



US00RE49296E

(19) **United States**  
(12) **Reissued Patent**  
**Liu**

(10) **Patent Number:** **US RE49,296 E**  
(45) **Date of Reissued Patent:** **Nov. 15, 2022**

(54) **LIQUID CRYSTAL DISPLAY MODULE COMPRISING AN ADHESIVE FRAME HAVING CARRYING SECTIONS AND LIMITING SECTIONS AND DISPLAY DEVICE**

(58) **Field of Classification Search**  
CPC ..... G02F 1/133308; G02F 1/13452; G02F 2001/13332; G02F 2001/133317; G02F 2001/133308; G02F 2001/13452  
USPC ..... 362/632; 349/58  
See application file for complete search history.

(71) Applicants: **Hisense Visual Technology Co., Ltd.**, Shandong (CN); **Hisense USA Corp.**, Suwanee, GA (US); **Hisense International Co., Ltd.**, Shandong (CN)

(56) **References Cited**

U.S. PATENT DOCUMENTS

9,459,501 B2 \* 10/2016 Sakamoto ..... G02F 1/13452  
2007/0117418 A1 5/2007 Azuma et al.  
2011/0128465 A1 6/2011 Park  
(Continued)

(72) Inventor: **Hao Liu**, Shandong (CN)

FOREIGN PATENT DOCUMENTS

(73) Assignees: **Hisense Visual Technology Co., Ltd.**, Qingdao (CN); **Hisense USA Corporation**, Suwanee, GA (US); **Hisense International Co., Ltd.**, Shandong (CN)

CN 102080788 A 6/2011  
CN 103018937 A 4/2013

OTHER PUBLICATIONS

(21) Appl. No.: **16/058,714**

First Office Action dated Dec. 5, 2016 for Chinese Application No. 201410747432.9, and first Search Report; including English translation of Office Action; total 12 pages.

(22) Filed: **Aug. 8, 2018**

*Primary Examiner* — Henry N Tran

**Related U.S. Patent Documents**

(74) *Attorney, Agent, or Firm* — Crowell & Moring LLP

Reissue of:

(64) Patent No.: **9,606,387**  
Issued: **Mar. 28, 2017**  
Appl. No.: **14/730,988**  
Filed: **Jun. 4, 2015**

(57) **ABSTRACT**

In a liquid crystal display module, notches are disposed on limiting sections and opposite to flexible circuit boards disposed on a liquid crystal panel so that the flexible circuit boards protrude through the notches and are bent toward the connecting sections; and moreover first depressed sections configured to accommodate the flexible circuit boards may be disposed on the connecting sections and opposite to the notches; and second depressed sections depressed inward may be disposed on the folded edge and opposite to the first depressed sections so that the first depressed sections and the second depressed sections cooperate with each other.

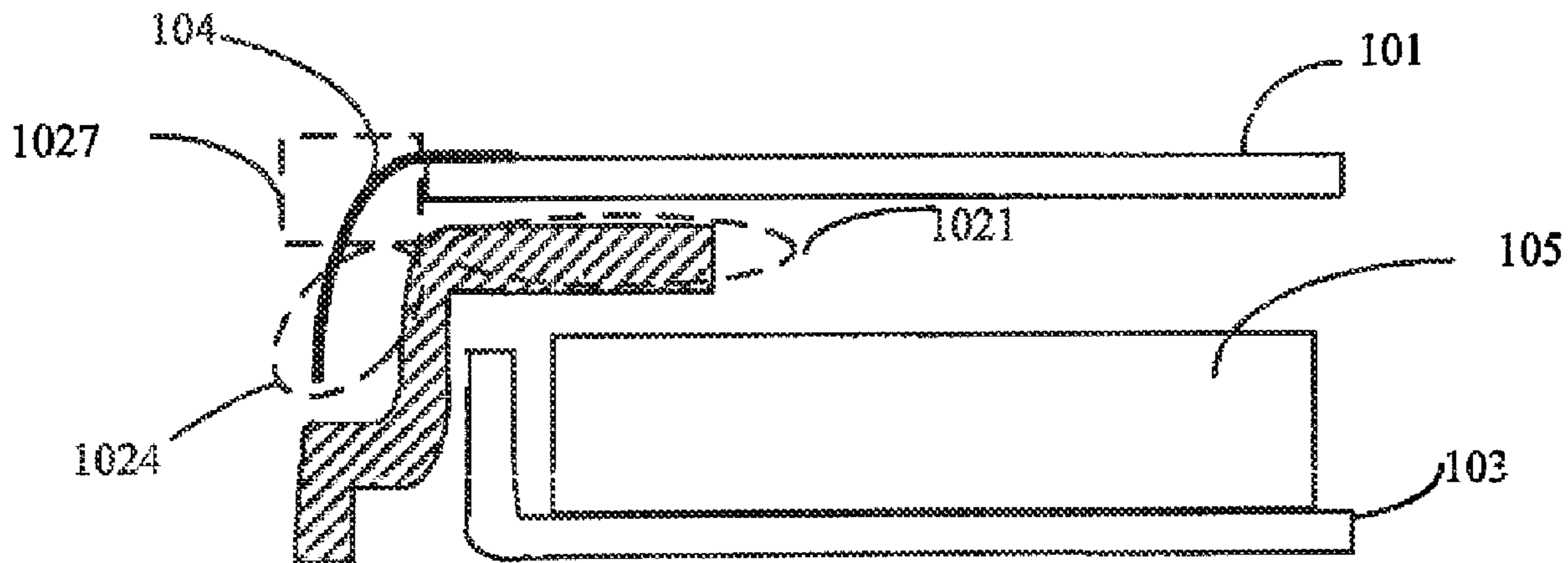
(30) **Foreign Application Priority Data**

Dec. 8, 2014 (CN) ..... 201410747432.9

(51) **Int. Cl.**  
**G02F 1/1333** (2006.01)  
**G02F 1/1345** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **G02F 1/1333** (2013.01); **G02F 1/1345** (2013.01)

**20 Claims, 6 Drawing Sheets**



(56)

**References Cited**

U.S. PATENT DOCUMENTS

2011/0242458 A1\* 10/2011 Itakura ..... G02B 6/0073  
349/65  
2011/0292320 A1\* 12/2011 Yu ..... G02B 6/0086  
349/63  
2013/0083512 A1 4/2013 Park  
2013/0169890 A1\* 7/2013 Kuromizu ..... G02F 1/13452  
348/790  
2014/0168565 A1\* 6/2014 Wu ..... G02B 6/0011  
349/58  
2015/0301391 A1 10/2015 Li

\* cited by examiner

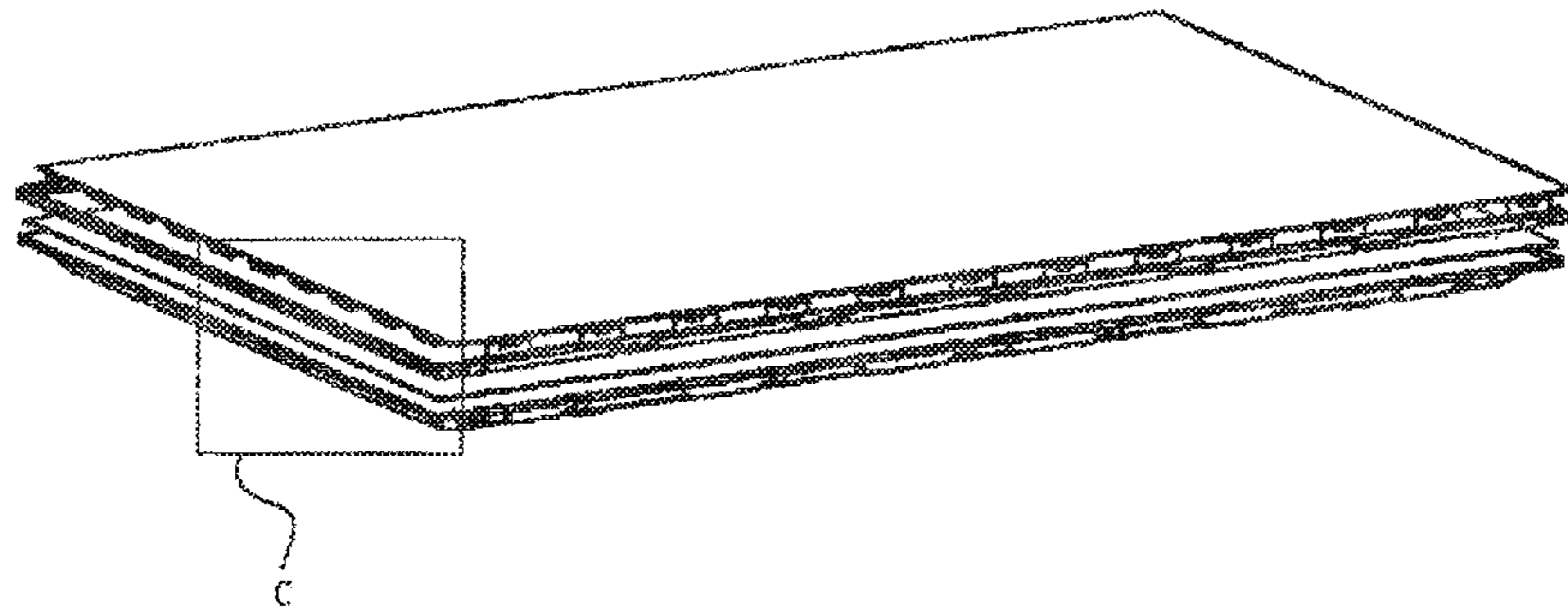


Fig.1A

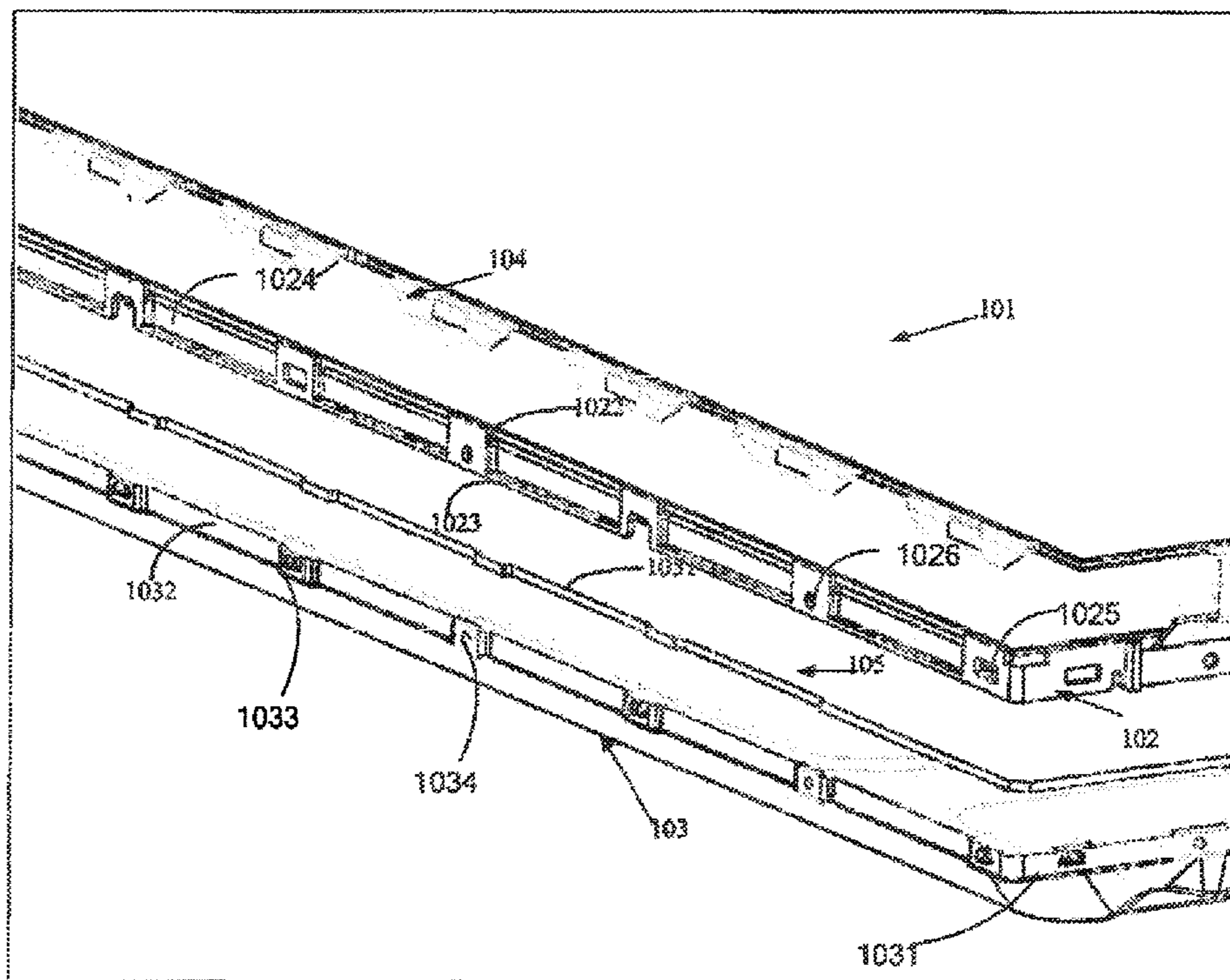


Fig.1B

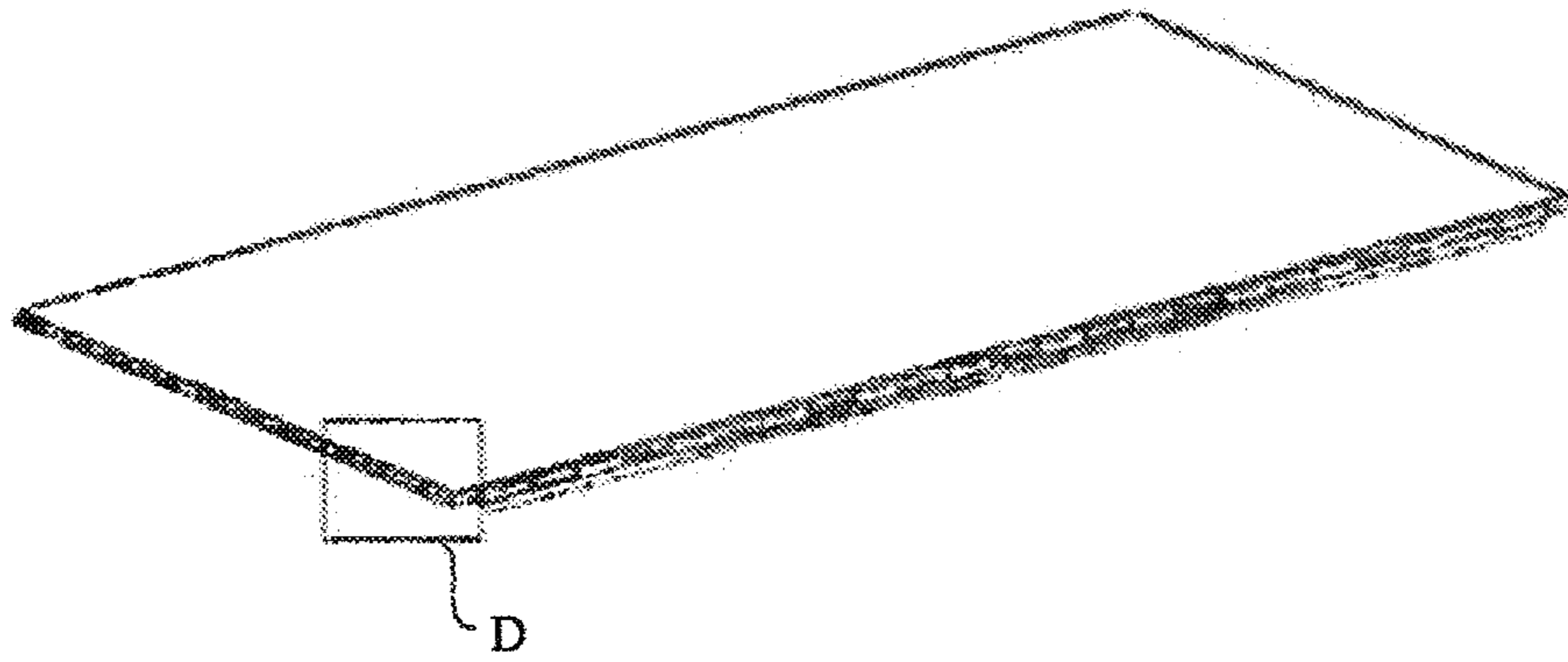


Fig.1C

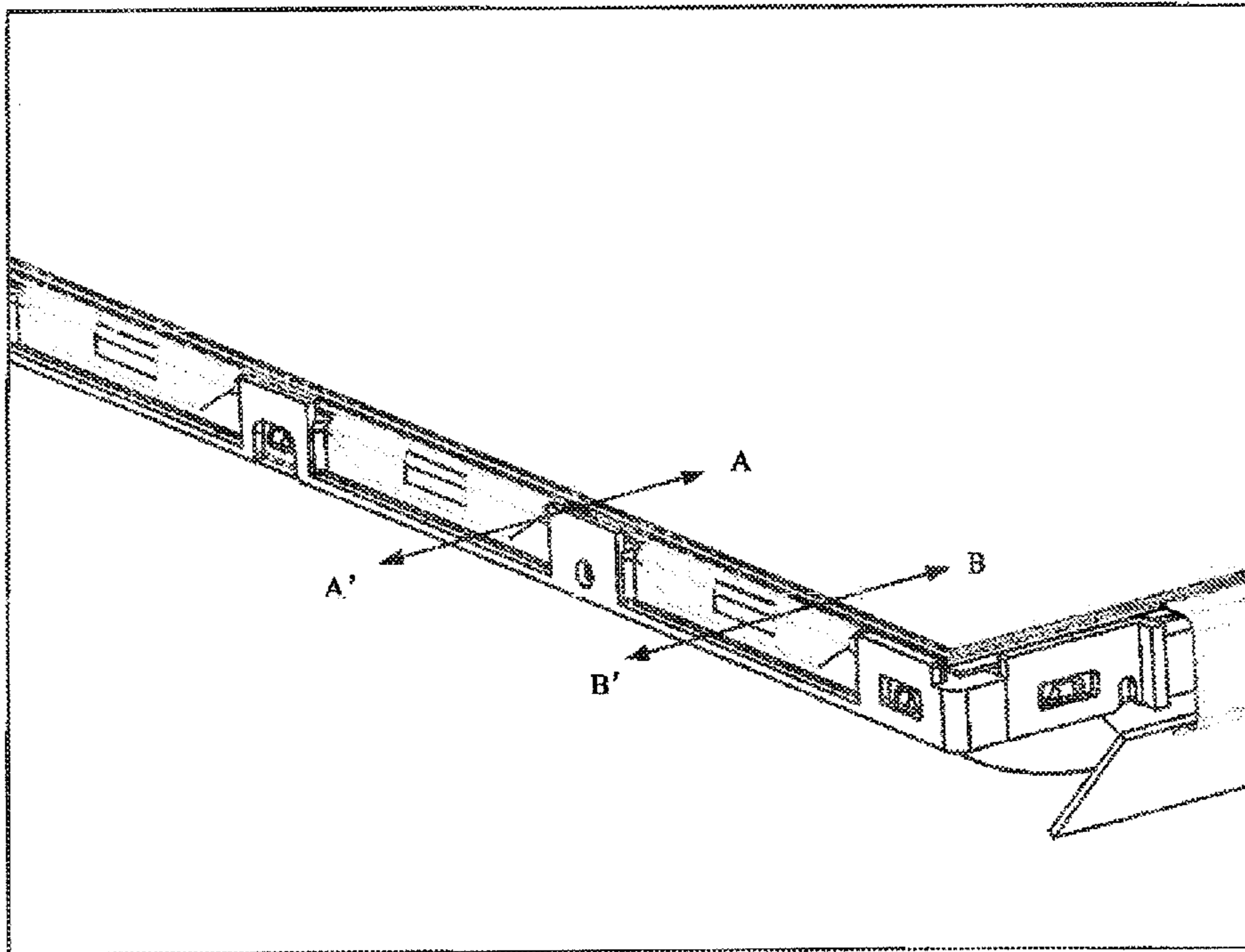


Fig.1D

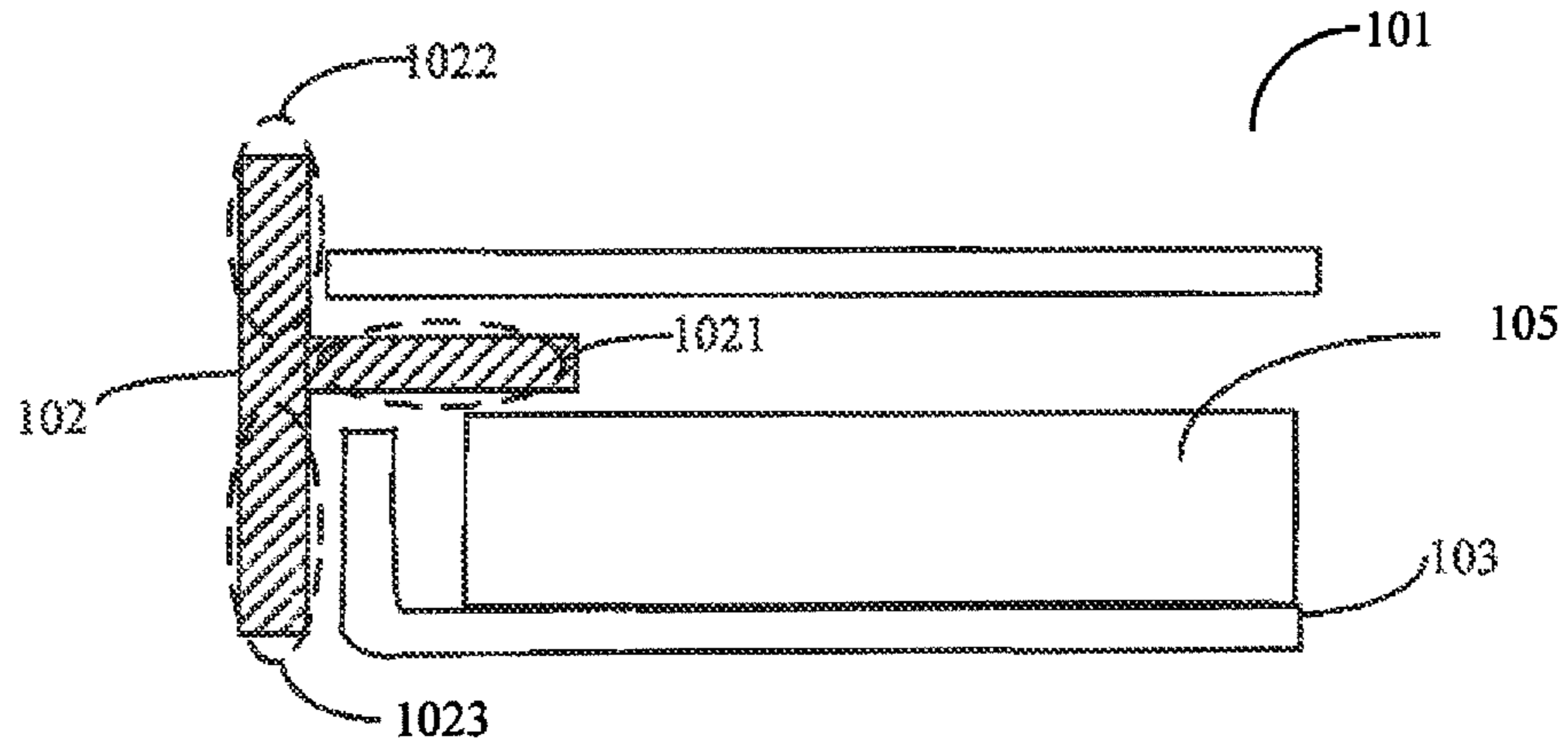


Fig. 2A

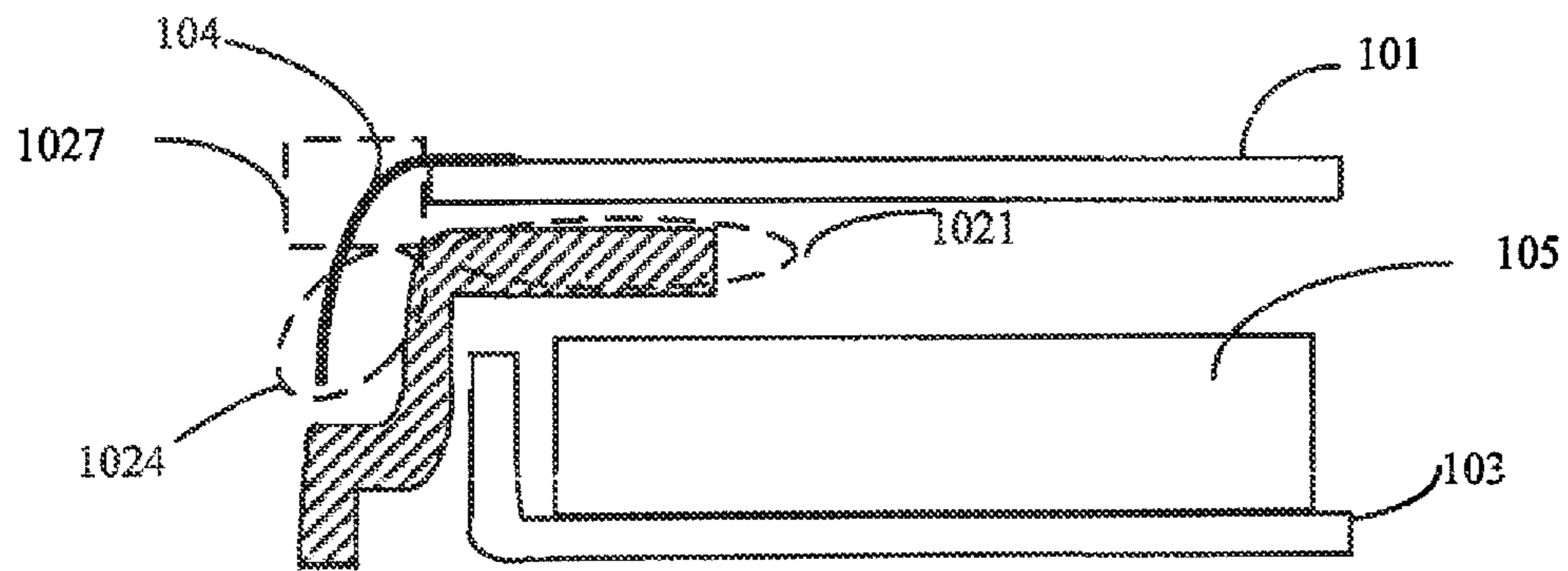


Fig. 2B

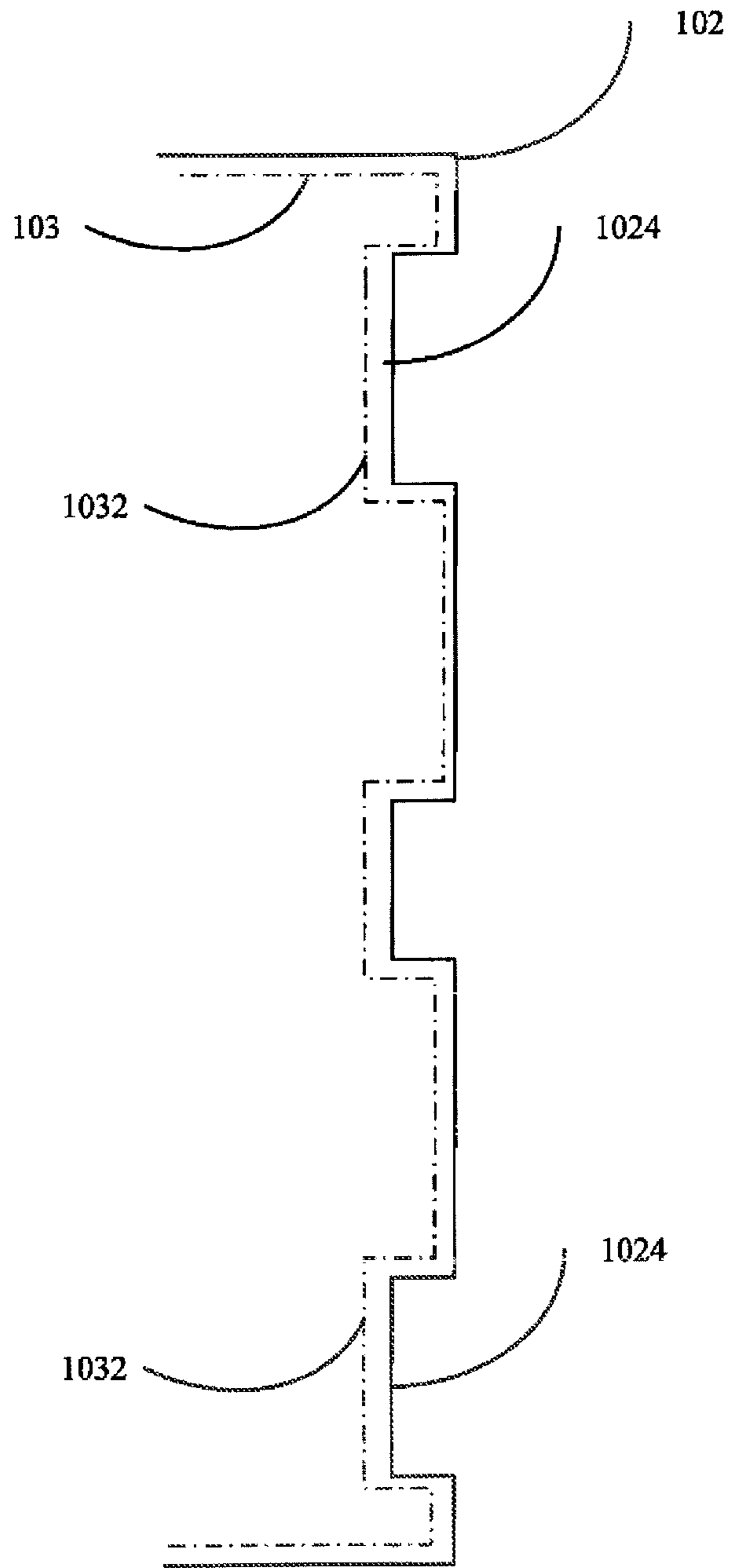


Fig.3

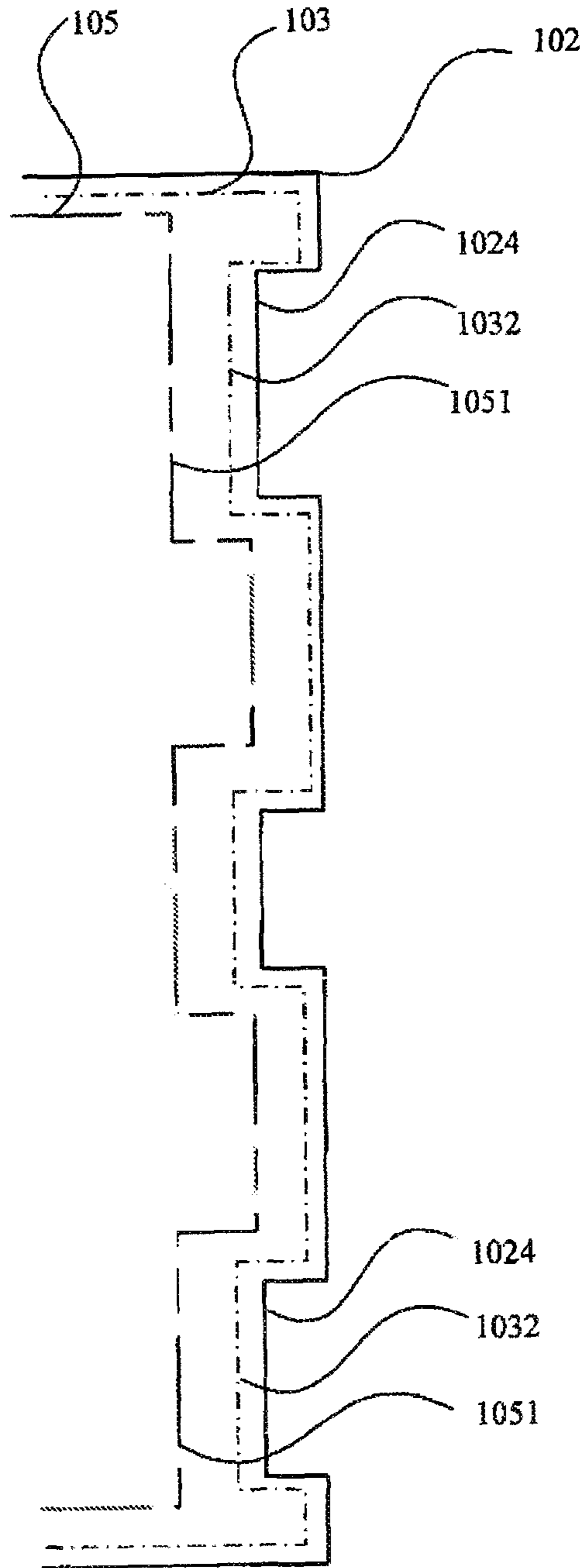


Fig.4

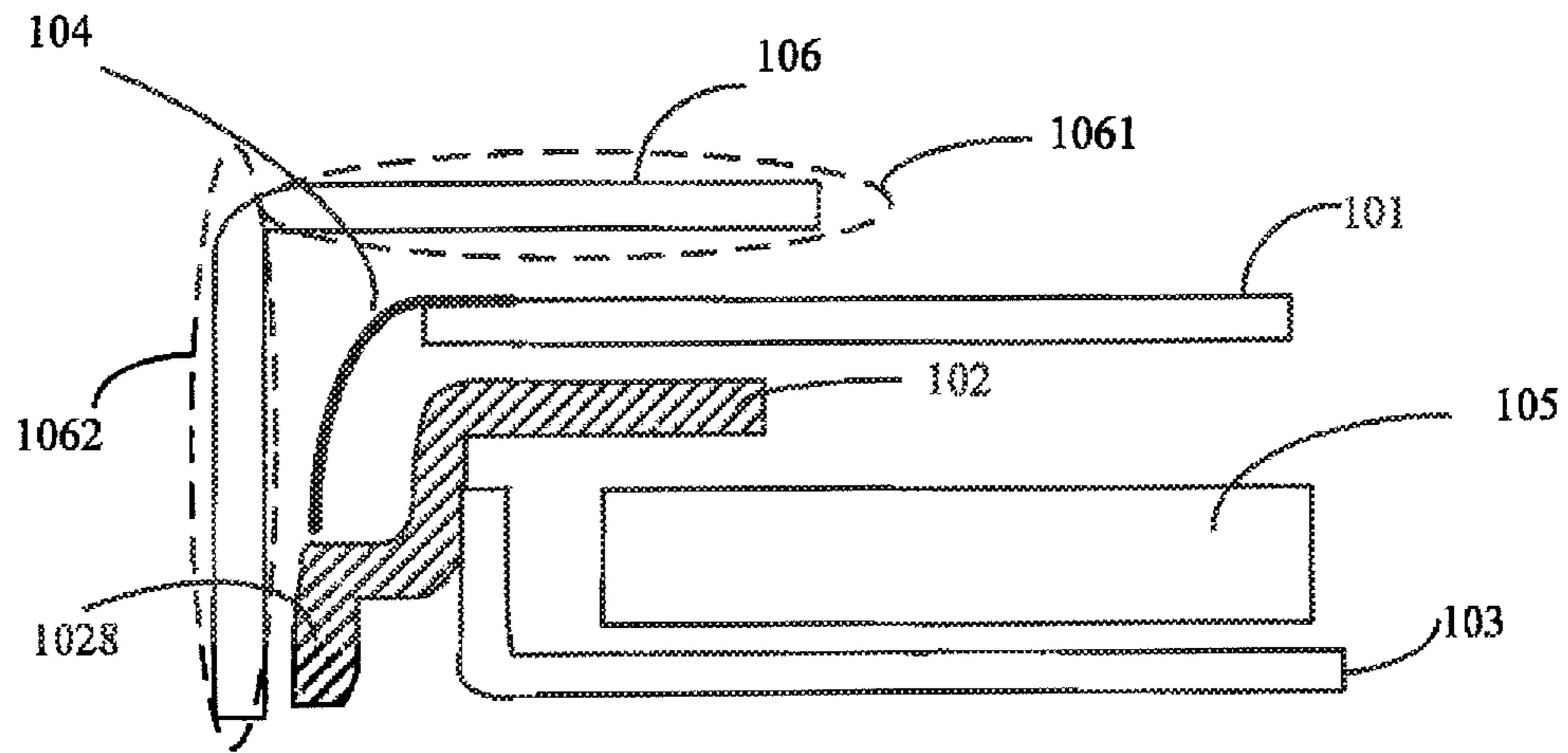


Fig.5

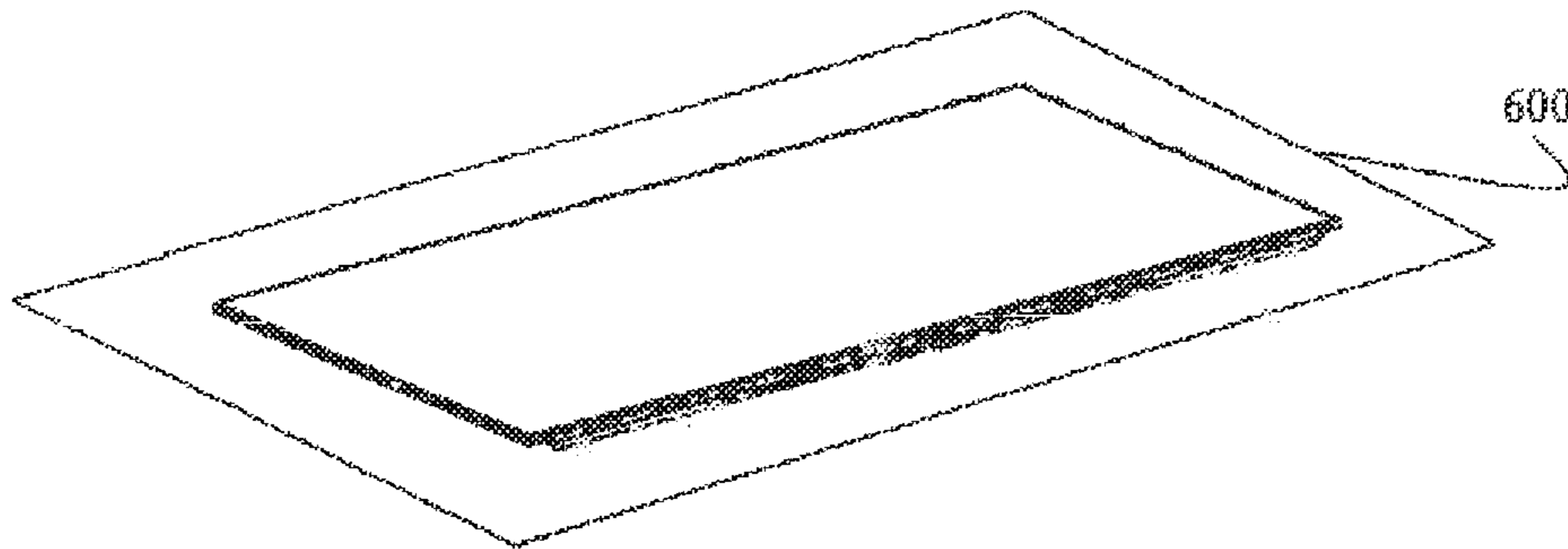


Fig.6



**LIQUID CRYSTAL DISPLAY MODULE  
COMPRISING AN ADHESIVE FRAME  
HAVING CARRYING SECTIONS AND  
LIMITING SECTIONS AND DISPLAY  
DEVICE**

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.**

This [application] is a reissue of U.S. Pat. No. 9,606,387, issued on Mar. 28, 2017 from U.S. patent application Ser. No. 14/730,988, which claims priority to Chinese Patent Application No. 201410747432.9[, and] filed with the State Intellectual Property Office of People's Republic of China on Dec. 8, 2014, the entire content of which is herein incorporated by reference.

FIELD

The present disclosure relates to the field of liquid crystal display technologies and particularly to a liquid crystal display module and a display device.

BACKGROUND

A liquid crystal display device has been widely applied to the fields of information technologies, multimedia technologies, etc., as a significant display device due to its low weight, small thickness, low power consumption, low radiation and other characteristics.

At present the liquid crystal display device becomes increasingly low in weight and small in thickness, and the structure of a liquid crystal display module is designed to be increasingly low in weight, small in thickness and increasingly compact.

SUMMARY

Some embodiments of the present disclosure provide a liquid crystal display module including a liquid crystal panel, an adhesive frame, and a backboard, herein:

flexible circuit boards are disposed on sides of the liquid crystal panel;

a folded edge facing the liquid crystal panel and configured to fix the adhesive frame are disposed on a periphery of the backboard;

the adhesive frame includes carrying sections parallel to a light incidence surface of the liquid crystal display module, limiting sections located above the carrying sections and perpendicular to the light incidence surface of the liquid crystal display module, and connecting sections disposed below the carrying sections and opposite to the limiting sections, herein the carrying sections are configured to support the liquid crystal panel, the limiting sections are configured to limit the liquid crystal panel to move in a plane horizontal to the light incidence surface of the liquid crystal display module, and the connecting sections are configured to cover an outside of the folded edge of the backboard, so that the adhesive frame and the backboard are fixed to each other;

notches are disposed on the limiting sections and opposite to the flexible circuit boards, the flexible circuit boards protrude the notches and are bent toward the connecting sections;

first depressed sections depressed inward are disposed on the connecting sections and opposite to the notches, and the first depressed is configured to accommodate the flexible circuit boards; and

second depressed sections depressed inward are disposed on the folded edge opposite to the first depressed sections, so that the first depressed sections and the second depressed sections cooperate with each other.

Some embodiments of the present disclosure provide a display device including a liquid crystal display module including liquid crystal panel, an adhesive frame, and a backboard, herein:

flexible circuit boards are disposed on sides of the liquid crystal panel;

a folded edge facing the liquid crystal panel and configured to fix the adhesive frame are disposed on a periphery of the backboard;

the adhesive frame includes carrying sections parallel to a light incidence surface of the liquid crystal display module, limiting sections located above the carrying sections and perpendicular to the light incidence surface of the liquid crystal display module, and connect-

ing sections disposed below the carrying sections and opposite to the limiting sections, herein the carrying sections are configured to support the liquid crystal panel, the limiting sections are configured to limit the liquid crystal panel to move in a plane horizontal to the light incidence surface of the liquid crystal display module, and the connecting sections are configured to cover an outside of the folded edge of the backboard,

so that the adhesive frame and the backboard are fixed to each other;

notches are disposed on the limiting sections and opposite to the flexible circuit boards, the flexible circuit boards protrude the notches and are bent toward the connecting sections;

first depressed sections depressed inward are disposed on the connecting sections and opposite to the notches, and the first depressed is configured to accommodate the flexible circuit boards; and

second depressed sections depressed inward are disposed on the folded edge opposite to the first depressed sections, so that the first depressed sections and the second depressed sections cooperate with each other.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to make the technical solutions according to the some embodiments of the present disclosure more apparent, the drawings to which reference is made in the description of the embodiments will be described below briefly; and apparently the drawings in the following description illustrate only some of the embodiments of the present disclosure, and those ordinarily skilled in the art may further derive other drawings from these embodiments here without any inventive effort. In the drawings:

FIG. 1A illustrates an exploded view of a liquid crystal display module according to some embodiments of the present disclosure;

FIG. 1B illustrates an enlarged view of a partial structure in an area C in FIG. 1A;

FIG. 1C illustrates a schematic diagram of the installed liquid crystal display module in FIG. 1A;

3

FIG. 1D illustrates an enlarged view of a structure in an area D in FIG. 1C;

FIG. 2A illustrates a schematic sectional view along A-A' in FIG. 1D;

FIG. 2B illustrates a schematic sectional view along B-B' in FIG. 1D;

FIG. 3 illustrates a schematic diagram of a first depressed section and a second depressed section, both of which cooperate with each other;

FIG. 4 illustrates a schematic diagram of a first depressed section, a second depressed section and a third depressed section, all of which cooperate with each other;

FIG. 5 illustrates a schematic sectional view of the position illustrated in FIG. 2B after a front housing is disposed at the position; and

FIG. 6 illustrates a schematic diagram of a display device according to some embodiments of the present disclosure.

#### DETAILED DESCRIPTION OF THE EMBODIMENTS

In order to make the objects, technical solutions and advantages of the present disclosure more apparent, the present disclosure will be described below in further details with reference to the drawings, and apparently the embodiments described below are only some but not all of the embodiments of the present disclosure. All the other embodiments which may occur to those ordinarily skilled in the art based upon the embodiments here of the present disclosure without any inventive effort shall fall into the scope of the present disclosure as claimed.

According to some exemplary embodiments of this disclosure, a liquid crystal display module may include a display panel, an adhesive frame, and a backboard, herein a folded edge facing the liquid crystal panel may be disposed on the periphery of the backboard. The adhesive frame may include carrying sections, parallel to a light incidence surface of the liquid crystal display module, configured to support the liquid crystal panel; limiting sections, located above the carrying sections and perpendicular to the light incidence surface of the liquid crystal display module, configured to limit the liquid crystal panel to move in a plane horizontal to the light incidence surface of the liquid crystal display module; and connecting sections, disposed below the carrying sections and [opposite] *corresponding* to the limiting sections, configured to cover the outside of the folded edge of the backboard, so that the adhesive frame and the backboard are fixed to each other. In order to enable the adhesive frame to cooperate with the liquid crystal panel disposed with flexible circuit boards, so that the flexible circuit boards are provided with an appropriate accommodating space, some embodiments of the present disclosure provide a liquid crystal display module. The liquid crystal panel may be disposed with the flexible circuit boards, and notches are disposed on the limiting sections and [opposite] *corresponding* to the flexible circuit boards, so that the flexible circuit boards protrude through the notches and are bent toward the connecting sections; and also first depressed sections configured to accommodate the flexible circuit boards may be disposed on the connecting sections and [opposite] *corresponding* to the notches; and second depressed sections depressed inward may be disposed on the folded edge and [opposite] *corresponding* to the first depressed sections, so that the first depressed sections and the second depressed sections cooperate with each other. With these cooperating structures, since both the first depressed sections and the second depressed sections face

4

the inside of the display module, the flexible circuit boards may be accommodated without any increase the width of the front edge frame, and the first depressed sections and the second depressed sections enable good cooperation between the structural components, to thereby improve the stability and firmness of the liquid crystal display module.

The technical solution according to the present disclosure will be described below in connection with some embodiments thereof, but the present disclosure will not be limited to the following embodiments.

It shall be noted that some embodiments of the present disclosure are directed to a liquid crystal display module disposed with flexible circuit boards, so some embodiments of the present disclosure are focused on two sides of the liquid crystal display module on which the flexible circuit boards are disposed, and since the flexible circuit boards on the two sides may be disposed similarly, and the adhesive frame and the backboard may also be structured similarly, some embodiments of the present disclosure refer to only one of the sides of the liquid crystal display module by way of an example, but may also apply to the other side of the liquid crystal display module, although a repeated description thereof will be omitted here.

FIG. 1A illustrates an exploded view of a liquid crystal display module according to some embodiments of the present disclosure; and FIG. 1B illustrates an enlarged view of a partial structure in an area C in FIG. 1A, and as illustrated in FIG. 1B, the liquid crystal display module may be structured as follows:

A liquid crystal panel **101**, an adhesive frame **102**, a backboard **103**, and optical components **105** may be disposed in that order from the top to the bottom; a flexible circuit boards **104** may be disposed on a side of the liquid crystal panel **101**; and a folded edge **1031** facing the liquid crystal panel **101** and configured to fix the adhesive frame **102** may be disposed on the periphery of the backboard **103**. The "from the top to the bottom" refers to the direction in FIG. 1B.

FIG. 1C illustrates a schematic structural diagram of an installed liquid crystal display module according to some embodiments of the present disclosure; FIG. 1D illustrates an enlarged view of a partial structure at D in FIG. 1A; and FIG. 2A and FIG. 2B illustrate sectional views of the structure of the liquid crystal display module taken along A-A' and B-B' of the installed liquid crystal display module in FIG. 1D.

As can be apparent from the figures above, the adhesive frame **102** may include carrying sections **1021** parallel to a light incidence surface of the liquid crystal display module, limiting sections **1022** located above the carrying sections **1021** and perpendicular to the light incidence surface of the liquid crystal display module, and connecting sections **1023** disposed below the carrying sections **1021** and [opposite] *corresponding* to the limiting sections **1022**, where the carrying sections **1021** are configured to support the liquid crystal panel **101**, the limiting sections **1022** are configured to limit the liquid crystal panel **101** to move in a plane horizontal to the light incidence surface of the liquid crystal display module, and the connecting sections **1023** are configured to cover the outside of the folded edge **1031** of the backboard **103**, so that the adhesive frame **102** and the backboard **103** are fixed to each other.

In some embodiments of the present disclosure, the flexible circuit boards may be disposed on the liquid crystal panel and [opposite] *corresponding* to B-B' of the adhesive frame, and as illustrated in FIG. 1D and FIG. 2B, in order to cooperate with the liquid crystal panel **101** disposed with the

5

flexible circuit board **104**, to thereby prevent a damage to the flexible circuit board **104** being adhered, notches **1027** may be disposed on the limiting sections **1022** of the adhesive frame and [opposite] *corresponding* to the flexible circuit boards **104**, so that the flexible circuit boards **104** may protrude the notches and be bent toward the connecting sections **1023**. The number of notches **1027** may be the same as the number of flexible circuit boards **104**. Since the limiting sections **1022** are configured to limit the liquid crystal panel **101** to horizontal movement, if the notches **1027** were not disposed, then the limiting sections **1022** would extrude the flexible circuit boards **104** when the liquid crystal panel were placed on the carrying sections **1021**, thus easily resulting in a damage to the flexible circuit boards **104**; and also first depressed sections **1024** depressed inward are disposed on the connecting sections **1023** and [opposite] *corresponding* to the notches **1027** to accommodate the flexible circuit boards **104**, so that the first depressed sections **1024** depressed inward are disposed on the limiting sections and [opposite] *corresponding* to the flexible circuit boards **104**, to thereby reserve some accommodation spaces for the flexible circuit boards, so that the flexible circuit boards **104** may be placed in the first depressed sections **1024**.

Moreover second depressed sections **1032** depressed inward may be disposed on the folded edge **1031** of the backboard **103** and [opposite] *corresponding* to the first depressed sections **1024**, so that the first depressed sections **1024** and the second depressed sections **1032** cooperate with each other, to thereby enable the backboard and the adhesive frame to be adhered firmly.

FIG. 3 illustrates the first depressed sections and the second depressed sections, both of which cooperate with each other, where the second depressed sections **1032** in the backboard **103** are disposed [opposite] *corresponding* to the first depressed sections **1024** in the adhesive frame, and both the first depressed sections **1024** and the second depressed sections **1032** are depressed toward the inside of the display module and fit closely together, so that the flexible circuit boards **104** may be accommodated without any increase in width of the front end face in the embodiments of the present disclosure.

Moreover in some embodiments of the present disclosure, as illustrated in FIG. 1B, since the optical components **105** may be disposed between the backboard **103**, and the carrying section **1021** of the adhesive frame **102**, in order to cooperate with the second depressed sections **1032** of the backboard **103**, and the first depressed sections **1024** of the adhesive frame **102**, third depressed sections **1051** depressed inward may be disposed on the optical components **105** and [opposite] *corresponding* to the second depressed sections **1032**, so that the third depressed sections **1051** may cooperate with the second depressed sections **1032** as illustrated in FIG. 4. Moreover, in view of some expansion gaps between the optical components, in order to enable the optical components to well match with the second depressed sections, the distances between the third depressed sections **1051** and the second depressed sections **1024** will be no smaller than the expansion gaps between the optical components.

In order to enable the first depressed sections **1024** to cooperate with the second depressed sections **1032**, as illustrated in FIG. 1B and FIG. 1D, in some embodiments of the present disclosure, in the optical modules, at least one first buckle **1025** may be disposed in at least one position of the connecting section **1023** other than the first depressed section **1024**, and at least one second buckle **1033** corre-

6

sponding to the first buckle **1025** may be disposed in at least one position of the folded edge **1031** other than the second depressed sections **1032**, and the at least one first buckle **1025** may be engaged with the at least one second buckle **1033**, so that the adhesive frame **102** is fixed to the backboard **103** when they are assembled. For example, multiple first buckles **1025** may be disposed in the center of the positions other than the first depressed sections **1024**, so that the first depressed sections **1024** and the first buckles **1025** are disposed alternately; and similarly multiple second buckles **1033** may be disposed in the center of the positions other than the second depressed sections **1032**, so that the second depressed sections **1032** and the second buckles **1033** are disposed alternately. The first buckles **1025** and the second buckles **1033** disposed on correspondence may be engaged with each other, to thereby stabilize and firm the backboard **103** and the adhesive frame **102**.

Moreover in some embodiments of the present disclosure, in the liquid crystal display, at least one first screwed hole **1026** may be disposed in at least one positions of the connecting sections **1023** module other than the first depressed section **1024** and the first buckle **1025**, and at least one second screwed hole **1034** corresponding to the first screwed hole **1026** may be disposed in at least one positions on the folded edge **1031** other than the second depressed section **1024** and the second buckle **1033**, and the first screwed hole **1026** and the second screwed hole **1034** are engaged with each other through a bolt, to thereby fix a back housing and/or a front housing to the liquid crystal display module.

Moreover, in addition to the structure above, the liquid crystal display module may further include a front housing **[105] 106**; and taking as an example a section of the position where a flexible circuit board is disposed, as illustrated in FIG. 5, the front housing **106** may include a front end face **1061** and a sidewall **1062**, herein the front end face **1061** may be fit onto a light exit face of the liquid crystal panel **101**, and in order to enable the front housing to be fixed to the liquid crystal panel, without any influence on a display area of the liquid crystal panel, the front end face may cover only an edge area of the liquid crystal panel. In some embodiments of the present disclosure, the inside of the sidewall **1062** may be fit onto the connecting sections **1023** in positions other than the first depressed sections **1024**, and accommodation spaces to accommodate the flexible circuit boards **104** may be formed between the inside of the sidewall **1062** and the first depressed sections **1024** in the connecting section **1023**, so that the flexible circuit boards **104** may be accommodated in the accommodation spaces.

In some embodiments of the present disclosure, protecting sections **[1028] 1024** may be disposed on the sides, of the first depressed sections **1024** of the connecting sections **1023**, away from the carrying sections. The protecting sections **1028** may be flushed with the connecting sections **1023**. Steps may be formed by the protecting sections **1028** and the first depressed sections **1024**, so that the first depressed sections with the front housing **106** being installed are enclosed to form closed spaces, to thereby prevent a damage to the flexible circuit board **104** from the outside.

In some embodiments of the present disclosure, the height of the folded edge **1031** may be no less than any one of the thicknesses of the optical components **105** in the direction perpendicular to the light incidence surface of the liquid crystal display module.

In order to enable the optical components **105** to be placed, the thickness of the folded edge **1031** of the backboard **103** may be sufficiently large and generally no less

than any one of the thicknesses of the optical components in the direction perpendicular to the light incidence surface of the liquid crystal display module.

According to FIG. 6, some embodiments of the present disclosure further provide a display device 600 which may include a liquid crystal display module, and the liquid crystal display module may include a liquid crystal panel, an adhesive frame, and a backboard;

Flexible circuit boards are disposed on sides of the liquid crystal panel;

A folded edge facing the liquid crystal panel and configured to fix the adhesive frame are disposed on the periphery of the backboard;

The adhesive frame includes: carrying sections parallel to a light incidence surface of the liquid crystal display module, limiting sections located above the carrying sections and perpendicular to the light incidence surface of the liquid crystal display module, and connecting sections disposed below the carrying sections and [opposite] *corresponding* to the limiting sections, herein the carrying sections are configured to support the liquid crystal panel, the limiting sections are configured to limit the liquid crystal panel to move in a plane horizontal to the light incidence surface of the liquid crystal display module, and the connecting sections are configured to cover the outside of the folded edge of the backboard, so that the adhesive frame and the backboard are fixed to each other;

Notches are disposed on the limiting sections and [opposite] *corresponding* to the flexible circuit boards, so that the flexible circuit boards protrude the notches and are bent toward the connecting sections;

First depressed sections depressed inward are disposed on the connecting sections and [opposite] *corresponding* to the notches to accommodate the flexible circuit boards; and

Second depressed sections depressed inward are disposed on the folded edge and [opposite] *corresponding* to the first depressed sections, so that the first depressed sections and the second depressed sections cooperate with each other.

In some embodiments of the present disclosure, the display device may further include optical components disposed between the backboard, and the carrying section of the adhesive frame, herein third depressed sections depressed inward are disposed on the optical components and [opposite] *corresponding* to the second depressed sections, so that the third depressed sections cooperate with the second depressed sections.

In some embodiments of the present disclosure, in the display device, distances between the third depressed sections and the second depressed sections are no less than expansion gaps between the optical components.

In some embodiments of the present disclosure, in the display device, at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section, and a second buckle corresponding to the first buckle is disposed in at least one position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

In some embodiments of the present disclosure, in the display device, at least one first screwed hole is disposed in at least one position of the connecting sections other than the first depressed section and the first buckle, and a second screwed hole is disposed on the folded edge and [opposite] *corresponding* to the first screwed hole.

In some embodiments of the present disclosure, the display device may further includes a front housing including a front end face and a sidewall, herein the front end face is fit onto a light exit face of the liquid crystal panel, and the

inside of the sidewall is fit onto the connecting sections in the positions other than the first depressed sections, and accommodation spaces to accommodate the flexible circuit boards is formed between the inside of the sidewall and the first depressed sections.

In some embodiments of the present disclosure, in the display device, protecting sections are disposed on the sides, of the first depressed sections of the connecting sections, away from the carrying sections, and the protecting sections are flushed with the connecting sections, and steps are formed by the protecting sections and the first depressed sections, and the steps cooperate with the front housing, so that the first depressed sections with the front housing being installed are enclosed to form closed spaces.

In some embodiments of the present disclosure, in the display device, the height of the folded edge is no less than any one of the thicknesses of the optical components in the direction perpendicular to the light incidence surface of the liquid crystal display module.

In some embodiments of the present disclosure, in the display device, at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section, and a second buckle corresponding to the first buckle is disposed in at least one position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

In some embodiments of the present disclosure, in the display device, at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section, and a second buckle corresponding to the first buckle is disposed in at least one position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

With the liquid crystal display module with the flexible circuit boards disposed on the sides of the liquid crystal panel, the notches are disposed on the limiting sections of the adhesive frame and [opposite] *corresponding* to the flexible circuit boards, and the first depressed sections depressed inward to accommodate the flexible circuit boards are disposed on the connecting sections and [opposite] *corresponding* to the notches, so that the notches cooperate with the first depressed sections in such a way that the flexible circuit boards may protrude the notches and be bent toward the connecting sections; and the second depressed sections depressed inward may be disposed on the folded edge of the backboard and [opposite] *corresponding* to the first depressed sections, so that the second depressed sections cooperate in structure with the first depressed sections, in such a way that the flexible circuit boards may be accommodated in the liquid crystal display module, without any influence on the structural functions of the latter, and the backboard and the adhesive may cooperate firmly with each other through the first depressed sections and the second depressed sections, to thereby improve the stability and firmness of the liquid crystal display module.

Although some embodiments of the present disclosure have been described, those skilled in the art benefiting from the underlying inventive concept may make additional modifications and variations to these embodiments. Therefore the appended claims are intended to be construed as encompassing the preferred embodiments and all the modifications and variations coming into the scope of the present disclosure.

Evidently those skilled in the art may make various modifications and variations to the present disclosure without departing from the spirit and scope of the present disclosure. Thus the present disclosure is also intended to

encompass these modifications and variations thereto so long as the modifications and variations come into the scope of the claims appended to the present disclosure and their equivalents.

The invention claimed is:

1. A liquid crystal display module, comprising a liquid crystal panel, an adhesive frame, and a backboard, wherein the liquid crystal display module comprises:

flexible circuit boards, disposed on sides of the liquid crystal panel,

a folded edge[, facing the liquid crystal panel,] disposed on a periphery of the backboard and configured to fix the adhesive frame,

wherein the adhesive frame comprises carrying sections parallel to [a light incidence surface of] the liquid crystal [display module] panel, limiting sections located above the carrying sections and perpendicular to [the light incidence surface of] the liquid crystal [display module] panel, and connecting sections disposed below the carrying sections and [opposite] corresponding to the limiting sections,

wherein the carrying sections are configured to support the liquid crystal panel, the limiting sections are configured to limit the liquid crystal panel to move in a plane [horizontal] parallel to [the light incidence surface of] the liquid crystal [display module] panel, and the connecting sections are configured to cover an outside of the folded edge of the backboard, so that the adhesive frame and the backboard are fixed to each other,

wherein notches are disposed on the limiting sections and [opposite] corresponding to the flexible circuit boards, so that the flexible circuit boards protrude and are bent toward the connecting sections,

first depressed sections depressed inward are disposed on the connecting section and [opposite] corresponding to the notches to accommodate the flexible circuit boards, and

second depressed sections depressed inward are disposed on the folded edge and [opposite] corresponding to the first depressed sections, so that the first depressed sections and the second depressed sections cooperate with each other.

2. The liquid crystal display module according to claim 1, wherein the liquid crystal display module further comprises optical components disposed between the backboard, and the carrying section of the adhesive frame, wherein third depressed sections depressed inward are disposed on the optical components and [opposite] corresponding to the second depressed sections, so that the third depressed sections cooperate with the second depressed sections.

3. The liquid crystal display module according to claim 2, wherein distances between the third depressed sections and the second depressed sections are no less than expansion gaps between the optical components.

4. The liquid crystal display module according to claim [1] 2, wherein at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section, and a second buckle corresponding to the first buckle is disposed in a position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

5. The liquid crystal display module according to claim 4, wherein at least one first screwed hole is disposed in at least one position of the connecting sections other than the first depressed section and the first buckle, and a second screwed

hole is disposed on the folded edge and [opposite] corresponding to the first screwed hole.

6. The liquid crystal display module according to claim 5, further comprising a front housing comprising a front end face and a sidewall, wherein the front end face is fit onto a light exit face of the liquid crystal panel, and an inside of the sidewall is fit onto the connecting sections in positions other than the first depressed sections, and accommodation spaces to accommodate the flexible circuit boards is formed between the inside of the sidewall and the first depressed sections.

7. The liquid crystal display module according to claim 6, wherein protecting sections are disposed on sides, of the first depressed sections of the connecting sections, away from the carrying sections, and the protecting sections are flushed with the connecting sections, and steps are formed by the protecting sections and the first depressed sections, and the steps cooperate with the front housing, so that the first depressed sections with the front housing being installed are enclosed forming closed spaces.

8. The liquid crystal display module according to claim 6, wherein a height of the folded edge is no less than thicknesses of the optical components in [the] a direction perpendicular to [the light incidence surface of] the liquid crystal [display module] panel.

9. The liquid crystal display module according to claim 2, wherein at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section. and a second buckle corresponding to the first buckle is disposed in a position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

10. The liquid crystal display module according to claim 3, wherein at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section, and a second buckle corresponding to the first buckle is disposed in a position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

11. A display device, comprising a liquid crystal display module comprising a liquid crystal panel, an adhesive frame, and a backboard, wherein the liquid crystal display module comprises:

flexible circuit boards, disposed on sides of the liquid crystal panel,

a folded edge[, facing the liquid crystal panel,] disposed on a periphery of the backboard and configured to fix the adhesive frame,

wherein the adhesive frame comprises carrying sections parallel to [a light incidence surface of] the liquid crystal [display module] panel, limiting sections located above the carrying sections and perpendicular to [the light incidence surface of] the liquid crystal [display module] panel, and connecting sections disposed below the carrying sections and [opposite] corresponding to the limiting sections,

wherein the carrying sections are configured to support the liquid crystal panel, the limiting sections are configured to limit the liquid crystal panel to move in a plane [horizontal] parallel to [the light incidence surface of] the liquid crystal [display module] panel, and the connecting sections are configured to cover an outside of the folded edge of the backboard, so that the adhesive frame and the backboard are fixed to each other,

wherein notches are disposed on the limiting sections and [opposite] corresponding to the flexible circuit boards,

## 11

so that the flexible circuit boards protrude and are bent toward the connecting sections,

first depressed sections depressed inward are disposed on the connecting sections and [opposite] *corresponding* to the notches to accommodate the flexible circuit boards, and

second depressed sections depressed inward are disposed on the folded edge and [opposite] *corresponding* to the first depressed sections, so that the first depressed sections and the second depressed sections cooperate with each other.

12. The display device according to claim 11, wherein the liquid crystal display further comprises optical components disposed between the backboard, and the carrying section of the adhesive frame, wherein third depressed sections depressed inward are disposed on the optical components and [opposite] *corresponding* to the second depressed sections, so that the third depressed sections cooperate with the second depressed sections.

13. The display device according to claim 12, wherein distances between the third depressed sections and the second depressed sections are no less than expansion gaps between the optical components.

14. The display device according to claim 12, wherein at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section, and a second buckle corresponding to the first buckle is disposed in a position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

15. The display device according to claim 14, wherein at least one first screwed hole is disposed in at least one position of the connecting sections other than the first depressed section and the first buckle, and a second screwed hole is disposed on the folded edge and [opposite] *corresponding* to the first screwed hole.

## 12

16. The display device according to claim 15, further comprising a front housing comprising a front end face and a sidewall, wherein the front end face is fit onto a light exit face of the liquid crystal panel, and an inside of the sidewall is fit onto the connecting sections in positions other than the first depressed sections, and accommodation spaces to accommodate the flexible circuit boards is formed between the inside of the sidewall and the first depressed sections.

17. The display device according to claim 16, wherein protecting sections are disposed on sides, of the first depressed sections of the connecting sections, away from the carrying sections, and the protecting sections are flushed with the connecting sections, and steps are formed by the protecting sections and the first depressed sections, and the steps cooperate with the front housing, so that the first depressed sections with the front housing being installed are enclosed forming closed spaces.

18. The display device according to claim 16, wherein a height of the folded edge is no less than thicknesses of the optical components in [the] *a* direction perpendicular to [the light incidence surface of] the liquid crystal [display module] *panel*.

19. The display device according to claim 12, wherein at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section, and a second buckle corresponding to the first buckle is disposed in a position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

20. The display device according to claim 13, wherein at least one first buckle is disposed in at least one position of the connecting sections other than the first depressed section, and a second buckle corresponding to the first buckle is disposed in a position of the folded edge other than the second depressed sections, and the first buckle is engaged with the second buckle.

\* \* \* \* \*