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Kuo et al.

(54) **BACK FRAME, BACKLIGHT SYSTEM, AND FLAT LIQUID CRYSTAL DISPLAY DEVICE**

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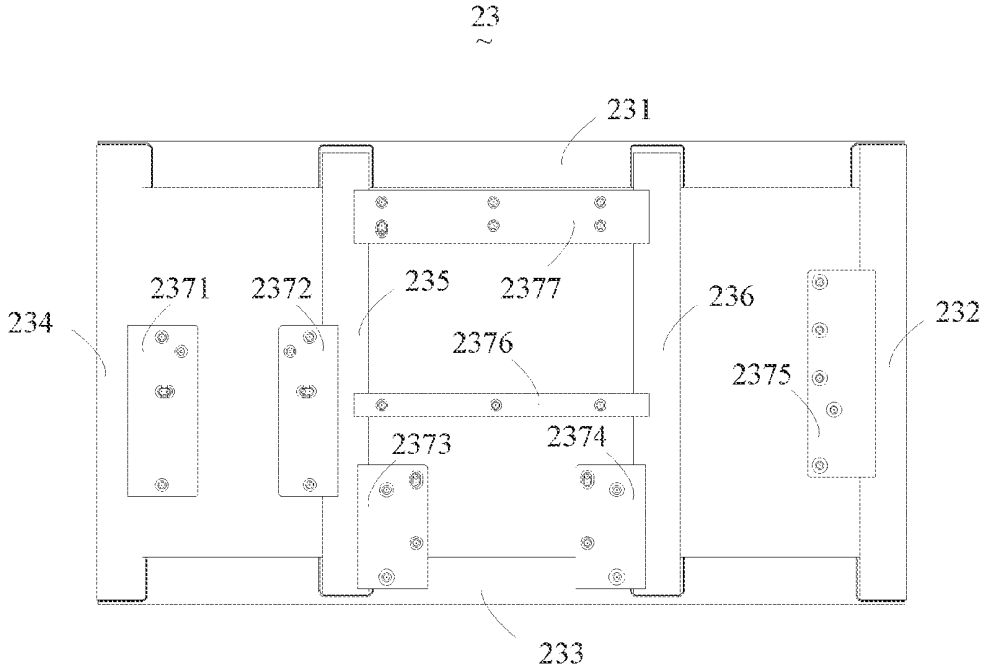
(52) **U.S. Cl.**

USPC **362/97.2**; 362/97.1; 211/26

(57) **ABSTRACT**

The present invention provides a back frame, which includes at least first and second primary assembling pieces. The at least two primary assembling pieces are joined to form the back frame. The primary assembling pieces have a vertical section, and the vertical section realizes mating between the back frame and an intermediate frame and a front frame of the flat panel display device. The present invention provides a back frame, a backlight system, and a flat liquid crystal display device that use a fastener extending through a mating hole of a vertical section of the primary assembling piece and a through hole of an intermediate frame and a through hole of a front frame of the flat liquid crystal display device to fix the back frame and the front frame and the intermediate frame of the flat liquid crystal display device together, making the entire frame structure of the flat liquid crystal display device more stable.



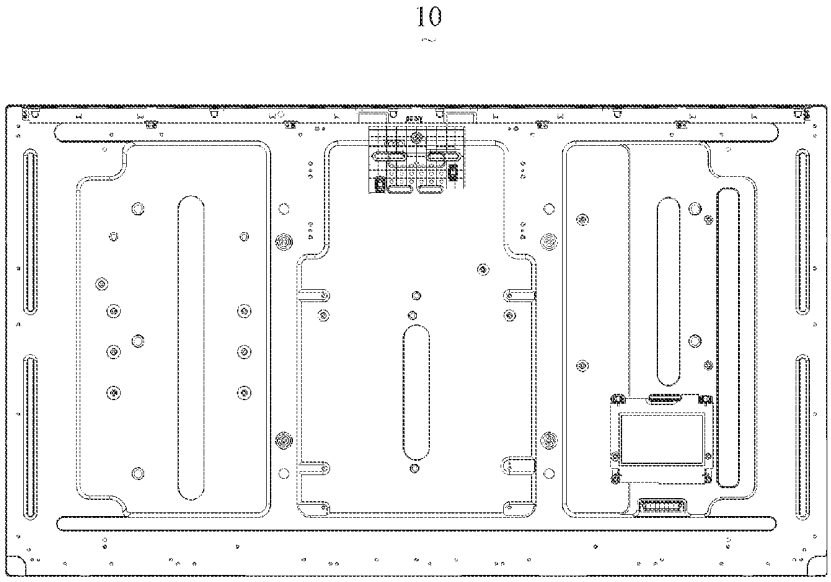


FIG. 1 (Prior Art)

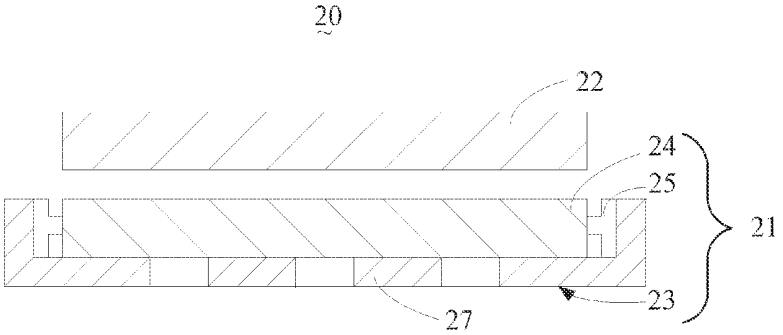


FIG. 2

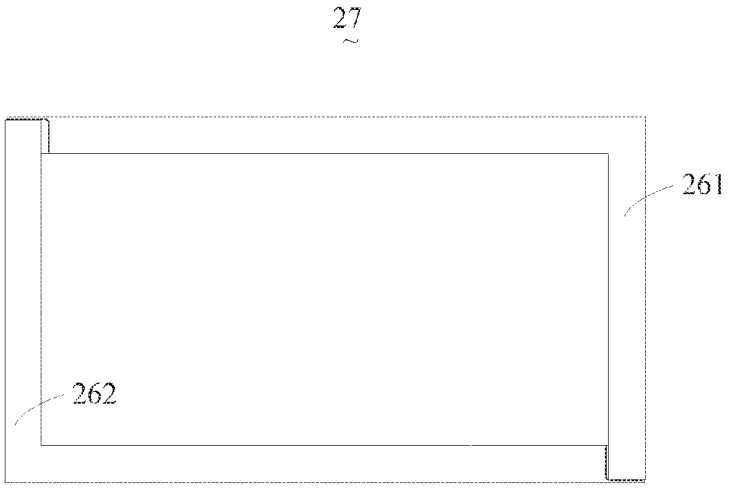


FIG. 3

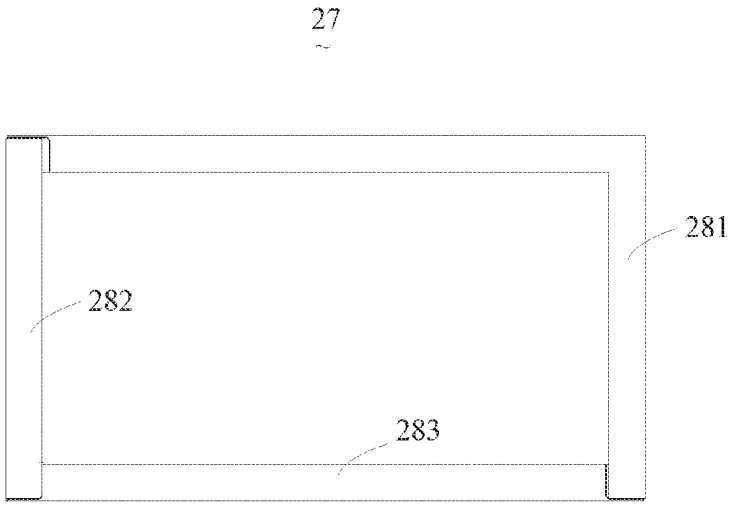
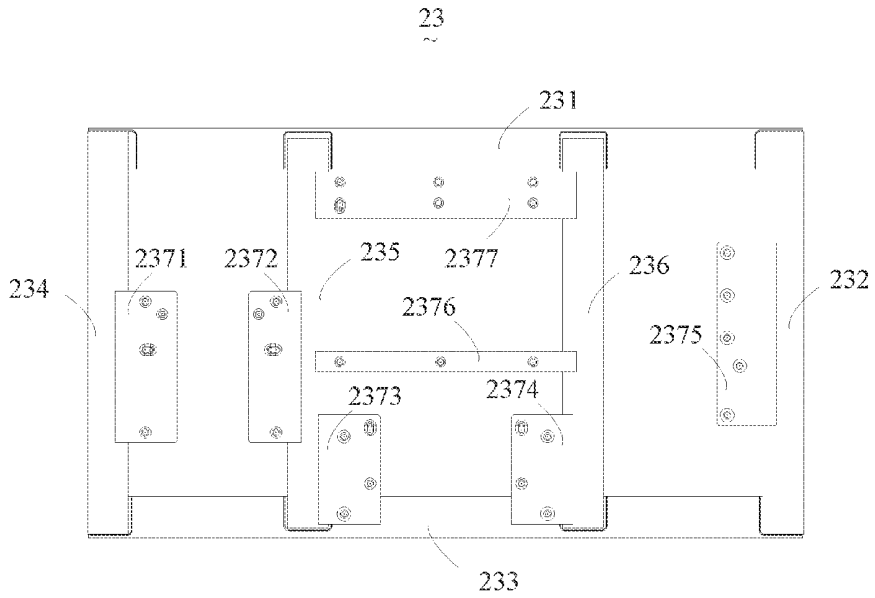


FIG. 4


23
231
2371
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235
2377
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2376
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2373
2374
233

FIG. 5

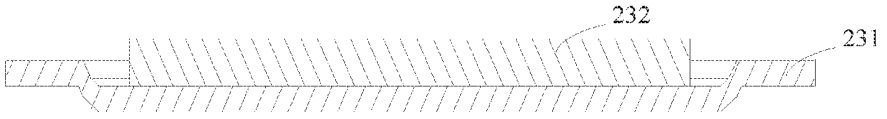
232
231

FIG. 6

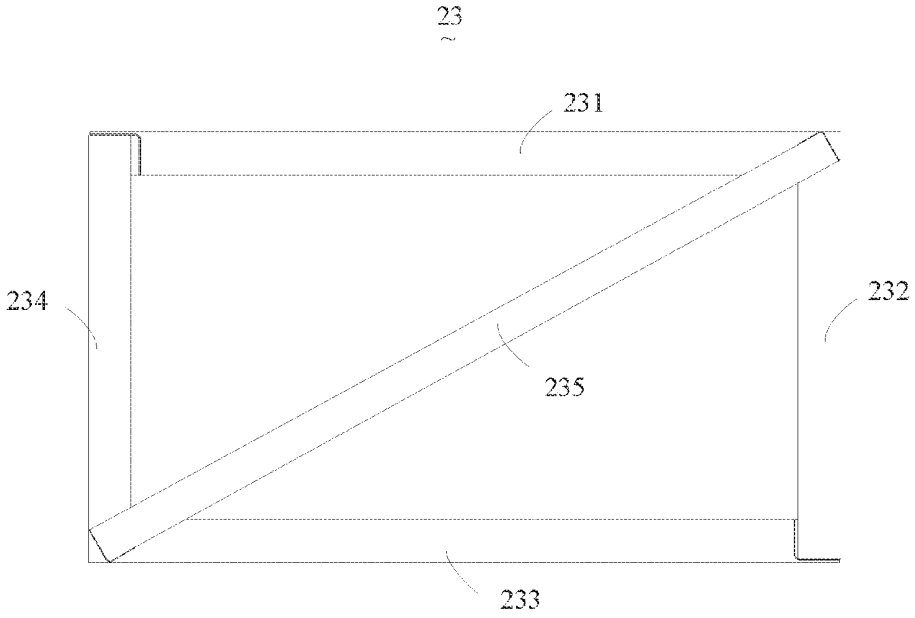

FIG. 7

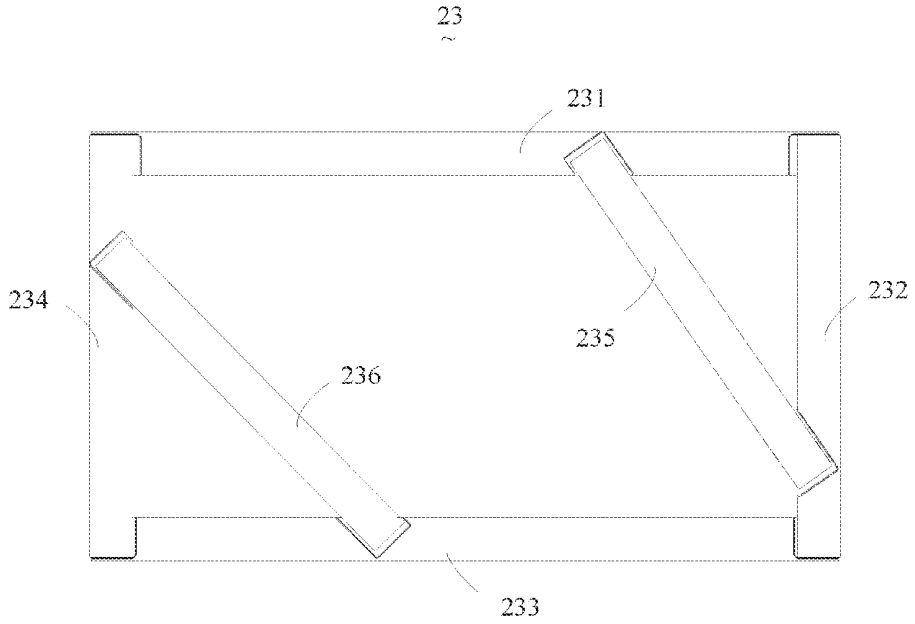

FIG. 8

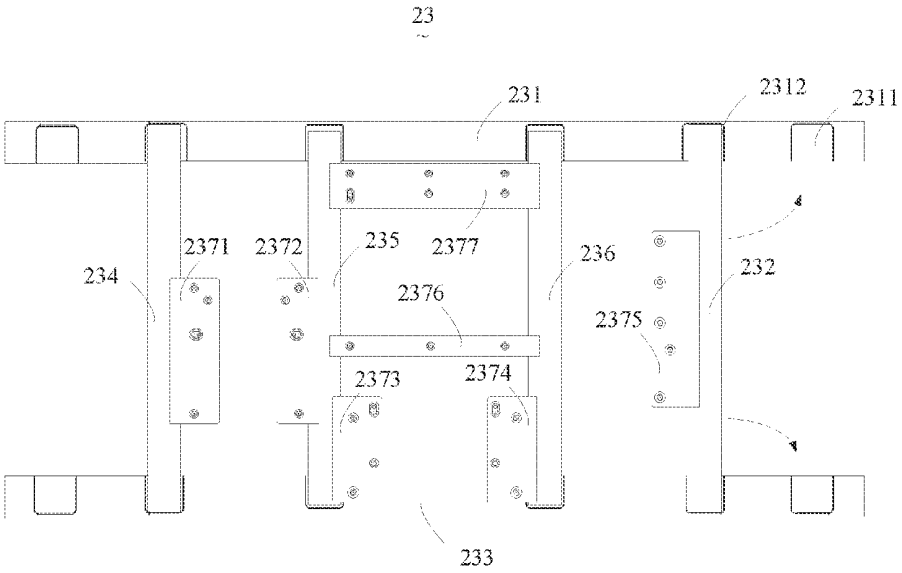

FIG. 9

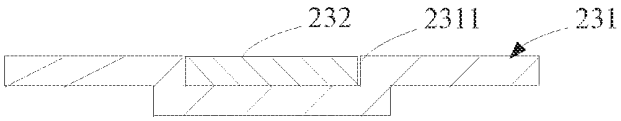

FIG. 10

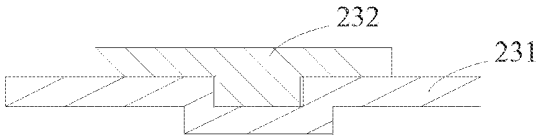

FIG. 11

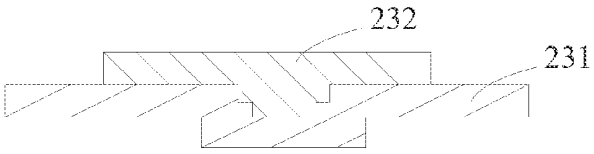

FIG. 12

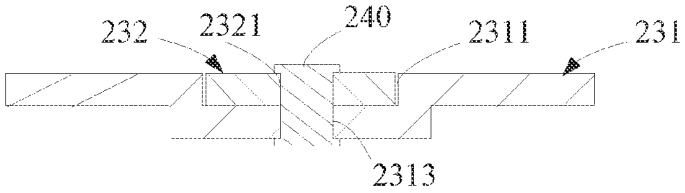

FIG. 13

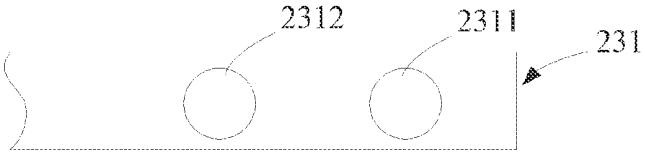

FIG. 14

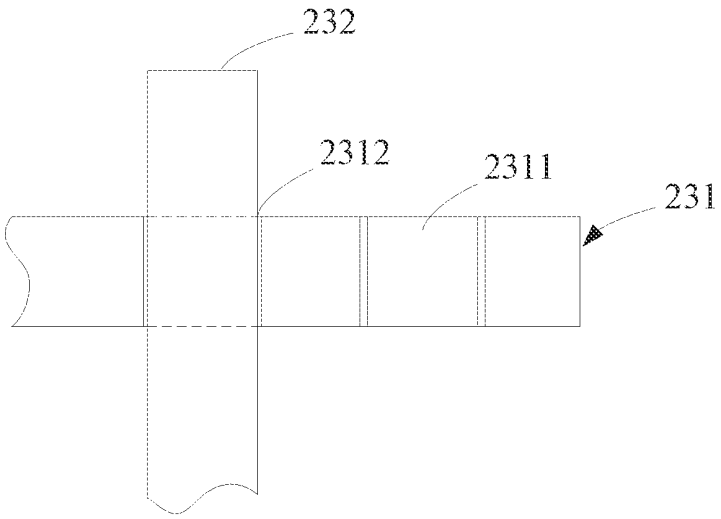
232
2312
2311
231

FIG. 15

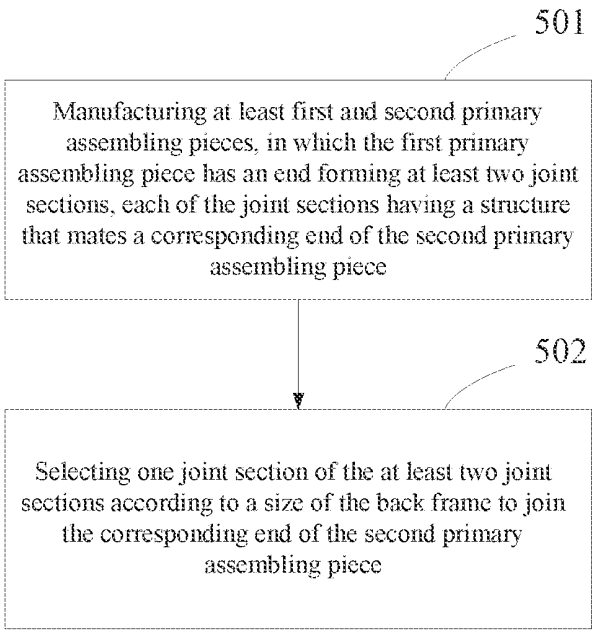
501
Manufacturing at least first and second primary assembling pieces, in which the first primary assembling piece has an end forming at least two joint sections, each of the joint sections having a structure that mates a corresponding end of the second primary assembling piece
502
Selecting one joint section of the at least two joint sections according to a size of the back frame to join the corresponding end of the second primary assembling piece

FIG. 16

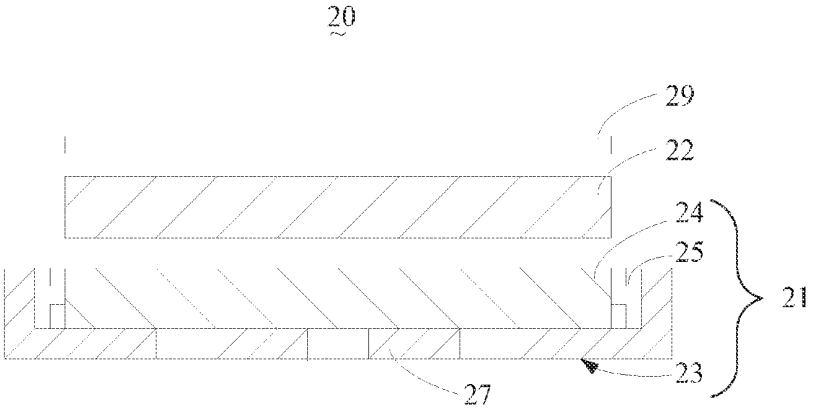

FIG. 17

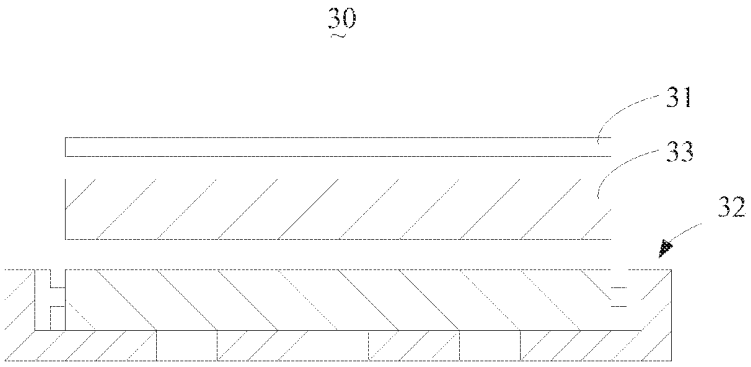

FIG. 18

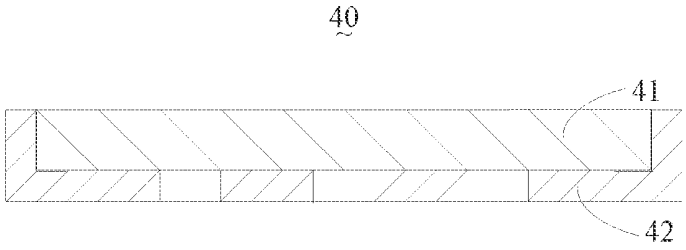

FIG. 19

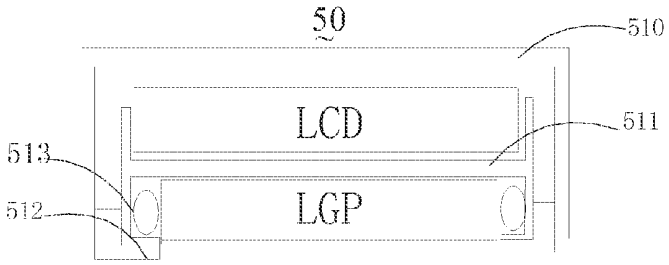

FIG. 20

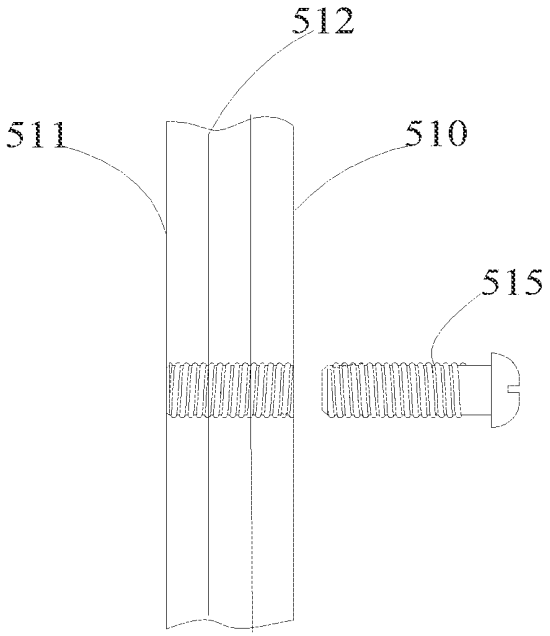

FIG. 21

BACK FRAME, BACKLIGHT SYSTEM, AND FLAT LIQUID CRYSTAL DISPLAY DEVICE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to the field of displaying techniques, and in particular to a back frame, a backlight system, and a flat liquid crystal display device.

[0003] 2. The Related Arts

[0004] The state-of-the-art liquid crystal display device comprises a front bezel, a panel, and a backlight module, of which the backlight module comprises a back frame, a reflector plate, a light guide, and a lighting assembly.

[0005] Currently, a variety of display panels of different sizes are available in the market to meet different needs of general consumers. For example, in the field of television set, the sizes of liquid crystal panels include 31.5, 42, 46, 48, and 55 inches. Different back frame molds are provided for liquid crystal planes of different sizes.

[0006] Referring to FIG. **1**, FIG. **1** is a schematic view showing a conventional back frame of liquid crystal display device. As shown in FIG. **1**, the conventional back frame **10** is a unitary back frame, and it is often that a unitary back frame **10** is made with metal stamping or plastic injection molding. The unitary back frame **10** consumes much material and has a high material cost. Further, a large-sized back frame **10** requires large-sized stamping equipment, and the size of mold corresponding to such a back frame **10** is large and the structure complicated, making the expenditure of the back frame mold high. As a consequence, the conventional back frame is of a high cost.

[0007] In the known techniques, a front frame, an intermediate frame, and a back frame of a flat panel display device are separate and are assembled together one by one and are not unitarily secured. This leads to a relatively loose entire frame structure of the flat panel display device.

SUMMARY OF THE INVENTION

[0008] The technical issue to be addressed by the present invention is to provide a back frame, a backlight system, and a flat liquid crystal display device, which make an entire frame structure of the flat panel display device more stable.

[0009] To address the above technical issue, the present invention adopts a technical solution that provides a back frame of flat panel display device. The back frame comprises at least first and second primary assembling pieces, the at least two primary assembling pieces being joined to form the back frame, the primary assembling pieces having a vertical section, the vertical section realizing mating between the back frame and an intermediate frame and a front frame of the flat panel display device.

[0010] Wherein, the first primary assembling piece has an end forming at least two joint sections, each of the joint sections having a structure mating an end of the second primary assembling piece, the first primary assembling piece using one of the joint sections to join the corresponding end of the second primary assembling piece.

[0011] Wherein, the at least two joint sections are arranged to space from each other in a lengthwise direction of the first primary assembling piece.

[0012] Wherein, the joint sections comprise recesses formed in a surface of the first primary assembling piece and having a shape corresponding to the end of the second primary assembling piece for receiving the end of the second primary assembling piece.

[0013] Wherein, the joint sections comprise recesses formed in a surface of the first primary assembling piece, the second primary assembling piece having a surface forming protrusions at corresponding positions, the protrusions being receivable in the recesses to join the first primary assembling piece and the second primary assembling piece to each other.

[0014] Wherein, the back frame comprises a third primary assembling piece and a fourth primary assembling piece; and the first primary assembling piece, the second primary assembling piece, the third primary assembling piece, and the fourth primary assembling piece are joined to each other to form the back frame.

[0015] To address the above technical issue, the present invention adopts a technical solution that provides a backlight system, which comprises a light source, a light homogenization mechanism, and a back frame as described in any of the above embodiments; and the back frame carries the light source and the light homogenization mechanism.

[0016] To address the above technical issue, the present invention adopts a technical solution that provides a flat liquid crystal display device. The flat liquid crystal display device comprises a liquid crystal panel, a front frame, a back panel, and a backlight system as described above. The backlight system further comprises an intermediate frame.

[0017] Wherein, a vertical section of the front frame, a vertical section of an intermediate frame, and a vertical section of the primary assembling piece partially or completely overlap each other.

[0018] Wherein, the vertical section forms a mating hole.

[0019] Wherein, the vertical section of the front frame, the vertical section of the intermediate section, and the mating hole of the vertical section of the primary assembling piece form through holes at corresponding locations.

[0020] Wherein, a fastener is received through the through hole of the vertical section of the front frame, the through hole of the vertical section of the intermediate frame, and the mating hole of the vertical section of the primary assembling piece to fix the front frame, the intermediate frame, and the back frame together.

[0021] The efficacy of the present invention is that to be distinguished from the state of the art, the present invention provides a back frame, a backlight system, and a flat liquid crystal display device that form vertical sections on two primary assembling pieces with the vertical sections forming mating holes corresponding to through holes defined in a front frame and an intermediate frame of the flat liquid crystal display device and uses a fastener extending through the through hole of the front frame, the through hole of the intermediate frame, and the through hole of the back frame to fix the front frame, the intermediate frame, and the back frame together, making the entire frame structure of the flat liquid crystal display device more stable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. **1** is a schematic view showing a conventional back frame of liquid crystal display device;

[0023] FIG. **2** is a schematic view showing a first embodiment of a flat panel display device according to the present invention;

[0024] FIG. **3** is a schematic view showing a first embodiment of a back frame of flat panel display device according to the present invention;

[0025] FIG. **4** is a schematic view showing a second embodiment of a back frame of flat panel display device according to the present invention;

[0026] FIG. **5** is a schematic view showing a third embodiment of a back frame of flat panel display device according to the present invention;

[0027] FIG. **6** is a schematic view showing a joining arrangement of a first embodiment of a flat panel display device according to the present invention;

[0028] FIG. **7** is a schematic view showing a diagonally-arranged first secondary assembling piece mounted to a main frame structure of a second embodiment of a flat panel display device according to the present invention;

[0029] FIG. **8** is a schematic view showing a first secondary assembling piece and a second secondary assembling piece mounted to a main frame structure of a third embodiment of a flat panel display device according to the present invention;

[0030] FIG. **9** is a schematic view showing a first embodiment of joint sections of a back frame of flat panel display device according to the present invention;

[0031] FIG. **10** is a cross-sectional view showing the first embodiment of the joint section of FIG. **9**;

[0032] FIG. **11** is a schematic view showing a second embodiment of a joining arrangement of a joint section of a back frame of a flat panel display device according to the present invention;

[0033] FIG. **12** is a schematic view showing a third embodiment of a joining arrangement of a joint section of a back frame of a flat panel display device according to the present invention;

[0034] FIG. **13** is a schematic view showing a fourth embodiment of a joining arrangement of a joint section of a back frame of a flat panel display device according to the present invention;

[0035] FIG. **14** is a schematic view showing a second embodiment of joint sections of a back frame of flat panel display device according to the present invention;

[0036] FIG. **15** is a schematic view showing a third embodiment of joint sections of a back frame of flat panel display device according to the present invention;

[0037] FIG. **16** is a flow chart showing a preferred embodiment of a method for manufacturing a back frame of a flat panel display device according to the present invention;

[0038] FIG. **17** is a schematic view showing a preferred embodiment of a flat panel display device with a touch screen according to the present invention;

[0039] FIG. **18** is a schematic view showing a preferred embodiment of a stereoscopic display device according to the present invention;

[0040] FIG. **19** is a schematic view showing a preferred embodiment of a plasma display device according to the present invention;

[0041] FIG. **20** is a schematic view showing a front frame, an intermediate frame, and a back frame of a flat liquid crystal display device according to the present invention after being fixed; and

[0042] FIG. **21** is a schematic view showing a specific way of fixing the front frame, the intermediate frame, and a back frame of a float liquid crystal display device according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0043] Referring to FIGS. **2-3**, FIG. **2** is a schematic view showing a flat panel display device according to a first embodiment of the present invention and FIG. **3** is a schematic view showing a first embodiment of a back frame of flat panel display device according to the present invention. As shown in FIG. **2**, the flat panel display device **20** according to the instant embodiment comprises: a backlight system **21** and a display panel **22**. The backlight system **21** is arranged on a back side of the display panel **22** and supplies light to the display panel **22**.

[0044] In the instant embodiment, the backlight system **21** comprises a light source **25**, a light homogenization mechanism **24**, and a back frame **23**. The back frame **23** carries the light source **25** and the light homogenization mechanism **24**. When the backlight system **21** is an edge lighting type, the light homogenization mechanism **24** is a light guide; and when the backlight system **21** is a direct type, the light homogenization mechanism **24** is a diffuser plate. The back frame **23** comprises at least a first primary assembling piece and a second primary assembling piece, and the two of at least a first and second primary assembling pieces constitute a main frame structure **27** of the back frame **23**.

[0045] Referring also to FIG. **3**, the back frame **23** of the first embodiment comprises a first primary assembling piece **261** and a second primary assembling piece **262**. The first primary assembling piece **261** has an end joined to an end of the second primary assembling piece **262**, and the first primary assembling piece **261** has another end joined to another end of the second primary assembling piece **262** in order to form the main frame structure **27** of the back frame **23**. The first primary assembling piece **261** and the second primary assembling piece **262** are both aluminum pieces or galvanized steel pieces. In the instant embodiment, the first primary assembling piece **261** and the second primary assembling piece **262** are L-shaped.

[0046] Referring also to FIG. **4**, the back frame **23** of a second embodiment comprises a first primary assembling piece **281**, a second primary assembling piece **282**, and a third primary assembling piece **283**. The three primary assembling pieces **281**, **282**, and **283** are assembled and joined to form a main frame structure **27** of the back frame **23**. The three primary assembling pieces **281**, **282**, and **283** are all aluminum pieces or galvanized steel pieces. In the instant embodiment, the first primary assembling piece **281** is L-shaped, and the second and third primary assembling pieces **282**, **283** are straight linear.

[0047] Further, the back frame **23** further comprises secondary assembling pieces arranged inside and joined to the main frame structure **27**.

[0048] A detailed description will be given to the back frame **23** of the flat panel display device **20** according to the present invention, which comprises four primary assembling pieces and two secondary assembling pieces.

[0049] Referring to FIG. **5**, FIG. **5** is a schematic view showing a third embodiment of a back frame of flat panel display device according to the present invention. As shown in FIG. **5**, in the instant embodiment, a back frame **23** comprises: a first primary assembling piece **231**, a second primary assembling piece **232**, a third primary assembling piece **233**, a fourth primary assembling piece **234**, a first secondary assembling piece **235**, a second secondary assembling piece **236**, and bracing pieces **2371**, **2372**, **2373**, **2374**, **2375**, **2376**,

and **2377**. The first primary assembling piece **231**, the second primary assembling piece **232**, the third primary assembling piece **233**, and the fourth primary assembling piece **234** are joined to each other in a leading end-to-tailing end manner to constitute a main frame structure **27** of the back frame **23**. The first secondary assembling piece **235** and the second secondary assembling piece **236**, serving as ancillary assembling pieces, are arranged in the main frame structure **27** and joined to the main frame structure **27**.

[0050] Specifically, an end of the first primary assembling piece **231** is joined to an end of the second primary assembling piece **232**, another end of the second primary assembling piece **232** is joined to an end of the third primary assembling piece **233**, another end of the third primary assembling piece **233** is joined to an end of the fourth primary assembling piece **234**, and another end of the fourth primary assembling piece **234** is joined to another end of the first primary assembling piece **231** in order to form the rectangular main frame structure **27**. The first primary assembling piece **231**, the second primary assembling piece **232**, the third primary assembling piece **233**, and the fourth primary assembling piece **234** are all aluminum pieces or galvanized steel pieces. In the instant embodiment, the first primary assembling piece **231**, the second primary assembling piece **232**, the third primary assembling piece **233**, and the fourth primary assembling piece **234** are straight linear, yet in other embodiments, it is apparent to those skilled in the art to make all the first primary assembling piece **231**, the second primary assembling piece **232**, the third primary assembling piece **233**, and the fourth primary assembling piece **234** L-shaped, or some being straight linear and the remaining being L-shaped. For example, in FIG. **3**, the first primary assembling piece **261** and the second primary assembling piece **262** are both L-shaped; in FIG. **4**, the first primary assembling piece **281** is L-shaped, while the second and third primary assembling pieces **282** and **283** are straight linear.

[0051] In the instant embodiment, the back frame **23** of the flat panel display device **20** is formed by joining connection. As shown in FIG. **6**, an illustrative example is given for the connection of an end of the first primary assembling piece **231** to an end of the second primary assembling piece **232**, wherein the end of the second primary assembling piece **232** is joined to the end of the first primary assembling piece **231** by means of for example screwing, fastening, or welding, to have the end of the second primary assembling piece **232** connected to the end of the first primary assembling piece **231**.

[0052] In the instant embodiment, the first secondary assembling piece **235** and the second secondary assembling piece **236** are arranged in the main frame structure **27** of the back frame **23**. An end of the first secondary assembling piece **235** is joined to the first primary assembling piece **231** and another end of the first secondary assembling piece **235** is joined to the third primary assembling piece **233**; and an end of the second secondary assembling piece **236** is joined to the first primary assembling piece **231** and another end of the second secondary assembling piece **236** is joined to the third primary assembling piece **233**. Further, the second primary assembling piece **232**, the fourth primary assembling piece **234**, the first secondary assembling piece **235**, and the second secondary assembling piece **236** are arranged parallel to each other. In other embodiments, those skilled in the art may arrange at least one secondary assembling piece in the main frame structure **27**. For example, only the first secondary assembling piece **235** is arranged in the main frame structure **27**. Further, the two ends of the first secondary assembling piece **235** can be selectively joined to at least two of the primary assembling pieces of the first primary assembling piece **231**, the second primary assembling piece **232**, the third primary assembling piece **233**, and the fourth primary assembling piece **234**. For example, the first secondary assembling piece **235** is set diagonally in the main frame structure **27**, as shown in FIG. **7**. Similarly, the two ends of the second secondary assembling piece **236** can be selectively joined to at least two of the primary assembling pieces of the first primary assembling piece **231**, the second primary assembling piece **232**, the third primary assembling piece **233**, and the fourth primary assembling piece **234**. For example, the two ends of the first secondary assembling piece **235** are respectively joined to the first primary assembling piece **231** and the second primary assembling piece **232** that are adjacent to each other and the two ends of the second secondary assembling piece **236** are respectively joined the third primary assembling piece **233** and the fourth primary assembling piece **234** that are adjacent to each other, as shown in FIG. **8**.

[0053] In the instant embodiment, the back frame **23** comprises seven bracing pieces **2371**, **2372**, **2373**, **2374**, **2375**, **2376**, and **2377**. The bracing piece **2371** is fixed to the fourth primary assembling piece **234**; the bracing pieces **2372**, **2373** are both fixed to the first secondary assembling piece **235**; the bracing piece **2374** is fixed to the second secondary assembling piece **236**; the bracing piece **2375** is fixed to the second primary assembling piece **232**; and the bracing pieces **2376**, **2377** are each fixed, at two ends thereof, to the first secondary assembling piece **235** and the second secondary assembling piece **236**. In practice, the bracing pieces can be fixed to one or more of the first primary assembling piece **231**, the second primary assembling piece **232**, the third primary assembling piece **233**, the fourth primary assembling piece **234**, the first secondary assembling piece **235**, and the second secondary assembling piece **236**. In other embodiments, those skilled in the art may mount bracing pieces of any other numbers to the back frame **23**, such as one or more bracing pieces. Further, the bracing pieces can be releasably fixed to one or more of the first primary assembling piece **231**, the second primary assembling piece **232**, the third primary assembling piece **233**, the fourth primary assembling piece **234**, the first secondary assembling piece **235**, and the second secondary assembling piece **236**.

[0054] The bracing pieces **2371**, **2372**, **2373**, **2374**, **2375**, **2376**, and **2377** may be provided with bumps (not labeled) so that the back frame **23** may fix components, such as circuit boards, with such bumps.

[0055] Molds for making the back frame **23** will be described. In the instant embodiment, the first primary assembling piece **231** and the third primary assembling piece **233** are of the same size and shape so that they can be made by stamping with the same mold. The second primary assembling piece **232**, the fourth primary assembling piece **234**, the first secondary assembling piece **235**, and the second secondary assembling piece **236** are of the same size and shape so that they can be made by stamping with the same mold, making it possible to share the mold. Thus, the back frame **23** of the present invention can be made by stamping with only two small-sized molds, and compared to the conventional back frame **10** that requires a large-sized mold, the molds for making the back frame **23** of the present invention are simple in structure and small in size and thus the cost of mold for the

back frame **23** can be lowered. Further, compared to the whole back frame structure of the conventional back frame **10**, the back frame **23** of the present invention can significantly save material used and thus reduce the manufacturing cost of the flat panel display device **20**.

[0056] Referring to FIG. **9**, FIG. **9** is a schematic view showing a first embodiment of joint sections of a back frame of flat panel display device according to the present invention. As shown in FIG. **9**, in the instant embodiment, an end of the first primary assembling piece is provided with two joint sections, and the joint sections have a structure mating an end of the second primary assembling piece so that the first primary assembling piece can be joined to a corresponding end of the second primary assembling piece.

[0057] Specifically, the first primary assembling piece **231** has an end forming joint sections **2311**, **2312**, and the joint sections **2311**, **2312** are arranged in a spaced manner in a lengthwise direction of the first primary assembling piece **231**. The joint sections **2311**, **2312** are formed by forming recesses having a shape mating an end of the second primary assembling piece **232** in the first primary assembling piece **231** in order to receive the end of the second primary assembling piece **232** therein. As shown in FIG. **10**, the joint sections **2311**, **2312** are recesses that do not extend through opposite surfaces of the end of the first primary assembling piece **231** and the recesses are of a rectangular shape with the second primary assembling piece **232** being straight linear.

[0058] To assemble a large-sized back frame **23**, the joint section **2311** that is close to the very end of the first primary assembling piece **231** is first taken and a second primary assembling piece **232** having a corresponding width is selected. Afterwards, an end of the second primary assembling piece **232** is positioned in the recess of the joint section **2311**. And then, means, such as screwing, fastening, or welding, is applied to join and fix the end of the second primary assembling piece **232** to the joint section **2311**. To assemble a small-sized back frame **23**, the joint section **2312** that is distant from the very end of the first primary assembling piece **231** is first chosen and a second primary assembling piece **232** having a corresponding width is selected. Afterwards, an end of the second primary assembling piece **232** is positioned in the recess of the joint section **2312**. And then, means, such as screwing, fastening, or welding, is applied to join and fix the end of the second primary assembling piece **232** to the joint section **2312**. Specifically, for example the second primary assembling piece **232** forms a protrusion at a corresponding location on a surface thereof, and the protrusion of the second primary assembling piece **232** is embedded in the recess the first primary assembling piece **231** at a corresponding location in order to join the first primary assembling piece **231** and the second primary assembling piece **232**, as shown in FIG. **11**. Furthermore, the recess of the first primary assembling piece **231** can be a recess of a multi-stepped configuration and the second primary assembling piece **232** forms, at a corresponding location, a protrusion having a multi-stepped configuration corresponding to the recess, as shown in FIG. **12**. Further, as shown in FIG. **13**, taking the joint section **2311** as an example, the recess of the first primary assembling piece **231** forms, in a bottom thereof, a first through hole **2313**, and the second primary assembling piece **232** forms, at a location corresponding to the joint section **2311**, a second through hole **2321**. The back frame **23** further comprises a fastener **240**. The fastener **240** extends through the first through hole **2313** and the second through hole **2321** to joint the first primary assembling piece **231** and the second primary assembling piece **232** to each other.

[0059] As shown in FIG. **14**, in another embodiment of the back frame of flat panel display device according to the present invention, the recesses of the joint sections **2311**, **2312** of the first primary assembling piece **231** are of a circular shape. Yet, in other embodiments, those skilled in the art may arrange the shape of the recesses to be other polygonal configurations, such as triangle.

[0060] As shown in FIG. **15**, in another embodiment of the back frame of flat panel display device according to the present invention, the joint sections **2311**, **2312** are recesses that do not extend through opposite surfaces of the first primary assembling piece **231**, whereby an end of the second primary assembling piece **232** is movable within the joint sections **2311**, **2312**. For example, after the end of the second primary assembling piece **232** is set extending beyond and joined and fixed to the joint section **2312**, the portion of extension is then trimmed off so that the length of the second primary assembling piece **232** that serves as a primary assembling piece of the back frame can be adjusted.

[0061] In a practical application, the other end of the first primary assembling piece **231** and both ends of the third primary assembling piece **233** are all provided with two joint sections having a structure identical to that of the joint sections **2311**, **2312**. The ends of the second primary assembling piece **232** and the ends of the fourth primary assembling piece **234** may be subjected to specific designs or no design at all according to the application. For example:

[0062] (1) In a first situation, as shown in FIG. **10**, the two ends of the second primary assembling piece **232** and the two ends of the fourth primary assembling piece **234** are of no specific design. In other words, the ends are of the same structure as the remaining portions. Under this condition, in making a join with a selected joint section **2311** (**2312**) at one end of the first primary assembling piece **231** (the same applicable to the other end), if an attempt is made to change the width of the back frame **23**, then the length of the corresponding second primary assembling piece **232** and fourth primary assembling piece **234** must be selected accordingly. Namely, if the joint section **2311** that is close to the very end of the first primary assembling piece **231** is selected for joining, then no trimming is applied to the second primary assembling piece **232** and the fourth primary assembling piece **234** or the portion that is trimmed off is short; if the joint section **2312** that is distant from the very end of the first primary assembling piece **231** is selected for joining, then the second primary assembling piece **232** and the fourth primary assembling piece **234** are trimmed and the trimmed portion being long or short is according to the distance that the joint section is from the very end of the first primary assembling piece **231** being great or small; and

[0063] (2) In a second situation, it is similar to the first situation, but as shown in FIG. **11**, the second primary assembling piece **232** and the fourth primary assembling piece **234** use different protrusions to respectively mate the first primary assembling piece **231** and the third primary assembling piece **233** in order to realize change of width of the back frame **23**; similarly, if a joint section **2312** other than the first joint section **2311** that is close to the very end of the first primary assembling piece **231** is selected for joining, then before or

after joining, excessive portions of the second primary assembling piece **232** and the fourth primary assembling piece **234** may be trimmed off.

[0064] This also applicable to a main frame structure **27** of the back frame **23** that is formed by joining two L-shaped primary assembling pieces.

[0065] In summary, the present invention provides a back frame **23** having a first primary assembling piece that is provided with at least two joint sections. The number of the joint section can be selected according to the requirement of customers. In the instant embodiment, a description is given to an example comprising two joint sections **2311**, **2312**. Thus, to prepare the molds for making the back frame **23**, only two sets of mold are needed, namely one mold for a first primary assembling piece and the other mold for a second primary assembling piece. The first primary assembling piece may be provided with a plurality of joint sections for joining operation in order to form various sizes for the back frame **23**. To assemble the back frame **23**, based on the desired size of the back frame **23**, the corresponding one of the joint sections is selected. With the joint section, the second primary assembling piece is joined to the joint section of the first primary assembling piece and the other joint section of the first primary assembling piece that is located outward of the joining location of the second primary assembling piece is trimmed off to obtain a desired size of the back frame **23**. Compared to the conventional technology that requires different back frame molds for making different sizes of back frame **10**, the back frame of the flat panel display device **23** according to the present invention requires only a mold for the first primary assembling piece and a mold for the second primary assembling piece **28** so that mold sharing among various sizes of product can be realized and the molds used are of simple structures, allowing of reduction of expenditure of the molds for back frames.

[0066] The present invention also provides a mold for making a back frame of flat panel display device. The back frame mold is provided with a main pattern for forming a primary assembling piece of the back frame and the main pattern comprises a sub-pattern that forms at least two joint sections on an end of the primary assembling piece. The primary assembling piece comprises the previously discussed first primary assembling piece and second primary assembling piece, corresponding to the above mentioned main pattern; and the joint section comprises the previously discussed joint section of the first primary assembling piece, corresponding to the above mentioned sub-pattern. Repeated description is omitted herein.

[0067] As shown in FIG. **16**, the present invention also provides a method for making a back frame of flat panel display device. The method comprises the following steps:

[0068] Step **501**: manufacturing at least first and second primary assembling pieces, in which the first primary assembling piece has an end forming at least two joint sections, each of the joint sections having a structure that mates a corresponding end of the second primary assembling piece; and

[0069] Step **502**: selecting one joint section of the at least two joint sections according to a size of the back frame to join the corresponding end of the second primary assembling piece.

[0070] In the instant embodiment, when other joint sections are present between the joining location of the second primary assembling piece and the end of the first primary assembling piece, before or after the step of selecting one joint section of the at least two joint sections according to a size of the back frame to join the corresponding end of the second primary assembling piece, the other joint sections of the first primary assembling piece that are located outward of the joining position of the second primary assembling piece are trimmed off. The first primary assembling piece comprises the previously discussed first primary assembling piece, and the second primary assembling piece comprises the previously discussed second primary assembling piece, and repeated description will be omitted herein.

[0071] As shown in FIG. **17**, the flat panel display device **20** of the present invention further comprises a touch screen **29**. The touch screen **29** is arranged on a light exit surface of the display panel **22** of the flat panel display device **20**. The flat panel display device **20** comprises: the backlight system **21** and the above discussed display panel **22**. The backlight system **21** is arranged at the back side of the display panel **22** and supplies light to the display panel **22**.

[0072] The backlight system **21** comprises a light source **25**, a light homogenization mechanism **24**, and a back frame **23**. The back frame **23** carries the light source **25** and the light homogenization mechanism **24**. When the backlight system **21** is an edge lighting type, the light homogenization mechanism **24** is a light guide; and when the backlight system **21** is a direct type, the light homogenization mechanism **24** is a diffuser plate. The back frame **23** comprises at least a first primary assembling piece and a second primary assembling piece, and the at least one first and second primary assembling pieces constitute a main frame structure **27** of the back frame **23**.

[0073] It is noted that the flat panel display device **20** of the present invention can be a liquid crystal display device or a liquid crystal television.

[0074] The present invention also provides a stereoscopic display device **30**, as shown in FIG. **18**. The stereoscopic display device **30** comprises a liquid crystal lens grating **31**, a backlight system **32**, and a display panel **33**. The liquid crystal lens grating **31** is arranged on a light exit surface of the display panel **33**. The backlight system **32** can be a backlight system of one of the above discussed embodiments, such as the backlight system **32** comprising the back frame **23**. The back frame **23** comprises at least first primary assembling piece and the second primary assembling piece. The at least first and second primary assembling pieces form a main frame structure of the back frame. Repeated description will be omitted herein.

[0075] The present invention also provides a plasma display device **40**, as shown in FIG. **19**. The plasma display device **40** comprises a plasma display panel **41** and a back frame **42**. The back frame **42** is arranged at a back side of the display panel **41**. The back frame **42** can be the back frame of any of the previous embodiments and repeated description will be omitted herein.

[0076] The present invention also provides a back frame that forms mating holes in a vertical section of an assembling piece. As shown in FIG. **20**, setting a fastener through the mating hole of the back frame, a through hole defined in an intermediate frame, and a through hole of a front frame can unitarily secure the back frame, the intermediate frame, and the front frame, making the whole frame structure of the flat primary assembling piece more stable.

[0077] Referring to FIG. **21**, FIG. **21** is a schematic view showing a specific way of fixing a front frame and a back frame of the flat panel display device according to the present

invention. A through hole defined in a vertical section of a front frame **510**, a through hole defined in a vertical section of an intermediate frame **511**, and a mating hole defined in a vertical section of a primary assembling piece of a back frame **512** are all provided with threads. A bolt **515** is put through the through hole of the vertical section of the front frame **510**, the through hole of the vertical section of the intermediate frame **51**, and the mating hole of the vertical section of the primary assembling piece of the back frame **512** fixes the front frame, the intermediate frame, and the back frame together.

[0078] The present invention also provides a backlight system. The backlight system comprises a light source, a light homogenization mechanism, and a back frame. The back frame carries the light source and the light homogenization mechanism. The structure of the back frame of the backlight system can refer to FIG. **20** and the description given with reference to FIG. **20**. Repeated description will be omitted here.

[0079] The present invention also provides a flat liquid crystal display device. The flat liquid crystal display device comprises a liquid crystal panel, a front frame, a back panel, and a backlight system. The backlight system comprises an intermediate frame. A vertical section of the front frame, a vertical section of the intermediate section, and a vertical section of a primary assembling piece partially or completely overlap each other. The vertical section forms a mating hole. The vertical section of the front frame, the vertical section of the intermediate section, and the mating hole of the vertical section of the primary assembling piece form through holes at corresponding locations. A fastener is put through the through hole of the vertical section of the front frame, the through hole of the vertical section of the intermediate frame, and the mating hole of the vertical section of the primary assembling piece to fix the front frame, the intermediate frame, and the back frame together. A specific way of fixing the front frame and the back frame of the flat liquid crystal display device can refer to FIG. **21** and the description given with reference to FIG. **21**. Repeated description will be omitted here.

[0080] With the above discussed manners, the present invention provides a back frame, a backlight system, and a flat liquid crystal display device that form vertical sections on two primary assembling pieces with the vertical sections forming mating holes corresponding to through holes defined in a front frame and an intermediate frame of the flat liquid crystal display device and uses a fastener extending through the mating hole of the vertical section of the primary assembling piece and the through hole of the intermediate frame and the through hole of the front frame of the flat liquid crystal display device to fix the front frame, the intermediate frame, and the back frame together, making the entire frame structure of the flat liquid crystal display device more stable. Further the at least two primary assembling pieces are joined to form the back frame so that the back frame has a simple structure, the expenditure for mold of back frame is reduced, and the material used for back frame is saved, and thus the cost is lowered down.

[0081] Embodiments of the present invention have been described, but are not intending to impose any undue constraint to the appended claims of the present invention. Any modification of equivalent structure or equivalent process made according to the disclosure and drawings of the present invention, or any application thereof, directly or indirectly, to other related fields of technique, is considered encompassed in the scope of protection defined by the claims of the present invention.

What is claimed is:

1. A back frame of a flat panel display device, wherein the back frame comprises at least first and second primary assembling pieces, the at least two primary assembling pieces being joined to form the back frame, the primary assembling pieces having a vertical section, the vertical section realizing mating between the back frame and an intermediate frame and a front frame of the flat panel display device.

2. The back frame as claimed in claim **1**, wherein the first primary assembling piece has an end forming at least two joint sections, each of the joint sections having a structure mating an end of the second primary assembling piece, the first primary assembling piece using one of the joint sections to join the corresponding end of the second primary assembling piece.

3. The back frame as claimed in claim **1**, wherein:

the at least two joint sections are arranged to space from each other in a lengthwise direction of the first primary assembling piece.

4. The back frame as claimed in claim **3**, wherein:

the joint sections comprise recesses formed in a surface of the first primary assembling piece and having a shape corresponding to the end of the second primary assembling piece for receiving the end of the second primary assembling piece.

5. The back frame as claimed in claim **3**, wherein:

the joint sections comprise recesses formed in a surface of the first primary assembling piece, the second primary assembling piece having a surface forming protrusions at corresponding positions, the protrusions being receivable in the recesses to join the first primary assembling piece and the second primary assembling piece to each other.

6. The back frame as claimed in claim **1**, wherein:

the back frame comprises a third primary assembling piece and a fourth primary assembling piece; and

the first primary assembling piece, the second primary assembling piece, the third primary assembling piece, and the fourth primary assembling piece are straight linear and are connected to each other in a leading end-to-tailing end manner to circumferentially form the back frame.

7. A backlight system, wherein:

the backlight system comprises a light source, a light homogenization mechanism, and a back frame as claimed in claim **1**; and

the back frame carries the light source and the light homogenization mechanism.

8. A flat liquid crystal display device, wherein:

the flat liquid crystal display device comprises a liquid crystal panel, a front frame, a back panel, and a backlight system according to claim **7**; and

the backlight system comprises an intermediate frame.

9. The flat liquid crystal display device as claimed in claim **8**, wherein a vertical section of the front frame, a vertical section of an intermediate frame, and a vertical section of the primary assembling piece partially or completely overlap each other.

10. The flat liquid crystal display device as claimed in claim **8**, wherein the vertical section forms a mating hole.

11. The flat liquid crystal display device as claimed in claim **9**, wherein the vertical section of the front frame, the vertical section of the intermediate section, and the mating hole of the vertical section of the primary assembling piece form through holes at corresponding locations.

12. The flat liquid crystal display device as claimed in claim **11**, wherein a fastener is received through the through hole of the vertical section of the front frame, the through hole of the vertical section of the intermediate frame, and the mating hole of the vertical section of the primary assembling piece to fix the front frame, the intermediate frame, and the back frame together.

* * * * *

专利名称(译)	背框，背光系统和平板液晶显示装置		
公开(公告)号	US20130128553A1	公开(公告)日	2013-05-23
申请号	US13/381802	申请日	2011-11-23
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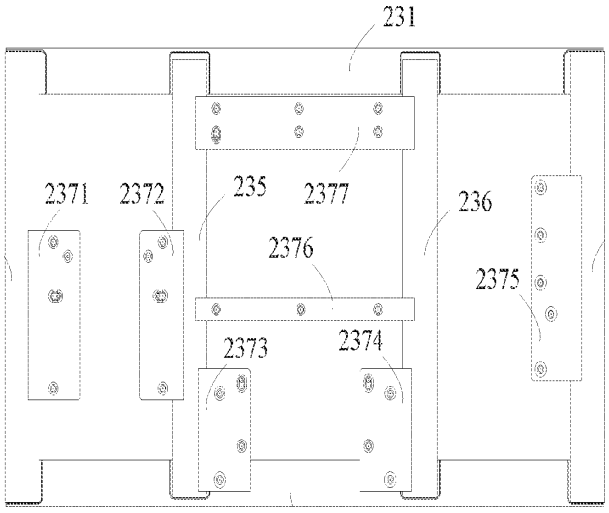
摘要(译)

本发明提供一种背框，其包括至少第一和第二主拼接件。至少两个主要组装件连接以形成后框架。主拼接件具有垂直截面，垂直截面实现后框架与平板显示装置的中间框架和前框架之间的配合。本发明提供一种背框，背光系统和平板液晶显示装置，其使用穿过主组装件的垂直截面的配合孔的紧固件和中间框架的通孔以及通孔。平板液晶显示装置的前框架，用于将后框架和前框架以及扁平液晶显示装置的中间框架固定在一起，使得扁平液晶显示装置的整个框架结构更加稳定。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