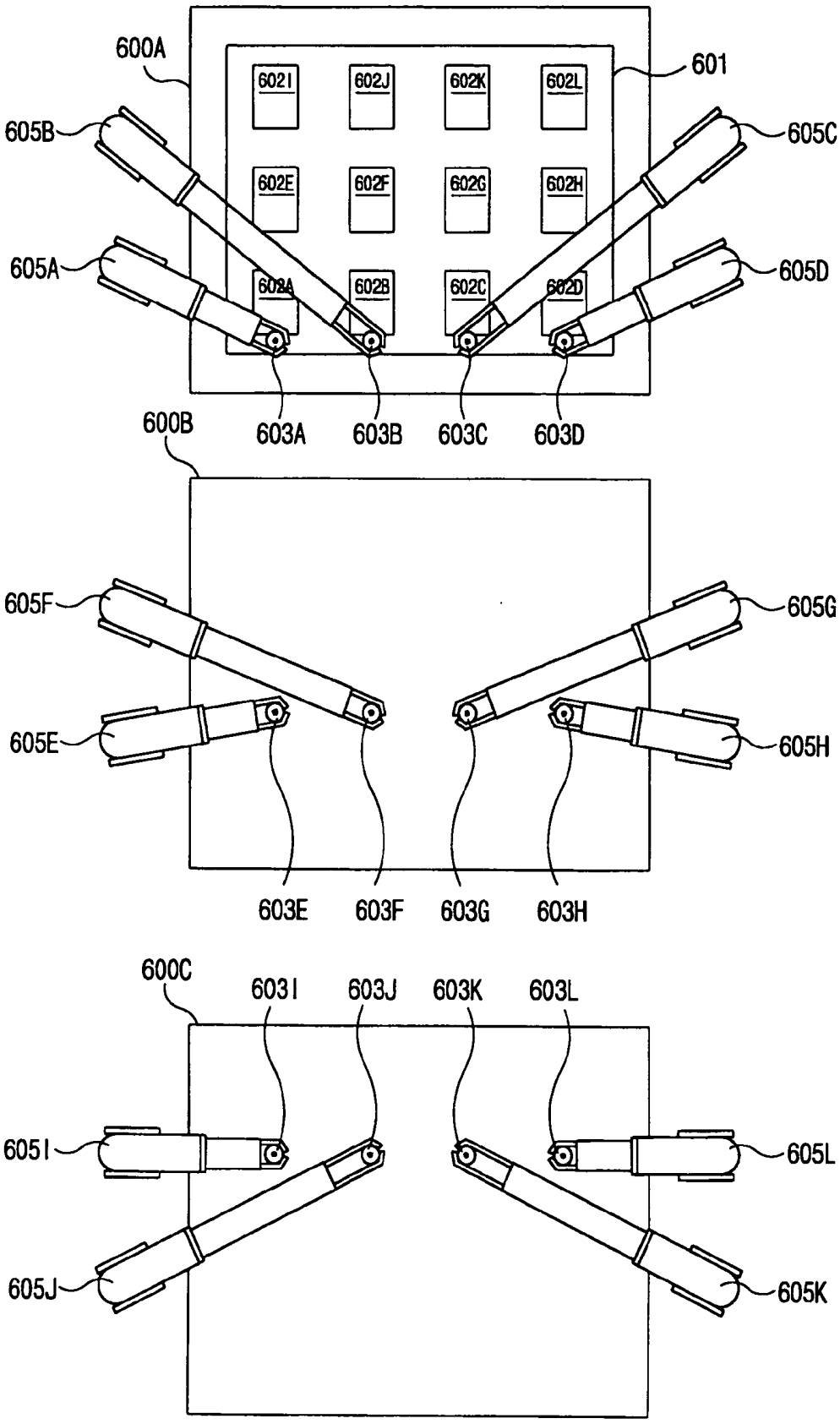

600A
601
602I
602J
602K
602L
605B
605C
602E
602F
602G
602H
605A
605D
602A
602B
602C
602D
603A
603B
603C
603D
600B
605F
605G
605E
605H
603E
603F
603G
603H
600C
603I
603J
603K
603L
605I
605L
605J
605K

FIG. 6C

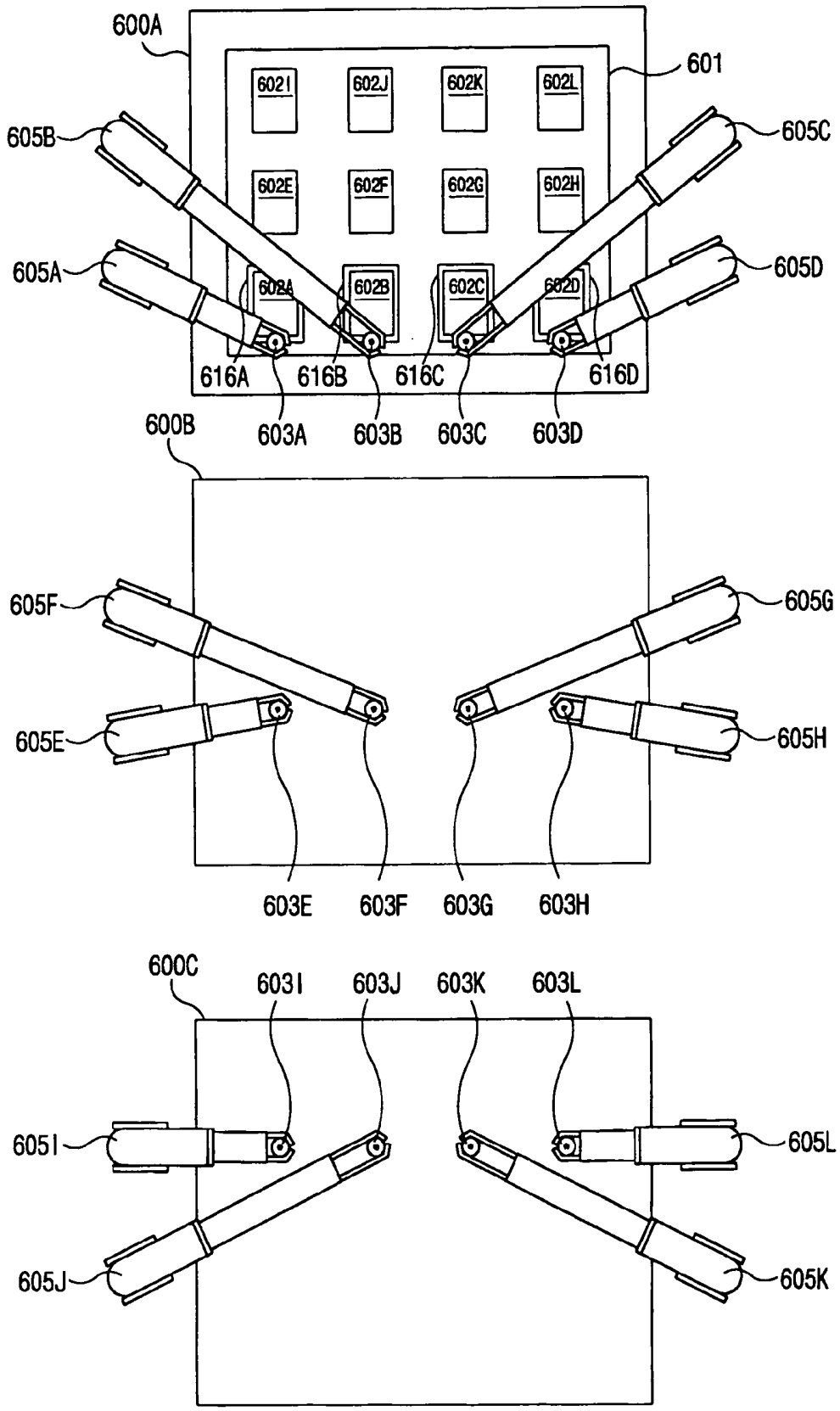

600A
601
602I
602J
602K
602L
605B
605C
602E
602F
602G
602H
605A
605D
602A
602B
602C
602D
616A
616B
616C
616D
603A
603B
603C
603D
600B
605F
605G
605E
605H
603E
603F
603G
603H
600C
603I
603J
603K
603L
605I
605L
605J
605K

FIG. 6D

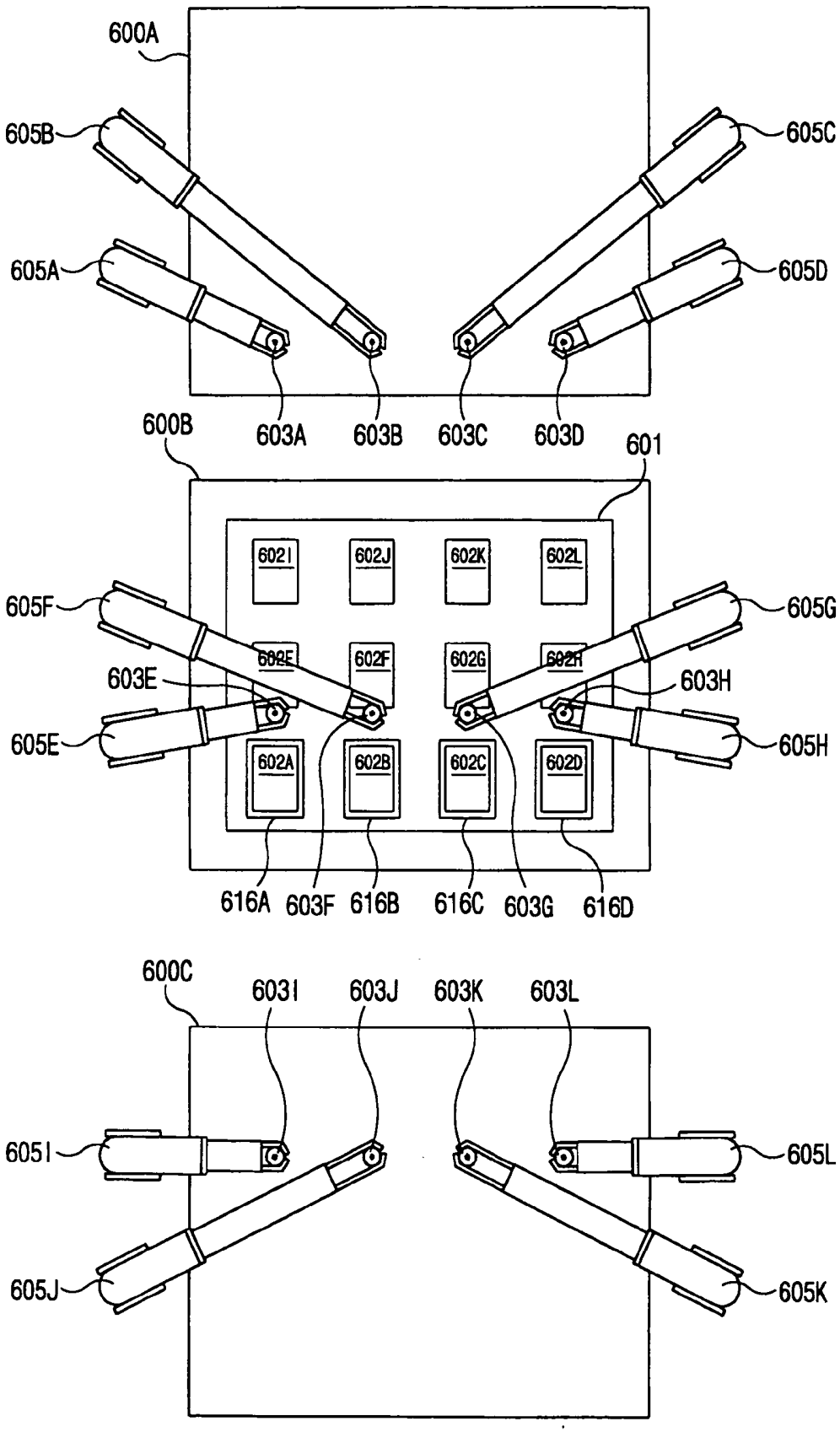

600A
605B
605C
605A
605D
603A
603B
603C
603D
600B
601
602I
602J
602K
602L
605F
605G
602E
602F
602G
602H
603E
603H
605E
605H
602A
602B
602C
602D
616A
603F
616B
616C
603G
616D
600C
603I
603J
603K
603L
605I
605L
605J
605K

FIG. 6E

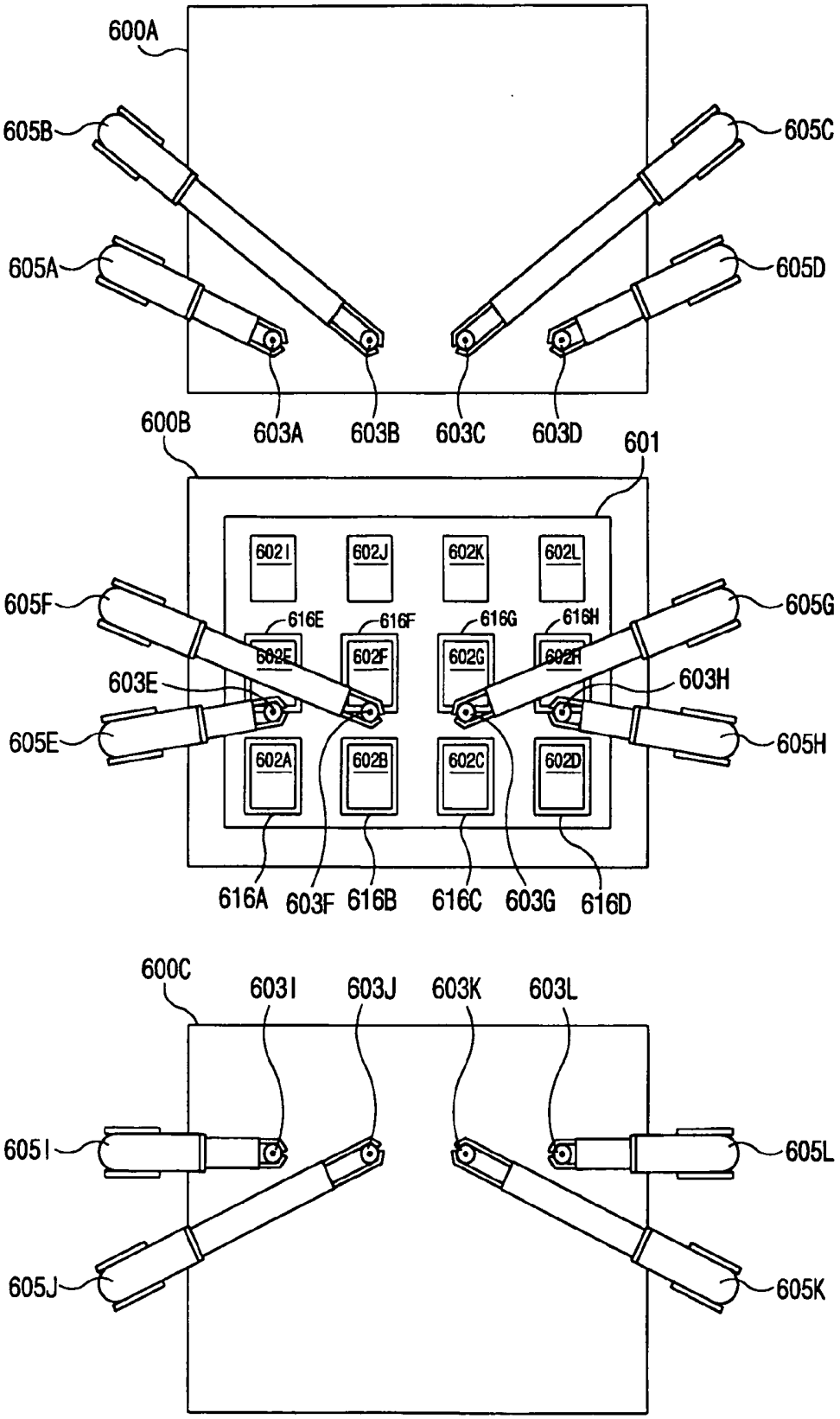

600A
605B
605C
605A
605D
603A
603B
603C
603D
600B
601
602I
602J
602K
602L
605F
605G
616E
616F
616G
616H
602E
602F
602G
602H
603E
603H
605E
605H
602A
602B
602C
602D
616A
603F
616B
616C
603G
616D
600C
603I
603J
603K
603L
605I
605L
605J
605K

FIG. 6F

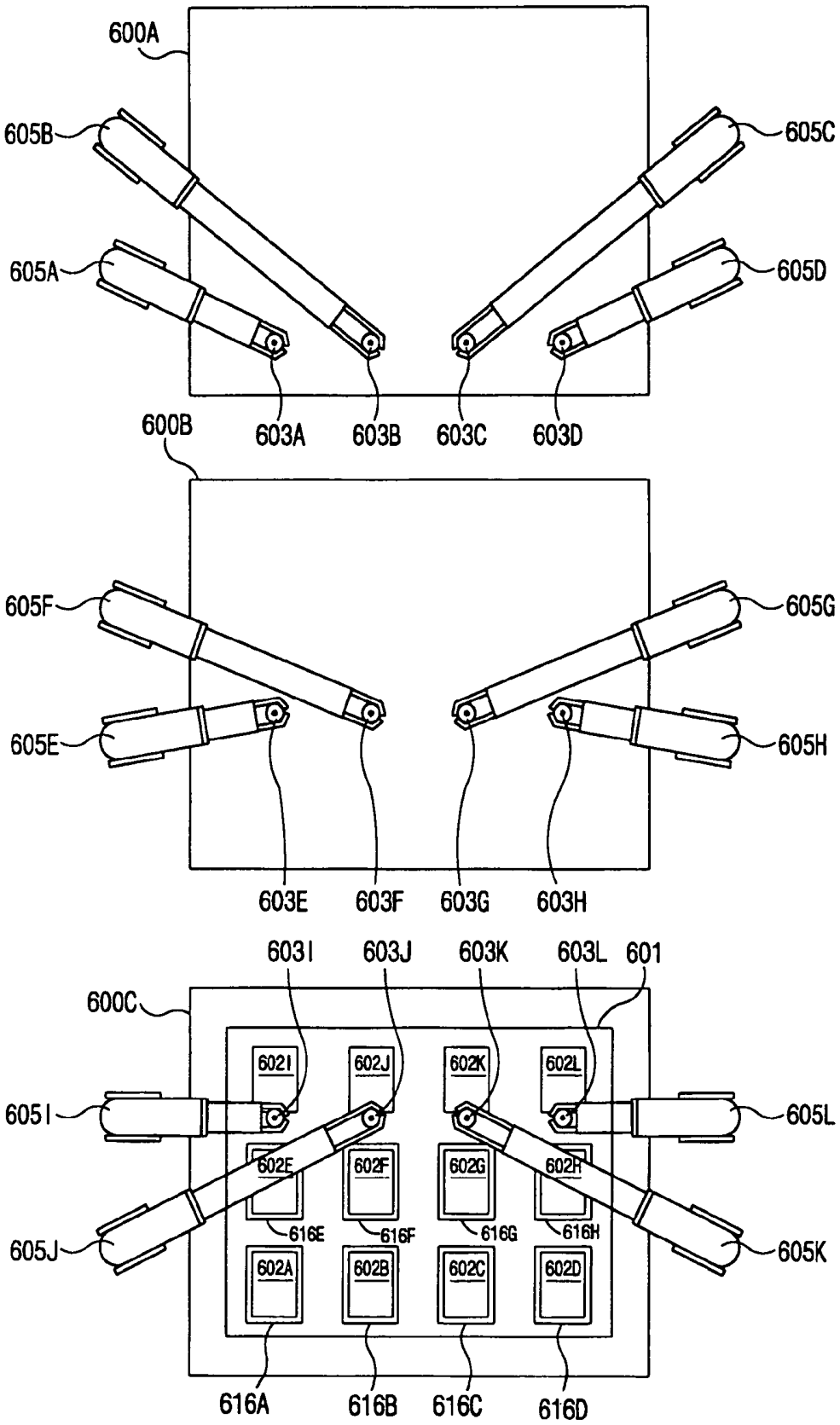

600A
605B
605C
605A
605D
603A
603B
603C
603D
600B
605F
605G
605E
605H
603E
603F
603G
603H
603I
603J
603K
603L
601
600C
602I
602J
602K
602L
605I
605L
602E
602F
602G
602H
616E
616F
616G
616H
605J
605K
602A
602B
602C
602D
616A
616B
616C
616D

FIG. 6G

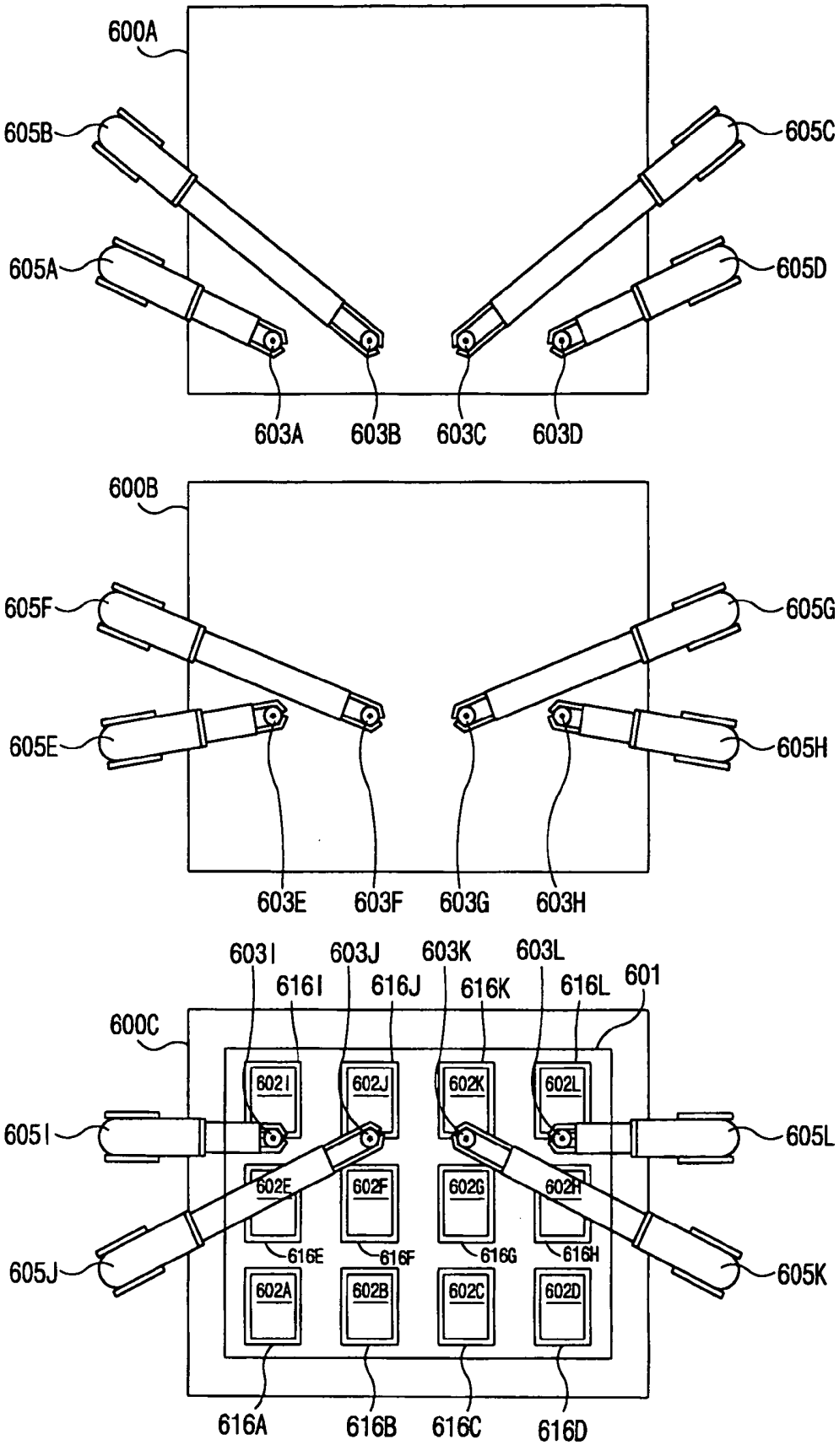

600A
605B
605C
605A
605D
603A
603B
603C
603D
600B
605F
605G
605E
605H
603E
603F
603G
603H
603I
603J
603K
603L
616I
616J
616K
616L
601
600C
602I
602J
602K
602L
605I
605L
602E
602F
602G
602H
616E
616F
616G
616H
605J
605K
602A
602B
602C
602D
616A
616B
616C
616D

FIG. 7A

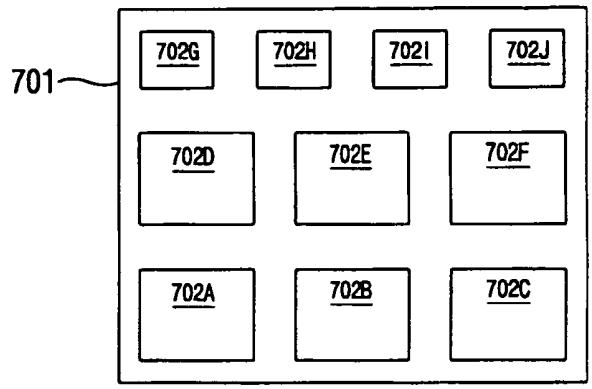

701
702G
702H
702I
702J
702D
702E
702F
702A
702B
702C

FIG. 7B

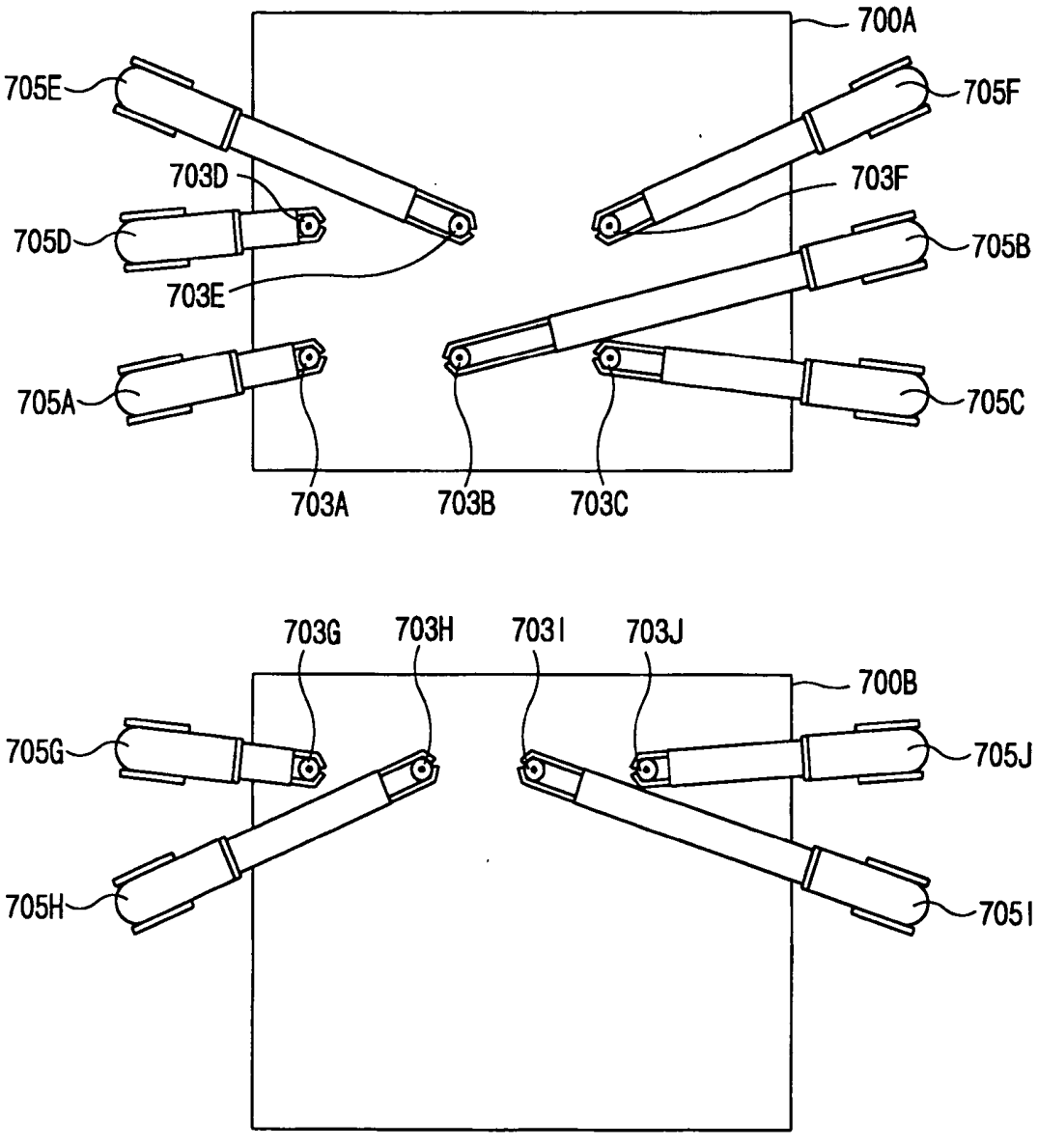
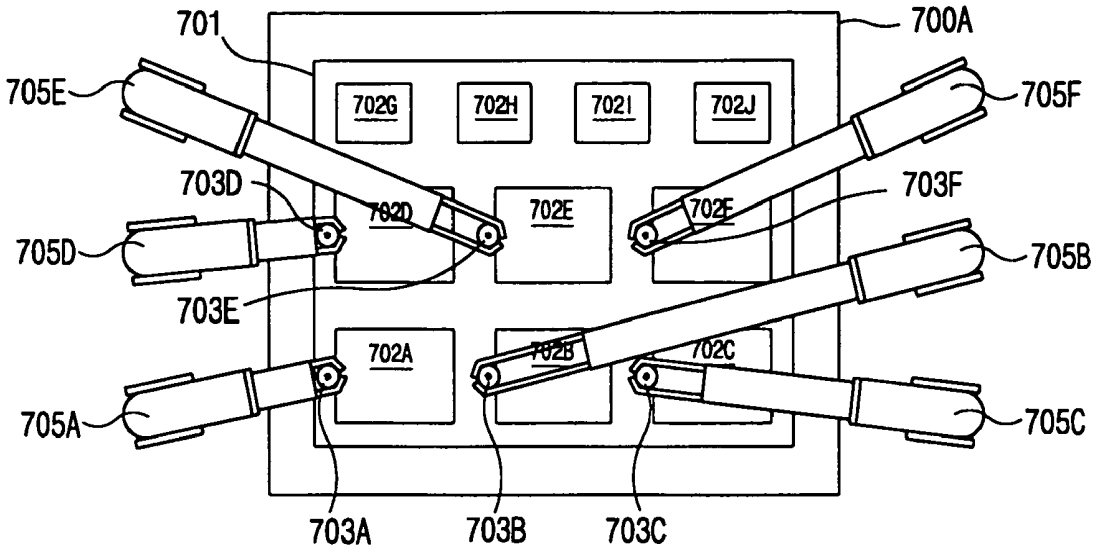

700A
705E
705F
703D
703F
705D
705B
703E
705A
705C
703A
703B
703C
703G
703H
703I
703J
700B
705G
705J
705H
705I

FIG. 7C


701
700A
705E
705F
702G
702H
702I
702J
703D
703F
702D
702E
702E
705D
705B
703E
702A
702B
702C
705A
705C
703A
703B
703C

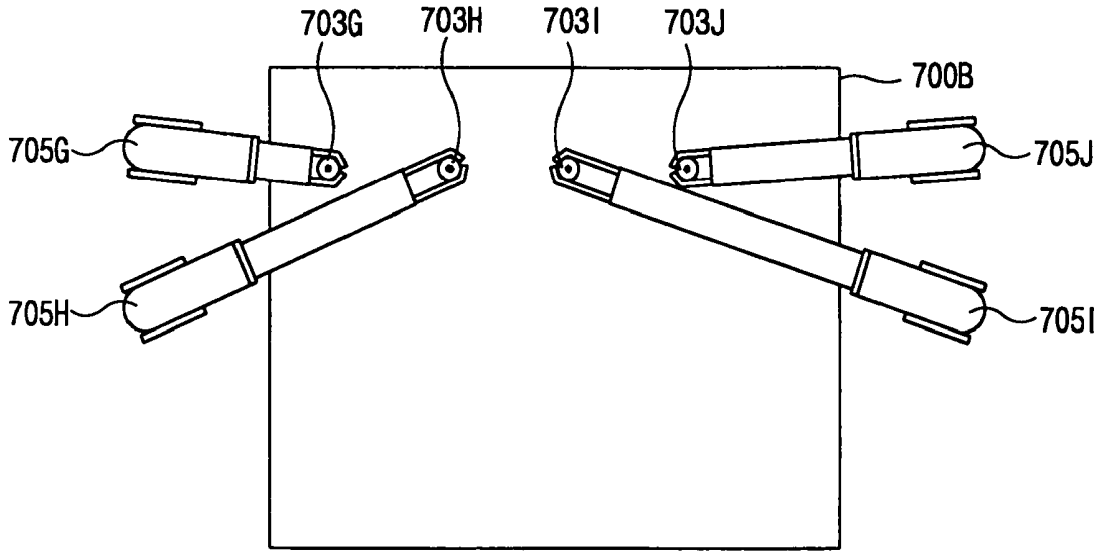

703G
703H
703I
703J
700B
705G
705J
705H
705I

FIG. 7D

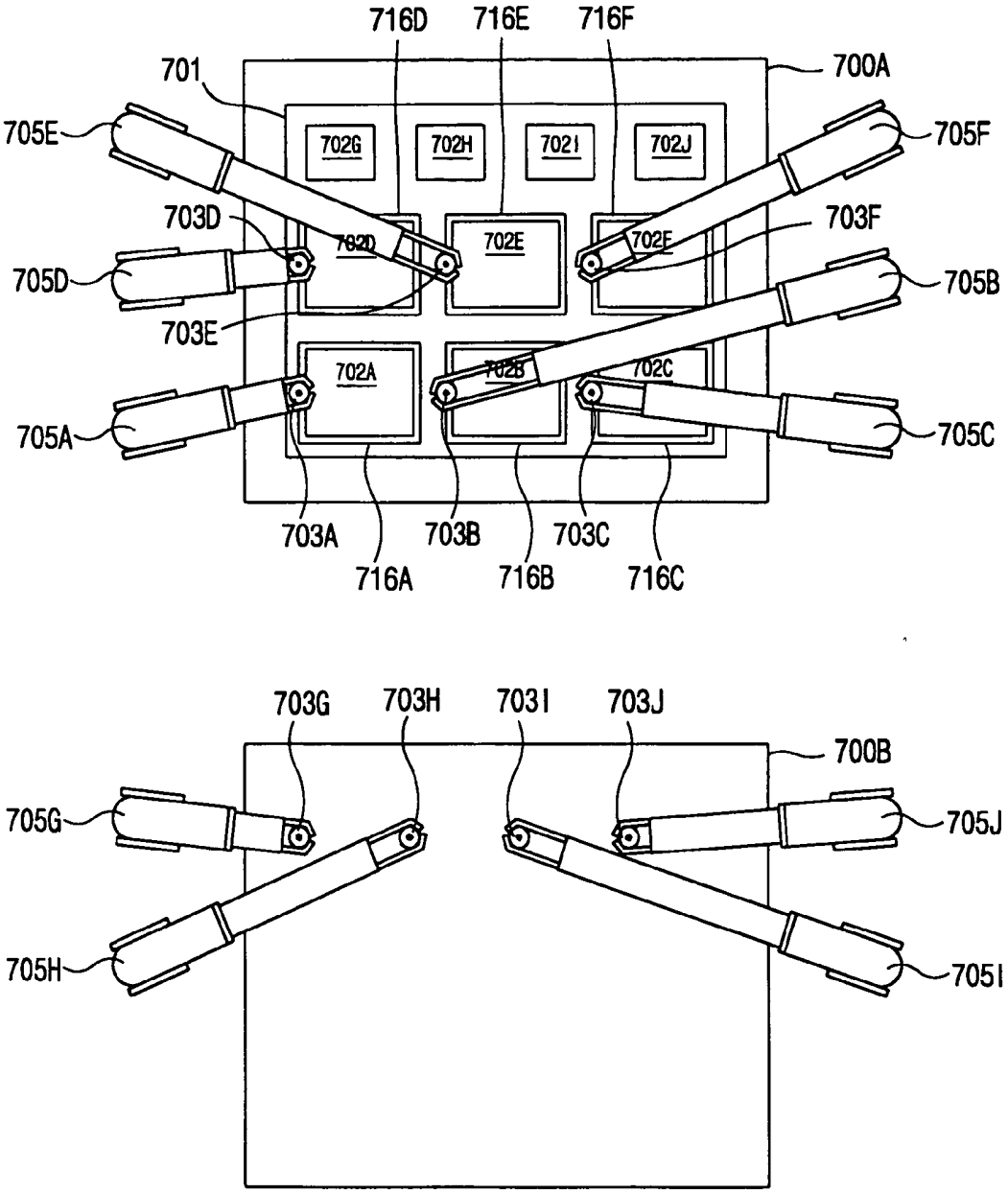

716D
716E
716F
701
700A
705E
705F
702G
702H
702I
702J
703D
703F
702D
702E
702F
705D
705B
703E
702A
702B
702C
705A
705C
703A
703B
703C
716A
716B
716C
703G
703H
703I
703J
700B
705G
705J
705H
705I

FIG. 7E

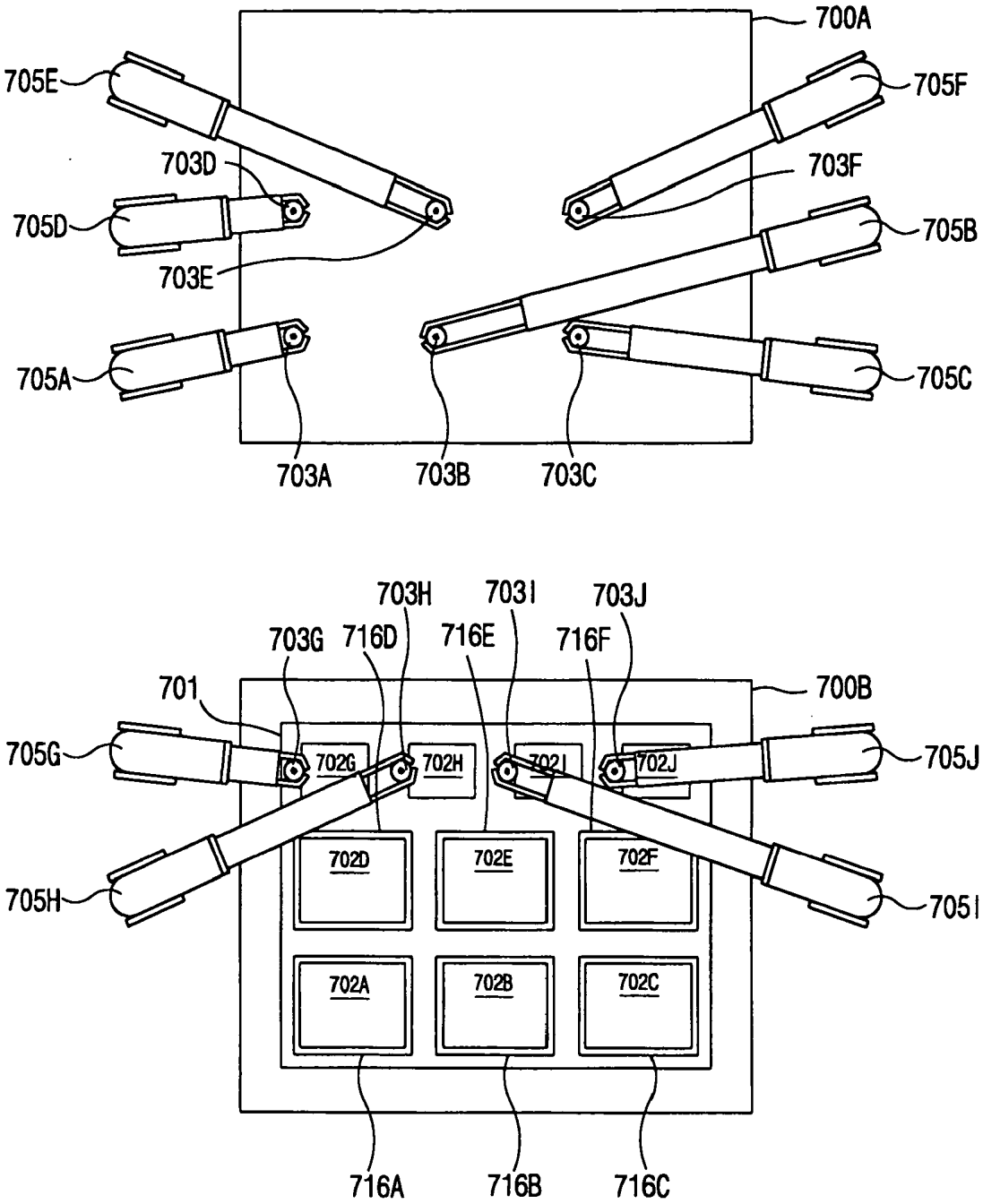

700A
705E
705F
703D
703F
705D
705B
703E
705A
705C
703A
703B
703C
703H
703I
703J
703G
716D
716E
716F
701
700B
705G
705J
702G
702H
702I
702J
702D
702E
702F
705H
705I
702A
702B
702C
716A
716B
716C

FIG. 7F

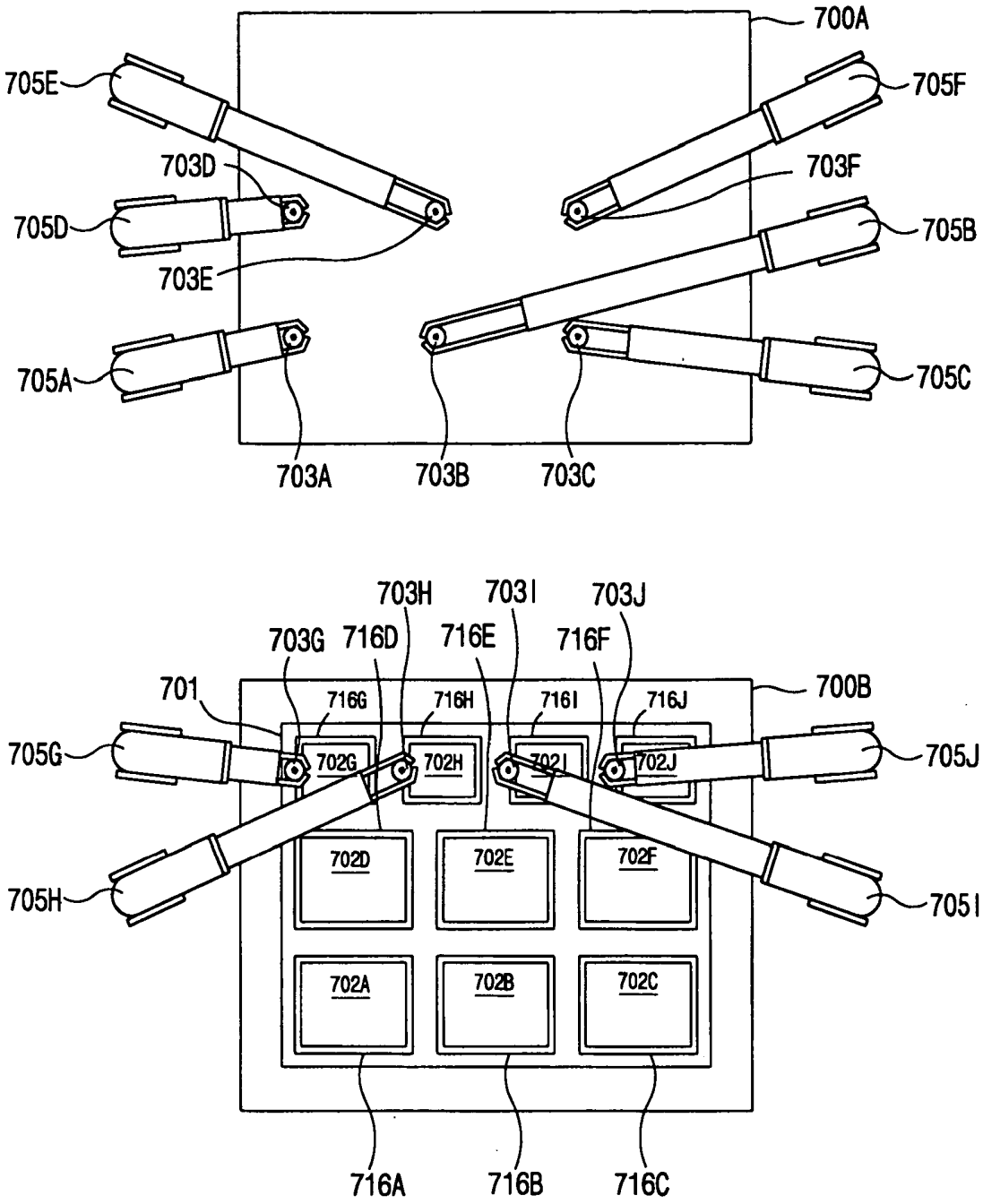

700A
705E
705F
703D
703F
705D
705B
703E
705A
705C
703A
703B
703C
703H
703I
703J
703G
716D
716E
716F
701
716G
716H
716I
716J
700B
705G
705J
702G
702H
702I
702J
702D
702E
702F
705H
705I
702A
702B
702C
716A
716B
716C

FIG. 8

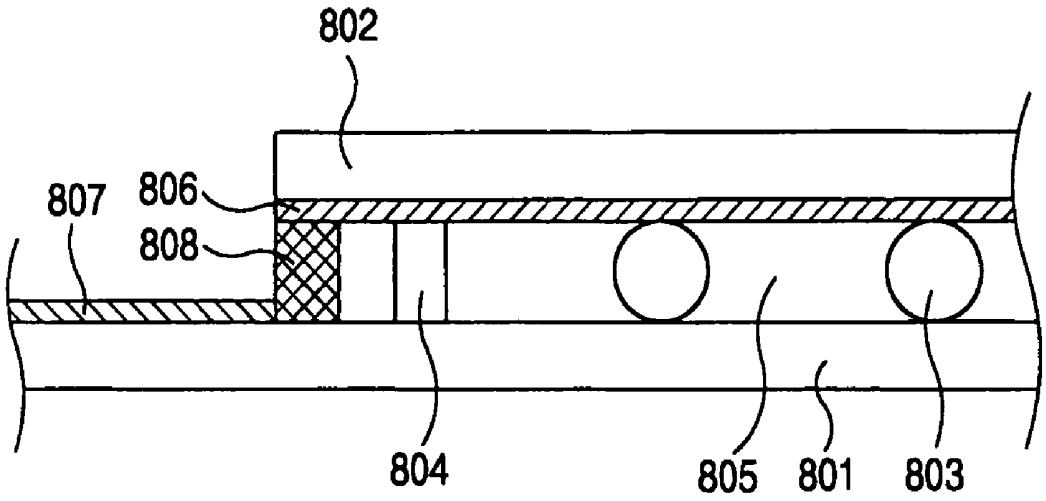
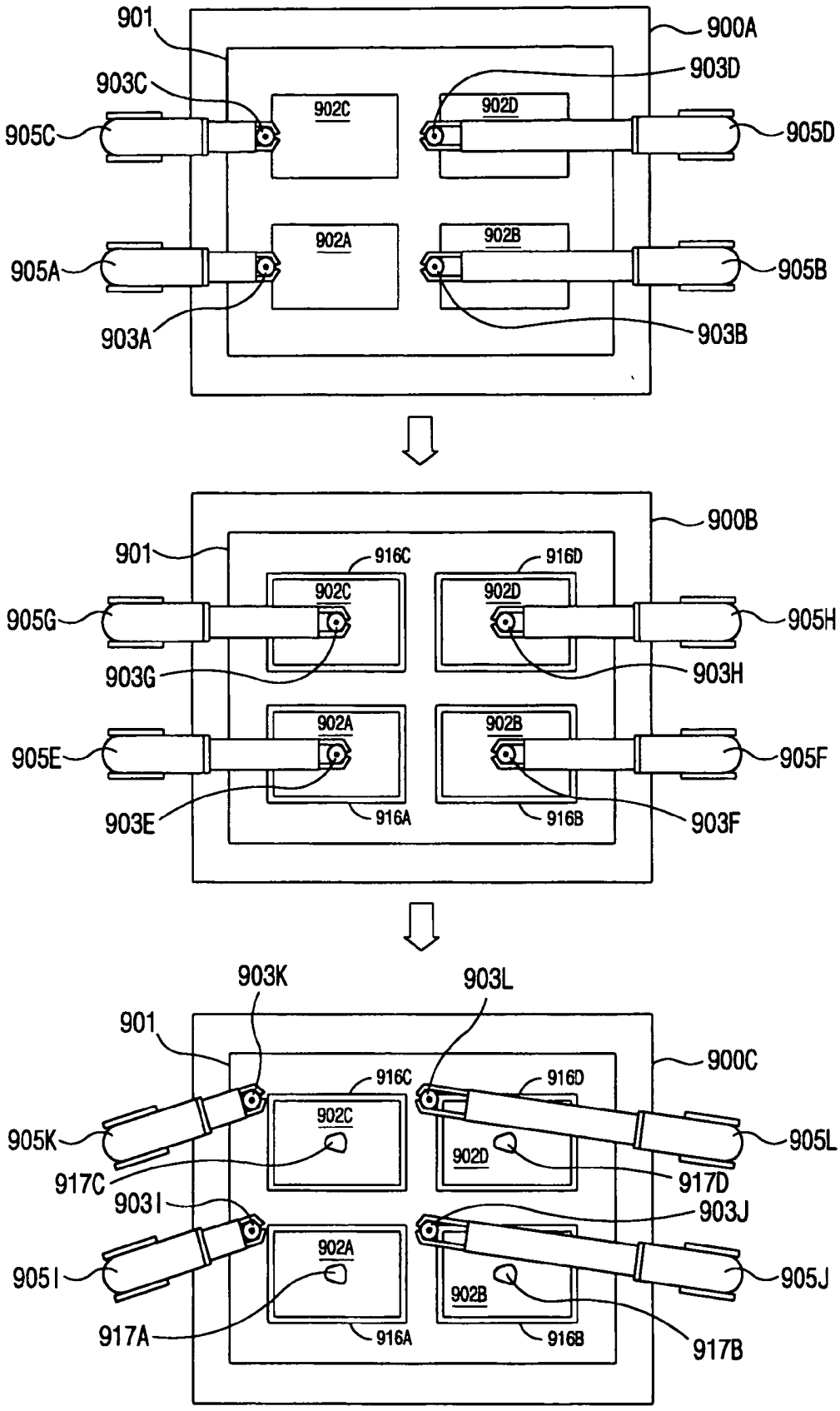


FIG. 9


901
900A
903C
903D
905C
902C
902D
905D
902A
902B
905A
905B
903A
903B
900B
901
916C
916D
902C
902D
905G
905H
903G
903H
902A
902B
905E
905F
903E
916A
916B
903F
903K
903L
901
900C
916C
916D
905K
902C
902D
905L
917C
917D
903I
903J
902A
902B
905I
905J
917A
916A
916B
917B

DISPENSER SYSTEM FOR LIQUID CRYSTAL DISPLAY PANEL, DISPENSING METHOD USING THE SAME, AND METHOD OF FABRICATING LIQUID CRYSTAL DISPLAY PANEL USING DISPENSER SYSTEM AND DISPENSING METHOD

[0001] The present invention application claims the benefit of the Korean Application No. P2002-070489 filed on Nov. 13, 2002, which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a dispenser, a method of using a dispenser, and a method of fabrication, and more particularly, to a dispenser system for a liquid crystal display panel, a dispensing method using a dispenser system, and a method of fabricating a liquid crystal display panel using a dispenser system and a dispensing method.

[0004] 2. Discussion of the Related Art

[0005] In general, operation of a liquid crystal display panel includes individually transmitting data signals according to image information to liquid crystal cells arranged in a matrix configuration, wherein light transmittance of the liquid crystal cells is controlled to display an image. The liquid crystal display device includes a liquid crystal display panel where the liquid crystal cells are arranged in a matrix configuration and a driver integrated circuit (IC) for driving the liquid crystal cells. In addition, the liquid crystal display panel includes a color filter substrate and a thin film transistor array substrate attached to each other, wherein a liquid crystal layer is disposed between the color filter and thin film transistor array substrates.

[0006] The thin film substrate includes data lines and gate lines formed to intersect at right angles, thereby defining a liquid crystal cell at every intersection of the data and gate lines. The data lines transmit data signals supplied from the data driver integrated circuit to the liquid crystal cells, and the gate lines transmit scan signals supplied from the gate driver integrated circuit to the liquid crystal cells. In addition, data pads and gate pads are provided for each of the data and gate lines, respectively. The gate driver integrated circuit sequentially supplies the scan signals to the gate lines to sequentially select the gate lines on a one-by-one basis, and the data signals are supplied to a selected one data line by the data driver integrated circuit.

[0007] A common electrode and a plurality of pixel electrodes are formed along inner surfaces of the color filter and thin film transistor array substrates, respectively, and apply an electric field to the liquid crystal layer. Each of the pixel electrodes is formed at each liquid crystal cell on the thin film transistor array substrate, and the common electrode is integrally formed along the entire inner surface of the color filter substrate. Accordingly, by controlling voltages supplied to the pixel electrode and the common electrode, light transmittance of the liquid crystal cells can be individually controlled. In order to control the voltages supplied to the pixel electrode, a thin film transistor, which functions as a switching device, is formed at each of the liquid crystal cells.

[0008] **FIG. 1** is a plan view of a liquid crystal display panel according to the related art. In **FIG. 1, a** liquid crystal display panel **100** includes an image display part **113** where a plurality of liquid crystal cells are arranged in a matrix configuration, a gate pad part **114** connected to gate lines of the image display part **113**, and a data pad part **115** connected to data lines of the image display part **113**. The gate pad part **114** and the data pad part **115** are formed along an edge region of a thin film transistor array substrate **101**, which does not overlap with a color filter substrate **102**. The gate pad part **114** supplies scan signals from the gate driver integrated circuit to the gate lines of the image display part **113**, and the data pad part **115** supplies image data from the data driver integrated circuit to the data lines of the image display part **113**. In addition, a thin film transistor for switching the liquid crystal cells is provided at the intersection of the data and gate lines. A pixel electrode for driving the liquid crystal cells connected to the thin film transistor is provided on the thin film transistor array substrate **101**, and a passivation film for protecting the pixel electrode and the thin film transistors is formed along an entire surface of the thin film transistor array substrate **101**. Color filters are separately coated at the cell regions using a black matrix, and a common transparent electrode is provided on the color filter substrate **102**. Moreover, a cell gap is formed using a spacer between the thin film transistor array substrate **101** and the color filter substrate **102** when the thin film transistor and color filter substrates **101** and **102** are attached using a seal pattern **116** formed along outer edges of the image display part **113**, thereby forming a unit liquid crystal display panel.

[0009] During fabrication of the unit liquid crystal display panel, simultaneous formation of the unit liquid crystal display panels on a large-scale glass substrate is commonly adopted. Accordingly, a method requires processes for separating the unit liquid crystal display panels from the large-scale glass substrate by cutting and processing the glass substrate with the plurality of liquid crystal display panels formed thereon. Then, liquid crystal material is injected through a liquid crystal injection opening to form a liquid crystal layer within the cell gap that separates the thin film transistor array and color filter substrates **101** and **102**. Next, the liquid crystal injection opening is sealed.

[0010] **FIGS. 2A and 2B** are perspective and sectional views of a seal pattern according to the related art. In **FIGS. 2A and 2B**, a screen printing method includes patterning a screen mask **206** so that a seal pattern forming region is selectively exposed, selectively supplying a sealant **203** onto the substrate **200** using a rubber squeegee **208** through the screen mask **206** to form the seal patterns **216**A~**216**C, and drying the seal patterns **216**A~**216**C by evaporating a solvent contained in the seal patterns **216**A~**216**C and leveling it. The seal patterns **216**A~**216**C formed on the substrate **200** provide for a gap to which liquid crystal material is injected, and prevent leakage of the injected liquid crystal material. Accordingly, the seal patterns **216**A~**216**C are formed along outer edges of the image display parts **213**A~**213**C of the substrate **200** and liquid crystal injection openings **204**A~**204**C are formed at one side of the seal patterns **216**A~**216**C.

[0011] The screen printing method is commonly used because of its convenience, but is disadvantageous in that a significant amount of the sealant **203** is consumed since the sealant **203** is applied along an entire surface of the screen mask **206**, and is printed using the rubber squeegee **208** to form the seal patterns **216**A~**216**C. In addition, the screen

printing method destroys a rubbing of an orientation film (not shown) formed on the substrate **200** as the screen mask **206** and the substrate **200** contact each other, thereby degrading image quality of the liquid crystal display device. Thus, a seal dispensing method has been developed.

[**0012**] **FIG. 3** is a perspective view of another seal pattern according to the related art. In **FIG. 3, a** table **310** is loaded with a substrate **300**, which is moved along forward/backward and left/right directions. A plurality of seal patterns **316**A~**316**C are simultaneously formed along each outer edge of the image display parts **313**A~**313**C of the substrate **300** by applying a certain pressure to a plurality of syringes **301**A~**301**C filled with a sealant, which are aligned and fixed by a support **314**. Since the sealant is selectively supplied only along the outer edges of the image display parts **313**A~**313**C of the substrate **300** to form the plurality of seal patterns **316**A~**316**C, sealant consumption can be reduced. In addition, since the syringes **301**A~**301**C do not contact the orientation film (not shown) of the image display parts **313**A~**313**C of the substrate **300**, the rubbed orientation film will not be damaged and image quality of the liquid crystal display device can be improved. However, the dispensing of the sealant is problematic since is cannot adjust for situations where the substrate **300** has an enlarged area or where a size of the image display parts **313**A~**313**C formed on the substrate **300** changes according to changes of the liquid crystal display panel.

[**0013**] For example, as the liquid crystal display panel is enlarged, the area of the substrate **300** also is increased to fabricate a large-scale liquid crystal display panel. Accordingly, since positions of the seal patterns **316**A~**316**C to be formed on the substrate **300** change, the support **314** and the syringes **301**A~**301**C must be reconfigured to accommodate the larger sized liquid crystal display panel. Likewise, when the liquid crystal display panels change, the area of the image display parts **313**A~**313**C formed on the substrate **300** changes and the positions of the seal patterns **316**A~**316**C change at each of the outer edges of the image display parts **313**A~**313**C. Thus, the support **314** and the syringes **301**A~**301**C must be reconfigured, thereby causing delays in processing time and a degradation of productivity.

SUMMARY OF THE INVENTION

[**0014**] Accordingly, the present invention is directed to a dispenser system for a liquid crystal display panel, a dispensing method using a dispenser system, and a method of fabricating a liquid crystal display device using a dispenser system and a dispensing method that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[**0015**] An object of the present invention is to provide a dispenser system for a liquid crystal display panel that improves productivity and efficiency.

[**0016**] Another object of the present invention is to provide a method of using a dispenser system for a liquid crystal display panel that improves productivity and efficiency.

[**0017**] Another object of the present invention is to provide a method of fabricating a liquid crystal display panel using a dispenser system and a dispensing method that improves productivity and efficiency.

[**0018**] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[**0019**] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, a dispenser system for a liquid crystal display panel includes at least one table upon which a substrate having a plurality of image display parts is loaded, a plurality of syringes each having a nozzle at one end portion for supplying a dispensing material onto the substrate, and a plurality of robot arms having the plurality of syringes arranged at both sides of the table.

[**0020**] In another aspect, a dispensing method for a liquid crystal display panel includes mounting a plurality of syringes each having a nozzle at one end portion at a plurality of robot arms arranged at opposing sides of a table, loading a substrate onto the table, and supplying a dispensing material through the nozzles onto the substrate.

[**0021**] In another aspect, a dispensing method for a liquid crystal display panel includes mounting a plurality of syringes each having a nozzle at one end portion at a plurality of robot arms arranged at opposing sides of first and second tables, loading a substrate having first and second image display parts onto the first table, forming a plurality of first seal patterns along outer edges of the first image display parts by using the syringes, loading the substrate having the first plurality of seal patterns onto the second table, and forming a second plurality of seal patterns along outer edges of the second plurality of image display parts by using the syringes.

[**0022**] In another aspect, a dispensing method for a liquid crystal display panel includes mounting a plurality of syringes each having a nozzle at one end portion at a plurality of robot arms arranged at opposing sides of first, second, and third tables, loading a substrate having a plurality of image display parts onto the first table, forming a plurality of seal patterns along outer edges of the image display parts using the syringes, loading the substrate having the plurality of seal patterns onto the second table, dropping liquid crystal material onto the image display parts using the syringes, loading the substrate having liquid crystal material onto the third table, and forming a plurality of silver dots at the outer edges of the image display parts using the syringes.

[**0023**] In another aspect, a method of fabricating a liquid crystal display panel includes forming a plurality of seal patterns along outer edges of a plurality of image display parts of a first substrate using the a first plurality of syringes, dropping liquid crystal material onto the image display parts using a second plurality of syringes, and forming a plurality of silver dots at the outer edges of the image display parts using a third plurality of syringes.

[**0024**] In another aspect, a method of fabricating a liquid crystal display panel includes mounting a plurality of syringes each having a nozzle at one end portion at a plurality of robot arms arranged at opposing sides of a table, loading a substrate onto the table, and supplying a dispensing material through the nozzles onto the substrate.

[**0025**] 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

[0026] 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. In the drawings:

[0027] **FIG. 1** is a plan view of a liquid crystal display panel according to the related art;

[0028] **FIGS. 2A and 2B** are perspective and sectional views of a seal pattern according to the related art;

[0029] **FIG. 3** is a perspective view of another seal pattern according to the related art;

[0030] **FIG. 4** is a plan view of an exemplary seal dispenser system of a liquid crystal display panel according to the present invention;

[0031] **FIGS. 5A** to **5**C are plan views of an exemplary dispensing method for a liquid crystal display panel according to the present invention;

[0032] **FIGS. 6A** to **6**G are plan views of another exemplary dispensing method for a liquid crystal display panel according to the present invention;

[0033] **FIGS. 7A** to **7**F are plan views of another exemplary dispensing method using a dispensing system for the liquid crystal display panel of **FIGS. 5A** to **5**C according to the present invention;

[0034] **FIG. 8** is a schematic cross sectional of an exemplary edge portion of a liquid crystal display panel according to the present invention; and

[0035] **FIG. 9** is a plan view of an exemplary dispensing method using a dispenser system for a liquid crystal display panel according to the present invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0036] Reference will now be made in detail to the illustrated embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0037] **FIG. 4** is a plan view of an exemplary seal dispenser system of a liquid crystal display panel according to the present invention. In **FIG. 4, a** dispenser system for a liquid crystal display panel may include a substrate **401** upon which a plurality of image display parts **402**A~**402**D may be formed, a table **400** upon which the substrate **401** may be loaded, a plurality of syringes **403**A~**403**D that may contain a sealant, a plurality of nozzles provided at end portions of the syringes **403**A~**403**D supply the sealant along outer edges of the image display parts **402**A~**402**D of the substrate **401** to form a plurality of seal patterns **416**A~**416**D, and a plurality of robot arms **405**A~**405**D each having one of the syringes **403**A~**403**D disposed along sides of the table **400**. The substrate **401** may be a large-scale first glass substrate upon which a plurality of thin film transistor array substrates may be fabricated or may be a large-scale second glass substrate upon which a plurality of color filter substrates may be fabricated.

[0038] As the relative position between the table **400** and the plurality of syringes **403**A~**403**D may change, by moving either the table **400** or the plurality of syringes **403**A~**403**D, the sealant may be supplied through the nozzles to form a plurality of seal patterns **416**A~**416**D on the substrate **401**. However, when the plurality of syringes **403**A~**403**D are moved along horizontal directions, foreign material may be generated by driving of the syringes **403**A~**403**D. Accordingly, the foreign material may be adsorbed onto the image display parts **402**A~**402**D of the substrate **401**. Thus, the table **400** may be moved along horizontal forward/backward and left/right directions.

[0039] The robot arms **405**A~**405**D that include the syringes **403**A~**403**D may be arranged at both sides of the table **400** to correspond with a number of the image display parts **402**A~**402**D formed on the substrate **401**. For example, if the image display parts **402**A~**402**D are formed having an M×N matrix configuration on the substrate **401**, a number of the robot arms **405**A~**405**D may be formed at both sides of the table **400** corresponding to the N-number of columns of the M×N matrix configuration of the image display parts **402**A~**402**D.

[0040] **FIGS. 5A** to **5**C are plan views of an exemplary dispensing method for a liquid crystal display panel according to the present invention. In **FIG. 5A, a** plurality of syringes **503**A~**503**L may be mounted on robot arms **505**A~**505**L, which may be arranged at both sides of a table **500** according to the total number of the plurality of syringes **503**A~**503**L, and may each include nozzle at end portions thereof.

[0041] In **FIG. 5B, a** substrate **501** upon which image display parts **502**A~**502**L may be formed is loaded onto the table **500**.

[0042] In **FIG. 5**C, sealant is supplied through the nozzles provided at end portions of the syringes **503**A~**503**L to form seal patterns **516**A~**516**L along outer edges of the image display parts **502**A~**502**L of the substrate **501**.

[0043] Accordingly, if the syringes **503**A~**503**L are driven to form the seal patterns **516**A~**516**L, foreign material may be generated and adsorbed onto the image display parts **502**A~**502**L of the substrate **501**. Thus, the table **500** may be moved along horizontal forward/backward and left/right directions to form the seal patterns **516**A~**516**L along the outer edges of the image display parts **502**A~**502**L of the substrate **501**. In addition, even if an area of the image display parts **502**A~**502**L changes as an area of the substrate **501** increases or as the liquid crystal display panel changes, the robot arms **505**A~**505**L may easily compensate for the changed areas. Thus, reconfiguration of the dispensing system may not be required, thereby increasing productivity and efficiency.

[0044] **FIGS. 6A** to **6**G are plan views of another exemplary dispensing method for a liquid crystal display panel according to the present invention. In **FIG. 6**A, first to third tables **600**A~**600**C may be independently driven along a convey path of a substrate **601** upon which image display parts **602**A~**602**L may be formed, and a plurality of robot arms **605**A~**605**L may be arranged at both sides of the first

to third tables **600**A~**600**C in pairs. Each of the plurality of syringes **603**A~**603**L may include a nozzle at one end portion thereof, and may be individually-mounted at the robot arms **605**A~**605**L.

[**0045**] In **FIG. 6**B, the substrate **601** upon which image display parts **602**A~**602**L may be formed may be loaded onto the first table **600**A.

[**0046**] In **FIG. 6C, a** first plurality of seal patterns **616**A~**616**D may be formed along outer edges of a first group of image display parts **602**A~**602**D of the plurality of image display parts **602**A~**602**L using a first plurality of syringes **603**A~**603**D mounted on a first plurality of robot arms **605**A~**605**D. Accordingly, if the first plurality of syringes **603**A~**603**D are driven to form the first plurality of seal patterns **616**A~**616**D along the outer edges of the first group of image display parts **602**A~**602**D, foreign material may be generated and adsorbed onto the first group of image display parts **602**A~**602**D of the substrate **601**. Thus, the first table **600**A may be moved along horizontal forward/backward and left/right directions to form the first plurality of seal patterns **616**A~**616**D.

[**0047**] In **FIG. 6**D, the substrate **601** upon which the first plurality of seal patterns **616**A~**616**D have been formed along the outer edges of the first plurality of image display parts **602**A~**602**D may be loaded on the second table **600**B.

[**0048**] In **FIG. 6E, a** second plurality of seal patterns **616**E~**616**H may be formed along outer edges of a second plurality of image display parts **602**E~**602**H of the image display parts **602**A~**602**L using a second plurality of syringes **603**E~**603**H mounted on a second plurality of robot arms **605**E-**605**H which are arranged at both sides of the second table **600**B in pairs. Accordingly, if the second plurality of syringes **603**E~**603**H are driven to form the second plurality of seal patterns **616**E~**616**H along the outer edges of the second plurality of image display parts **602**E~**602**H, foreign material may be generated and adsorbed onto the first and second pluralities of image display parts **602**A~**602**L of the substrate **601**. Thus, the second table **600**B may be moved along horizontal forward/backward and left/right directions to form the second plurality of seal patterns **616**E~**616**H.

[**0049**] In **FIG. 6**F, the substrate **601** upon which the first and second seal patterns **616**A~**616**H may have been formed along the outer edges of the first and second pluralities of image display parts **602**A~**602**H may be loaded onto the third table **600**C.

[**0050**] In **FIG. 6G, a** third plurality of seal patterns **616**I~**616**L may be formed along outer edges of a third plurality of image display parts **602**I~**602**L of the image display parts **602**A~**602**L using a third plurality of syringes **603**I~**603**L mounted on a third plurality of robot arms **605**I~**605**L which may be arranged at both sides of the third table **600**C in pairs. Accordingly, if the third plurality of syringes **603**I~**603**L are driven to form the third plurality of seal patterns **616**I~**616**L along the outer edges of the third plurality of image display parts **602**I~**602**L, foreign material may be generated and adsorbed onto the first, second, and third pluralities of image display parts **602**A~**602**L of the substrate **601**. Thus, the third table **600**C may be moved along horizontal forward/backward and left/right directions to form the third plurality of seal patterns **616**I~**616**L.

[**0051**] Accordingly, the exemplary dispensing method for a liquid crystal display panel of FIGS. **6**A-**6**G may include first, second, and third pluralities of robot arms **601**A~**605**L having first, second, and third pluralities of syringes **603**A~**603**L disposed at both sides of the first to third tables **600**A~**600**C in pairs. In addition, the first to third tables **600**A~**600**C may be independently driven and the first, second, and third pluralities of seal patterns **616**A~**616**L may be formed along the outer edges of the first, second, and third pluralities of image display parts **602**A~**602**L on the substrate **601**.

[**0052**] In addition, the first, second, and third pluralities of robot arms **605**A~**605**L may convey the first, second, and third pluralities of syringes **603**A~**603**L to desired positions on the first to third table **600**A~**600**C. Thus, even if an area of the first, second, and third pluralities of image display parts **602**A~**602**L may change as an area of the substrate **601** increases or as the liquid crystal display panel changes, the first, second, and third pluralities of robot arms **605**A~**605**L may easily accommodate the changes. Therefore, reconfiguration of the dispensing system may not be necessary, thereby increasing productivity and efficiency.

[**0053**] **FIGS. 7A** to **7**F are plan views of another exemplary dispensing method using a dispensing system for the liquid crystal display panel of **FIGS. 5A** to **5**C according to the present invention. In **FIGS. 7A** to **7**F, liquid crystal display panels having different sizes may be simultaneously fabricated using a dispenser system for a liquid crystal display panel according to the present invention.

[**0054**] In **FIG. 7A, a** substrate **701** may include a first plurality of image display parts **702**A~**702**F having a first size and a second plurality of image display parts **702**G~**702**J having a second size different from the first size.

[**0055**] In **FIG. 7B, a** first table **700**A and a second table **700**B may be independently driven along a convey path of the substrate **701** with the first plurality of image display parts **702**A~**702**F having the first size and the second plurality of image display parts **702**G~**702**J having the second size formed thereon. In addition, a first plurality of robot arms **705**A~**705**F may be arranged at both sides of the first table **700**A to correspond to the first plurality of image display parts **702**A~**702**F in pairs, and a second plurality of robot arms **705**G~**705**J may be arranged at both sides of the second table **700**B to corresponding to the second plurality of image display parts **702**G~**702**J in pairs. Moreover, a first plurality of syringes **703**A~**703**J each having a nozzle at one end portion may be provided on the first and second pluralities of robot arms **705**A~**705**J.

[**0056**] In **FIG. 7**C, the substrate **701** upon which the first plurality of image display parts **702**A~**702**F having the first size and the second plurality of image display parts **702**G~**702**J having the second size may be loaded on the first table **700**A.

[**0057**] In **FIG. 7D, a** first plurality of seal patterns **716**A~**716**F may be formed along the outer edges of the first plurality of image display parts **702**A~**702**F using the first plurality of syringes **703**A~**703**F provided on the first plurality of robot arms **705**A~**705**F at both sides of the first table **700**A in groups of three. Accordingly, if the first plurality of syringes **703**A~**703**F are driven to form the first plurality of seal patterns **716**A~**716**F, foreign material may

be generated and adsorbed onto the first plurality of image display parts **702**A~**702**J of the substrate **701**. Thus, the first table **700**A may be moved along horizontal forward/backward and left/right directions to form the first plurality of seal patterns **716**A~**716**F.

[**0058**] In **FIG. 7**E, the substrate **701** upon which the first plurality of seal patterns **716**A~**716**F may have been formed along the outer edges of the first plurality of image display parts **702**A~**702**F may be loaded on the second table **700**B.

[**0059**] In **FIG. 7F, a** second plurality of seal patterns **716**G~**716**J may be formed along outer edges of a second plurality of image display parts **702**G~**702**J using a second plurality of syringes **703**G~**703**J provided on a second plurality of robot arms **705**G~**705**J that may be arranged at both sides of the second table **700**B in pairs. Accordingly, if the second plurality of syringes **703**G~**703**J are driven to form the second plurality of seal patterns **716**G~**716**J, foreign material may be generated and adsorbed onto the first and second pluralities of image display parts **702**A~**702**J of the substrate **701**. Thus, the second table **700**B may be moved along horizontal forward/backward and left/right directions to form the second plurality of seal patterns **716**G~**716**J.

[**0060**] **FIG. 8** is a schematic cross sectional of an exemplary edge portion of a liquid crystal display panel according to the present invention. In **FIG. 8, a** liquid crystal display panel may be formed such that a thin film transistor array substrate **801** and a color filer substrate **802** are attached in a facing manner having a gap provided by a spacer **803** and a seal pattern **804**, wherein a liquid crystal layer **805** may be formed within the gap between the thin film transistor array substrate **801** and the color filter substrate **802**. The thin film transistor array substrate **801** may be provided to protrude from the color filter substrate **802**, wherein a gate pad part connected to gate lines of the thin film transistor array substrate **801** and a data pad part connected to data lines of the thin film transistor array substrate **801** may be formed on the protrusion of the thin film transistor array substrate **801**.

[**0061**] Within an image display part of the thin film transistor array substrate **801**, gate lines that receive scan signals via the gate pad part and data lines that receive image data via the data pad part may be arranged to intersect each other, wherein a thin film transistor for switching the liquid crystal cells may be formed at each of the intersections. In addition, a pixel electrode connected to the thin film transistor may be formed within the image display part of the thin film transistor array substrate **801**.

[**0062**] Within an image display part of the color filter substrate **802**, color filters may be provided at cell regions defined by a black matrix, and a common transparent electrode for driving the liquid crystal layer together with the pixel electrode may be formed on the color filter substrate **802**. A common voltage line **807** for supplying a common voltage to the common electrode **806** may be formed on the thin film transistor array substrate **801**. Accordingly, a silver (Ag) dot **808** may be formed either on the thin film transistor array substrate **801** or on the color filter substrate **802** to electrically interconnect the common voltage line **807** and the common electrode **806**. Thus, the common voltage supplied to the common voltage line **807** may be supplied to the common electrode **806** using the silver dot **808**. At least one or more silver dots **808** may be formed at each of the plurality of unit liquid crystal display panels fabricated on a large-scale glass substrate, which may be also formed by using the dispenser system for a liquid crystal display panel according to the present invention. For example, a plurality of syringes filled with silver material may be provided at a plurality of robot arms arranged at both sides of a table. Then, the silver material may be supplied through a nozzle provided at each end portion of the plurality of syringes while moving the table along horizontal directions, thereby forming the silver dots **808** along outer edges of a plurality of image display parts formed on the substrate.

[**0063**] When forming the silver dots **808** along the outer edges of the plurality of image display parts formed on the substrate using a dispenser system of a liquid crystal display panel according to the present invention, the robot arms may convey the syringes to desired positions on the table. Thus, even if an area of the image display parts changes as an area of the substrate **501** increases or as the liquid crystal display panel changes, the robot arms may easily accommodate the changes.

[**0064**] **FIG. 9** is a plan view of an exemplary dispensing method using a dispenser system for a liquid crystal display panel according to the present invention. In **FIG. 9**, first to third tables **900**A~**900**C may be provided to be independently driven along a convey path of a substrate **901** having a plurality of image display parts **902**A~**902**D formed thereon, and a plurality of robot arms **905**A~**905**L may be provided at both sides of the first to third tables **900**A~**900**C in pairs. In addition, a plurality of syringes **903**A~**903**L each having a nozzle provided at each one end portion may be provided on the robot arms **905**A~**905**L.

[**0065**] Although formation of the image display parts **902**A~**902**D is shown in a 2-lines×2-columns matrix configuration, a plurality of image display parts **902**A~**902** having a matrix configuration of M-lines×N-columns may be formed on the substrate **901**, according to which the number of robot arms **905**A~**905**L and the number of syringes **903**A~**903**L may differ accordingly.

[**0066**] The syringes **903**A~**903**L may include one of a sealant material, a liquid crystal material, and a silver material. For example, a first plurality of syringes **903**A~**903**D provided on a first plurality of robot arms **905**A~**905**D corresponding to the first table **900**A may include the sealant material, a second plurality of syringes **903**E~**903**H provided on a second plurality of robot arms **905**E~**905**H corresponding to the second table **900**B may include the liquid crystal material, and a third plurality of syringes **903**I~**903**L provided on a third plurality of robot arms **905**I~**905**L corresponding to the third table **900**C may include the silver material. Accordingly, productivity and efficiency of a liquid crystal display panel may be improved.

[**0067**] When the substrate **901** upon which the image display parts **902**A~**902**D are formed is loaded onto the first table **900**A, the seal patterns **916**A~**916**D may be formed along outer edges of the image display parts **902**A~**902**D using the first plurality of syringes **903**A~**903**D provided on the first plurality of robot arms **905**A~**905**D provided at both sides of the first table **900**A in pairs. Accordingly, when the first plurality of syringes **903**A~**903**D are driven to form the seal patterns **916**A~**916**D, foreign material may be generated and adsorbed onto the image display parts **902**A~**902**D

of the substrate **901**. Thus, the first table **900**A may be moved along horizontal forward/backward and left/right directions to form the seal patterns **916**A~**916**D.

[**0068**] When the substrate **901** upon which the seal patterns **916**A~**916**D have been formed along the outer edges of the image display parts **902**A~**902**D is loaded on the second table **900**B, the liquid crystal material may be dropped onto the image display parts **902**A~**902**D using the second plurality of syringes **903**E~**903**H provided on a second plurality of robot arms **905**E~**905**H provided at both sides of the second table **900**B in pairs.

[**0069**] When the substrate **901** upon which the liquid crystal material **917**A~**917**D have been dropped onto the image display parts **902**A~**902**D is loaded on the third table **900**C, silver dots may be formed along the outer edges of the image display parts **902**A~**902**D using the third plurality of syringes **903**I~**903**L provided on a third plurality of robot arms **905**I~**905**L provided at both sides of the third table **900**C in pairs. In addition, although not shown, at least one silver dot may be formed at each of the outer edges of the image display parts **902**A~**902**D, and a plurality of silver dots may be formed according to signal characteristics.

[**0070**] It will be apparent to those skilled in the art that various modifications and variations can be made in the dispenser system for a liquid crystal display panel, a dispensing method using a dispenser system, and a method of fabricating a liquid crystal display panel using a dispenser system and a dispensing method of the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers 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 dispenser system for a liquid crystal display panel, comprising:

at least one table upon which a substrate having a plurality of image display parts is loaded;

a plurality of syringes each having a nozzle at one end portion for supplying a dispensing material onto the substrate; and

a plurality of robot arms having the plurality of syringes arranged at both sides of the table.

2. The system according to claim 1, wherein a plurality of thin film transistor array substrates are formed on the substrate.

3. The system according to claim 1, wherein a plurality of color filter substrates are formed on the substrate.

4. The system according to claim 1, wherein the plurality of image display parts include at least two groups each having different sizes.

5. The system according to claim 1, wherein the table is moved along horizontal forward/backward and left/right directions.

6. The system according to claim 1, wherein the dispensing material is a sealant material.

7. The system according to claim 1, wherein the dispensing material is a liquid crystal material.

8. The system according to claim 1, wherein the dispensing material is a silver material.

9. The system according to claim 1, wherein the image display parts have a matrix configuration.

10. A method of fabricating a liquid crystal display panel using the dispenser system according to claim 1, comprising moving the table along horizontal forward/backward and left/right directions.

11. A dispensing method for a liquid crystal display panel, comprising:

mounting a plurality of syringes each having a nozzle at one end portion at a plurality of robot arms arranged at opposing sides of a table;

loading a substrate onto the table; and

supplying a dispensing material through the nozzles onto the substrate.

12. The method according to claim 11, wherein the dispensing material is one of a sealant material, a liquid crystal material, and a silver material.

13. A dispensing method for a liquid crystal display panel, comprising:

mounting a plurality of syringes each having a nozzle at one end portion at a plurality of robot arms arranged at opposing sides of first and second tables;

loading a substrate having first and second image display parts onto the first table;

forming a plurality of first seal patterns along outer edges of the first image display parts by using the syringes;

loading the substrate having the first plurality of seal patterns onto the second table; and

forming a second plurality of seal patterns along outer edges of the second plurality of image display parts by using the syringes.

14. The method according to claim 13, wherein the first plurality of image display parts each have a first size and the second plurality of image display parts each have a second size different from the first size.

15. A dispensing method for a liquid crystal display panel, comprising:

mounting a plurality of syringes each having a nozzle at one end portion at a plurality of robot arms arranged at opposing sides of first, second, and third tables;

loading a substrate having a plurality of image display parts onto the first table;

forming a plurality of seal patterns along outer edges of the image display parts using the syringes;

loading the substrate having the plurality of seal patterns onto the second table;

dropping liquid crystal material onto the image display parts using the syringes;

loading the substrate having liquid crystal material onto the third table; and

forming a plurality of silver dots at the outer edges of the image display parts using the syringes.

16. A method of fabricating a liquid crystal display panel using the dispensing method according to claim 15.

17. A method of fabricating a liquid crystal display panel, comprising:

forming a plurality of seal patterns along outer edges of a plurality of image display parts of a first substrate using the a first plurality of syringes;

dropping liquid crystal material onto the image display parts using a second plurality of syringes; and

forming a plurality of silver dots at the outer edges of the image display parts using a third plurality of syringes.

18. A method of fabricating a liquid crystal display panel, comprising:

mounting a plurality of syringes each having a nozzle at one end portion at a plurality of robot arms arranged at opposing sides of a table;

loading a substrate onto the table; and

supplying a dispensing material through the nozzles onto the substrate.

19. The method according to claim 18, wherein the dispensing material is one of a sealant material, a liquid crystal material, and a silver material.

* * * * *

专利名称(译)	用于液晶显示面板的分配器系统，使用该分配器的分配方法，以及使用分配器系统和分配方法制造液晶显示面板的方法		
公开(公告)号	US20040090591A1	公开(公告)日	2004-05-13
申请号	US10/691662	申请日	2003-10-24
[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG.飞利浦液晶CO.，LTD		
当前申请(专利权)人(译)	LG DISPLAY CO.，LTD.		
[标]发明人	JUNG SUNG SU		
发明人	JUNG, SUNG-SU		
IPC分类号	G02F1/13 G02F1/1333		
CPC分类号	G02F2001/13415 G02F1/133351		
优先权	1020020070489 2002-11-13 KR		
其他公开文献	US7592034		
外部链接	Espacenet USPTO		

摘要(译)

一种用于液晶显示板的分配器系统，包括至少一个工作台，其上装有具有多个图像显示部件的基板，多个注射器，每个注射器在一个端部具有喷嘴，用于将分配材料供应到基板上，以及多个机器人臂，其中多个注射器设置在桌子的两侧。