A backlight module and a display. The backlight module comprises a light guide plate (10), a light source assembly (20), a frame (30) and multiple layers of optical films (40). The frame (30) surrounds the light guide plate (10). The light source assembly (20) is arranged between one edge of the light guide plate (10) and the frame (30). The light source assembly (20) comprises a circuit board (22) and a light-emitting piece (24). The light-emitting piece (24) is located between the light guide plate (10) and the frame (30). The circuit board (22) is located above the edge of the light guide plate (10). The optical films (40) are stacked on the light guide plate (10). The backlight module further comprises a first double-faced adhesive tape (50) and a second double-faced adhesive tape (60). The edges of the optical films (40) are stacked and arranged in a step-like manner. The first double-faced adhesive tape (50) is bonded between the light guide plate (10) and the bottom surface of the circuit board (22). The first double-faced adhesive tape (50) comprises an edge part bonded to the optical film (40) at the bottommost layer. The second double-faced adhesive tape (60) is bonded to the top surface of the circuit board (22), the edge part of the first double-faced adhesive tape (50) and the edges of the optical films (40) except the optical film (40) on the bottommost layer. The backlight module and the display have the advantage of being easy to assemble.
Fig. 1
BACKLIGHT MODULE AND DISPLAY DEVICE

CROSS-REFERENCE TO RELATED ARTS

[0001] This application claims the priority of Chinese Patent Application No. 201410654607.1 filed on November 17, 2014, entitled “Backlight Module and Display Device”, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD OF THE INVENTION

[0002] The present invention relates to the field of liquid crystal display technology, and more particularly to a backlight module and a display device.

DESCRIPTION OF THE PRIOR ART

[0003] Nowadays, liquid crystal displays have been increasingly widely used in various electronic products to serve as a display component of electronic devices. A prior art backlight module often comprises a resin frame, a light guide plate, a light source circuit board, and an optical film. The light source circuit board has a bottom surface that is fixed, through double-sided adhesive tapes, to the light guide plate and the resin frame. The optical film generally includes multiple layers or sheets, such as a diffusion sheet, a prism sheet, and a polarizer sheet. Each of the optical film sheet must be secured and it is a common practice to fix the optical film, by means of double-sided adhesive tapes, to a top surface of the light source circuit board.

[0004] It is an issue that is under constant research and study in this industry to provide a backlight module that allows an optical film, a light guide plate, a
light source circuit board, and a resin frame to be readily fixed to each other in a simpler manner for easy assembly.

SUMMARY OF THE INVENTION

[0005] The technical issue to be addressed by the present invention is to provide a backlight module and a display device, such that the backlight module and the display device possess advantages of simple assembly structure and being easy to assemble.

[0006] To achieve the above object, an embodiment of the present invention provides the following technical solution:

[0007] In an aspect, the present invention provides a backlight module, which comprises a light guide plate, a light source assembly, an edge frame, and a number of optical sheets. The edge frame surrounds the light guide plate. The light source assembly is arranged between an edge portion of the light guide plate and the edge frame. The light source assembly comprises a circuit board and a light emission element. The light emission element is located between the light guide plate and the edge frame. The circuit board is located above the edge portion of the light guide plate. The optical sheets are arranged, in a stacked manner, on the light guide plate. The backlight module further comprises a first double-sided adhesive tape and a second double-sided adhesive tape. The number of optical sheets has edge portions that are stacked in a stairway-like arrangement. The first double-sided adhesive tape is adhesively bonded between the light guide plate and a bottom surface of the circuit board. The first double-sided adhesive tape comprises an edge section. The edge section is adhesively attached to a bottommost one of the optical sheets. The second double-sided adhesive tape is adhesively attached to a top surface of the circuit board, the edge section of the first double-sided adhesive tape, and the edge portions of remaining ones of the optical sheets excluding the
bottommost optical sheet.

[0008] In the above backlight module, the edge frame comprises a first positioning surface and a second positioning surface that are arranged in a step-like form. The first positioning surface is located on an inner circumference of the second positioning surface. The first positioning surface is substantially flush with the edge portion of the light guide plate. The bottom surface of the circuit board is fixed through the first double-sided adhesive tape to the first positioning surface and the edge portion of the light guide plate. The second positioning surface is substantially flush with the top surface of the circuit board.

[0009] In the above backlight module, the backlight module further comprises a back board. The back board comprises a bottom plate and an outer wall. The outer wall extends vertically from an edge of the bottom plate. The edge frame is fixed, together with the light guide plate, the optical sheets, and the light source assembly, to the back board. The outer wall has a top surface that is substantially flush with the second positioning surface.

[00010] In the above backlight module, the backlight module further comprises a reflection sheet. The reflection sheet is arranged between the light guide plate and the bottom plate.

[00011] In the above backlight module, the light guide plate has a bottom surface that is coated with a reflective coating layer. The reflective coating layer is set in contact engagement with the bottom plate.

[00012] In the above backlight module, the first double-sided adhesive tape and the second double-sided adhesive tape are both a light-shielding double-sized adhesive tape.

[00013] In the above backlight module, the number of the optical sheets is three; and the edge section of the first double-sided adhesive tape that is adhesively attached to the bottommost one of the optical sheets has a top surface that is substantially flush with a top surface of a middle one of the optical sheets.
[00014] In another aspect, the present invention also provides a display device. The display device comprises a backlight module and a display panel. The backlight module comprises a light guide plate, a light source assembly, an edge frame, and a number of optical sheets. The edge frame surrounds the light guide plate. The light source assembly is arranged between an edge portion of the light guide plate and the edge frame. The light source assembly comprises a circuit board and a light emission element. The light emission element is located between the light guide plate and the edge frame. The circuit board is located above the edge portion of the light guide plate. The optical sheets are arranged, in a stacked manner, on the light guide plate. The backlight module further comprises a first double-sided adhesive tape and a second double-sided adhesive tape. The number of optical sheets has edge portions that are stacked in a stairway-like arrangement. The first double-sided adhesive tape is adhesively bonded between the light guide plate and a bottom surface of the circuit board. The first double-sided adhesive tape comprises an edge section. The edge section is adhesively attached to a bottommost one of the optical sheets. The second double-sided adhesive tape is adhesively attached to a top surface of the circuit board, the edge section of the first double-sided adhesive tape, and the edge portions of remaining ones of the optical sheets excluding the bottommost optical sheet. The display panel is arranged above the backlight module. A top surface of the second double-sided adhesive tape is adhesively attached to the display panel.

[00015] In the above display device, the edge frame comprises a first positioning surface and a second positioning surface that are arranged in a step-like form. The first positioning surface is located on an inner circumference of the second positioning surface. The first positioning surface is substantially flush with the edge portion of the light guide plate. The bottom surface of the circuit board is fixed through the first double-sided adhesive tape to the first positioning surface and the edge portion of the light guide plate.
The second positioning surface is substantially flush with the top surface of the circuit board.

[00016] In the above display device, the backlight module further comprises a back board. The back board comprises a bottom plate and an outer wall. The outer wall extends vertically from an edge of the bottom plate. The edge frame is fixed, together with the light guide plate, the optical sheets, and the light source assembly, to the back board. The outer wall has a top surface that is substantially flush with the second positioning surface.

[00017] In the above display device, the backlight module further comprises a reflection sheet. The reflection sheet is arranged between the light guide plate and the bottom plate.

[00018] In the above display device, the light guide plate has a bottom surface that is coated with a reflective coating layer. The reflective coating layer is set in contact engagement with the bottom plate.

[00019] In the above display device, the first double-sided adhesive tape and the second double-sided adhesive tape are both a light-shielding double-sided adhesive tape.

[00020] In the above display device, the number of the optical sheets is three; and the edge section of the first double-sided adhesive tape that is adhesively attached to the bottommost one of the optical sheets has a top surface that is substantially flush with a top surface of a middle one of the optical sheets s.

[00021] The present invention is structured such that the edge portions of the number of optical sheets are stacked on each other to show a stairway like arrangement and the first double-sided adhesive tape is adhesively bonded between the light guide plate and the circuit board, with an edge section of the first double-sided adhesive tape adhesively attached to the bottommost optical sheet, and the second double-sided adhesive tape is adhesively attached to a top surface of the circuit board, the edge section of the first double-sided adhesive tape, and the edge portions of the other sheets of the optical sheets except the
bottommost sheet. Such an arrangement has a simple configuration and provides an advantage of easy assembly of the backlight module with a display device.

BRIEF DESCRIPTION OF THE DRAWINGS

[00022] To more clearly explain the technical solution of the present invention, a brief description of the drawings that are necessary for embodiment is given as follows. It is obvious that the drawings that will be described below show only some embodiments of the present invention. For those having ordinary skills of the art, other drawings may also be readily available from these attached drawings without the expense of creative effort and endeavor.

[00023] FIG. 1 is a cross-sectional view illustrating a backlight module according to an embodiment of the present invention.

PREFERRED EMBODIMENTS

[00024] A clear and complete description will be given to a technical solution of an embodiment of the present invention with reference to the attached drawings of the embodiment of the present invention.

[00025] Referring to FIG. 1, the present invention provides a backlight module, which comprises a light guide plate 10, a light source assembly 20, an edge frame 30, and a plurality of optical sheets 40. The light guide plate 10 is arranged in a hollowed area of the edge frame 30 and the edge frame 30 surrounds the light guide plate 10. The light source assembly 20 is arranged between to an edge of the light guide plate 10 (which is an light incidence side of the light guide plate 10) and the edge frame 30. The light source assembly 20 comprises a circuit board 22 and a light emission element 24. The light emission element 24 is integrally formed on the circuit board 22. To assemble,
the light emission element 24 is set and located between the light guide plate 10 and the edge frame 30 and the circuit board 22 is set and located above the edge of the light guide plate 10. The optical sheets 40 are arranged, in a stacked manner, on the light guide plate 10 such that edges of the plurality of optical sheets 40 are stacked on each other in a stairway-like arrangement. The backlight module further comprises a first double-sided adhesive tape 50 and a second double-sided adhesive tape 60. The first double-sided adhesive tape 50 is adhesively bonded between the light guide plate 10 and a bottom surface of the circuit board 22. The first double-sided adhesive tape 50 comprises an edge section and the edge section is adhesively attached to a bottommost one 42 of the optical sheets. In other words, the first double-sided adhesive tape 50 extends to a top surface of an edge portion of the bottommost optical sheet 42 so as to fix, through adhesion, the bottommost optical sheet 42. The second double-sided adhesive tape 60 is adhesively attached to a top surface of the circuit board 22, the edge section of the first double-sided adhesive tape 50, and edge portions of other sheets 44, 46 of the optical sheets 40 except the bottommost sheet.

[00026] The present invention is structured such that the edge portions of the plurality of optical sheets 40 are stacked on each other to show a stairway like arrangement and the first double-sided adhesive tape 50 is adhesively bonded between the light guide plate 10 and the circuit board 22, with an edge section of the first double-sided adhesive tape 50 adhesively attached to the bottommost optical sheet 42, and the second double-sided adhesive tape 60 is adhesively attached to a top surface of the circuit board 22, the edge section of the first double-sided adhesive tape 50, and the edge portions of the other sheets of the optical sheets 40 except the bottommost sheet. Such an arrangement has a simple configuration and provides an advantage of easy assembly of the backlight module with a display device.

[00027] Specifically, the edge frame 30 comprises a first positioning surface 32
and a second positioning surface 34 that are arranged in a step-like form. The first positioning surface 32 is located on an inner circumference of the second positioning surface 34 and the first positioning surface 32 is substantially flush with an edge portion of the light guide plate 10. The bottom surface of the circuit board 22 is fixed, through the first double-sided adhesive tape 50, to the first positioning surface 32 and the edge portion of the light guide plate 10. The second positioning surface 34 is substantially flush with the top surface of the circuit board 22.

[00028] The backlight module of the present invention further comprises a back board 70. The back board 70 comprises a bottom plate 72 and an outer wall 74. The outer wall 74 extends vertically from an edge of the bottom plate 72. The edge frame 30 is fixed, together with the light guide plate 10, the optical sheets 40, and the light source assembly 20, to the back board 70. The outer wall 74 has a top surface that is substantially flush with the second positioning surface 34.

[00029] In an embodiment, the backlight module further comprises a reflection sheet 80. The reflection sheet 80 is arranged between the light guide plate 10 and the bottom plate 72.

[00030] In another embodiment, the light guide plate 10 has a bottom surface that is coated with a reflective coating layer. The reflective coating layer is set on contact engagement with the bottom plate 72. In other words, the reflective coating layer is provided to replace the reflection sheet 80, and this helps reduce the size of the backlight module.

[00031] In the backlight module of the present invention, the first double-sided adhesive tape 50 and the second double-sided adhesive tape 60 are both light-shielding double-sized adhesive tapes. Light-shielding double-sized adhesive tapes help prevent light leaking at edges of the backlight module.

[00032] Specifically, the number of the optical sheets 40 is three; and the edge section of the first double-sided adhesive tape 50 is adhesively attached to the
bottommost optical sheet 42, and a top surface of the edge section of the first double-sided adhesive tape 50 is substantially flush with a top surface of a middle one 44 of the optical sheets.

[00033] The present invention also provides a display device. The display device comprises the above-described backlight module and a display panel. The display panel is arranged above the backlight module and a top surface of the second double-sided adhesive tape 60 is adhesively attached to the display panel.

[00034] The above illustrates preferred embodiments of the present invention. However, it is noted that those skilled in the art would appreciate that various improvements and modifications are still available without departing from the principle of the present invention and such improvements and modifications are considered within the scope of protection of the present invention.
CLAIMS:

1. A backlight module, comprising a light guide plate, a light source assembly, an edge frame, and a number of optical sheets, the edge frame surrounding the light guide plate, the light source assembly being arranged between an edge portion of the light guide plate and the edge frame, the light source assembly comprising a circuit board and a light emission element, the light emission element being located between the light guide plate and the edge frame, the circuit board being located above the edge portion of the light guide plate, the optical sheets being arranged, in a stacked manner, on the light guide plate, characterized in that the backlight module further comprises a first double-sided adhesive tape and a second double-sided adhesive tape, the number of optical sheets having edge portions that are stacked in a stairway-like arrangement, the first double-sided adhesive tape being adhesively bonded between the light guide plate and a bottom surface of the circuit board, the first double-sided adhesive tape comprising an edge section, the edge section being adhesively attached to a bottommost one of the optical sheets, the second double-sided adhesive tape being adhesively attached to a top surface of the circuit board, the edge section of the first double-sided adhesive tape, and the edge portions of remaining ones of the optical sheets excluding the bottommost optical sheet.

2. The backlight module as claimed in Claim 1, characterized in that the edge frame comprises a first positioning surface and a second positioning surface that are arranged in a step-like form, the first positioning surface being located on an inner circumference of the second positioning surface, the first positioning surface being substantially flush with the edge portion of the light guide plate, the bottom surface of the circuit board being fixed
through the first double-sided adhesive tape to the first positioning surface and the edge portion of the light guide plate, the second positioning surface being substantially flush with the top surface of the circuit board.

3. The backlight module as claimed in Claim 2, characterized in that the backlight module further comprises a back board, the back board comprising a bottom plate and an outer wall, the outer wall extending vertically from an edge of the bottom plate, the edge frame being fixed, together with the light guide plate, the optical sheets, and the light source assembly, to the back board, the outer wall having a top surface that is substantially flush with the second positioning surface.

4. The backlight module as claimed in Claim 3, characterized in that the backlight module further comprises a reflection sheet, the reflection sheet being arranged between the light guide plate and the bottom plate.

5. The backlight module as claimed in Claim 3, characterized in that the light guide plate has a bottom surface that is coated with a reflective coating layer, the reflective coating layer being set in contact engagement with the bottom plate.

6. The backlight module as claimed in Claim 1, characterized in that the first double-sided adhesive tape and the second double-sided adhesive tape are both a light-shielding double-sided adhesive tape.

7. The backlight module as claimed in Claim 1, characterized in that the number of the optical sheets is three; and the edge section of the first double-sided adhesive tape that is adhesively attached to the bottommost
one of the optical sheets has a top surface that is substantially flush with a top surface of a middle one of the optical sheets.

8. A display device, characterized in that the display device comprises a backlight module and a display panel, the backlight module comprising a light guide plate, a light source assembly, an edge frame, and a number of optical sheets, the edge frame surrounding the light guide plate, the light source assembly being arranged between an edge portion of the light guide plate and the edge frame, the light source assembly comprising a circuit board and a light emission element, the light emission element being located between the light guide plate and the edge frame, the circuit board being located above the edge portion of the light guide plate, the optical sheets being arranged, in a stacked manner, on the light guide plate, the backlight module further comprising a first double-sided adhesive tape and a second double-sided adhesive tape, the number of optical sheets having edge portions that are stacked in a stairway-like arrangement, the first double-sided adhesive tape being adhesively mounted between the light guide plate and a bottom surface of the circuit board, the first double-sided adhesive tape comprising an edge section, the edge section being adhesively attached to a bottommost one of the optical sheets, the second double-sided adhesive tape being adhesively attached to a top surface of the circuit board, the edge section of the first double-sided adhesive tape, and the edge portion of remaining ones of the optical sheets excluding the bottommost optical sheet, the display panel being arranged above the backlight module, a top surface of the second double-sided adhesive tape being adhesively attached to the display panel.

9. The display device as claimed in Claim 8, characterized in that the edge frame comprises a first positioning surface and a second positioning
surface that are arranged in a step-like form, the first positioning surface being located on an inner circumference of the second positioning surface, the first positioning surface being substantially flush with the edge portion of the light guide plate, the bottom surface of the circuit board being fixed through the first double-sided adhesive tape to the first positioning surface and the edge portion of the light guide plate, the second positioning surface being substantially flush with the top surface of the circuit board.

10. The display device as claimed in Claim 9, characterized in that the backlight module further comprises a back board, the back board comprising a bottom plate and an outer wall, the outer wall extending vertically from an edge of the bottom plate, the edge frame being fixed, together with the light guide plate, the optical sheets, and the light source assembly, to the back board, the outer wall having a top surface that is substantially flush with the second positioning surface.

11. The display device as claimed in Claim 10, characterized in that the backlight module further comprises a reflection sheet, the reflection sheet being arranged between the light guide plate and the bottom plate.

12. The display device as claimed in Claim 10, characterized in that the light guide plate has a bottom surface that is coated with a reflective coating layer, the reflective coating layer being set in contact engagement with the bottom plate.

13. The display device as claimed in Claim 8, characterized in that the first double-sided adhesive tape and the second double-sided adhesive tape are both a light-shielding double-sized adhesive tape.
14. The display device as claimed in Claim 8, characterized in that the number of the optical sheets is three; and the edge section of the first double-sided adhesive tape that is adhesively attached to the bottommost one of the optical sheets has a top surface that is substantially flush with a top surface of a middle one of the optical sheets.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

F21S 8/00 (2006.01) i; F21V 17/10 (2006.01) i; G02F 1/13357 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F21; G02F

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

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

CNPAT, CNKL, WPI, EPDOC: double faced adhesive tape, offset, rubberized fabric, adhesive tape, glue, pastern, mucus, step+, adhesiv+, rubberiz+, adhibit+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>CN 202955582 U (XIAMEN TIANMA MICROELECTRONICS CO. LTD.), 29 May 2013 (29.05.2013), description, paragraphs 0038-0047, figures 3-10</td>
<td>1-14</td>
</tr>
<tr>
<td>A</td>
<td>CN 203036402 U (SHANGHAI AVIC OPTOELECTRONICS CO. LTD.), 03 July 2013 (03.07.2013), the whole document</td>
<td>1-14</td>
</tr>
<tr>
<td>A</td>
<td>CN 203082680 U (BOE TECHNOLOGY GROUP CO., LTD. et al.), 24 July 2013 (24.07.2013), the whole document</td>
<td>1-14</td>
</tr>
<tr>
<td>A</td>
<td>JP 2011191444 A (OMRON TATEISHI ELECTRONICS CO.), 29 September 2011 (29.09.2011), the whole document</td>
<td>1-14</td>
</tr>
<tr>
<td>A</td>
<td>CN 201401701 Y (XIAMEN OCULAR TECHNOLOGY CO., LTD.), 10 February 2010 (10.02.2010), the whole document</td>
<td>1-14</td>
</tr>
</tbody>
</table>

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

10 July 2015 (10.07.2015)

Date of mailing of the international search report

22 July 2015 (22.07.2015)

Name and mailing address of the ISA/CA:

State Intellectual Property Office of the P. R. China
No. 6, Xitucheng Road, Jingshenao
Haidian District, Beijing 100088, China
Facsimile No.: (86-10) 62019451

Authorized officer

ZHANG, Dun

Telephone No.: (86-10) 61648476

Form PCT/ISA/210 (second sheet) (July 2009)
<table>
<thead>
<tr>
<th>Patent Documents referred in the Report</th>
<th>Publication Date</th>
<th>Patent Family</th>
<th>Publication Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN 202955582 U</td>
<td>29 May 2013</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>CN 203036402 U</td>
<td>03 July 2013</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>CN 203082680 U</td>
<td>24 July 2013</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>JP 2011191444 A</td>
<td>29 September 2011</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>CN 201401701 Y</td>
<td>10 February 2010</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Form PCT/ISA/210 (patent family annex) (July 2009)