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(54) **MANUFACTURING METHOD OF AIRBAG CUSHION, AND THE AIRBAG CUSHION**

(71) Applicant: **Autoliv Development AB**, Vargarda (SE)

(72) Inventors: **Takeshi Idomoto**, Yokohama (JP); **Hiroya Tabushi**, Yokohama (JP)

(73) Assignee: **AUTOLIV DEVELOPMENT AB**, Vargarda (SE)

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B60R 21/231 (2011.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B60R 21/231*** (2013.01); ***B60R 21/2338*** (2013.01); *B60R 2021/0044* (2013.01);
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(58) **Field of Classification Search**
CPC B60R 21/233; B60R 2021/23308; B60R 21/2338; B60R 2021/23382;
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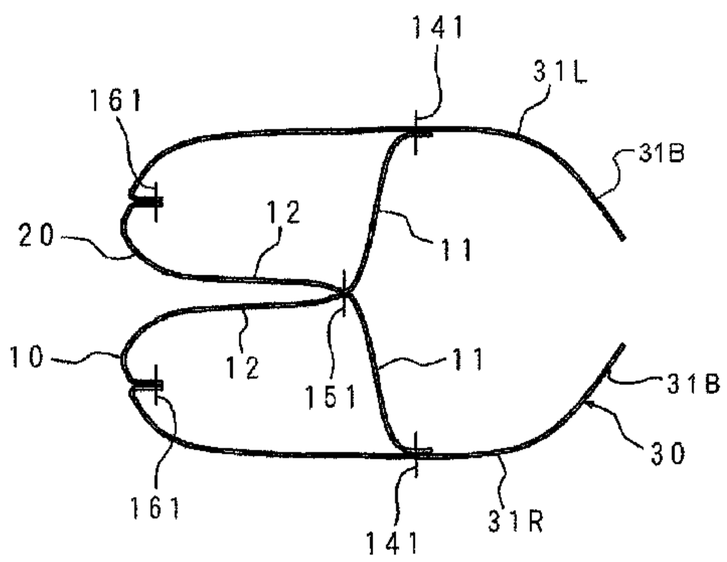
Primary Examiner — Peter C English
(74) *Attorney, Agent, or Firm* — Stephen T. Olson; Harness, Dickey & Pierce, P.L.C.

(57) **ABSTRACT**

An airbag cushion is manufactured with a rear fabric panel and two front fabric panels. Each front fabric panel has a projecting tether portion to be sewn to an inner face of the rear fabric panel. The front fabric panels are, firstly, superimposed *on* each other. A **[**back**]** *first* end of the projecting tether portion is sewn to a part of a periphery of the front fabric panel, to form a second stitch portion **[**in a recessed shape**]**. A **[**front**]** *second* end of the tether portion is then sewn to the inner face of the rear fabric panel. A periphery of the rear fabric panel is, in addition, sewn to a periphery of the front fabric panel corresponding to the periphery of the rear fabric panel, to form a third stitch portion.

40 Claims, 16 Drawing Sheets



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B60R 21/235	(2006.01)

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

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(58) **Field of Classification Search**

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See application file for complete search history.

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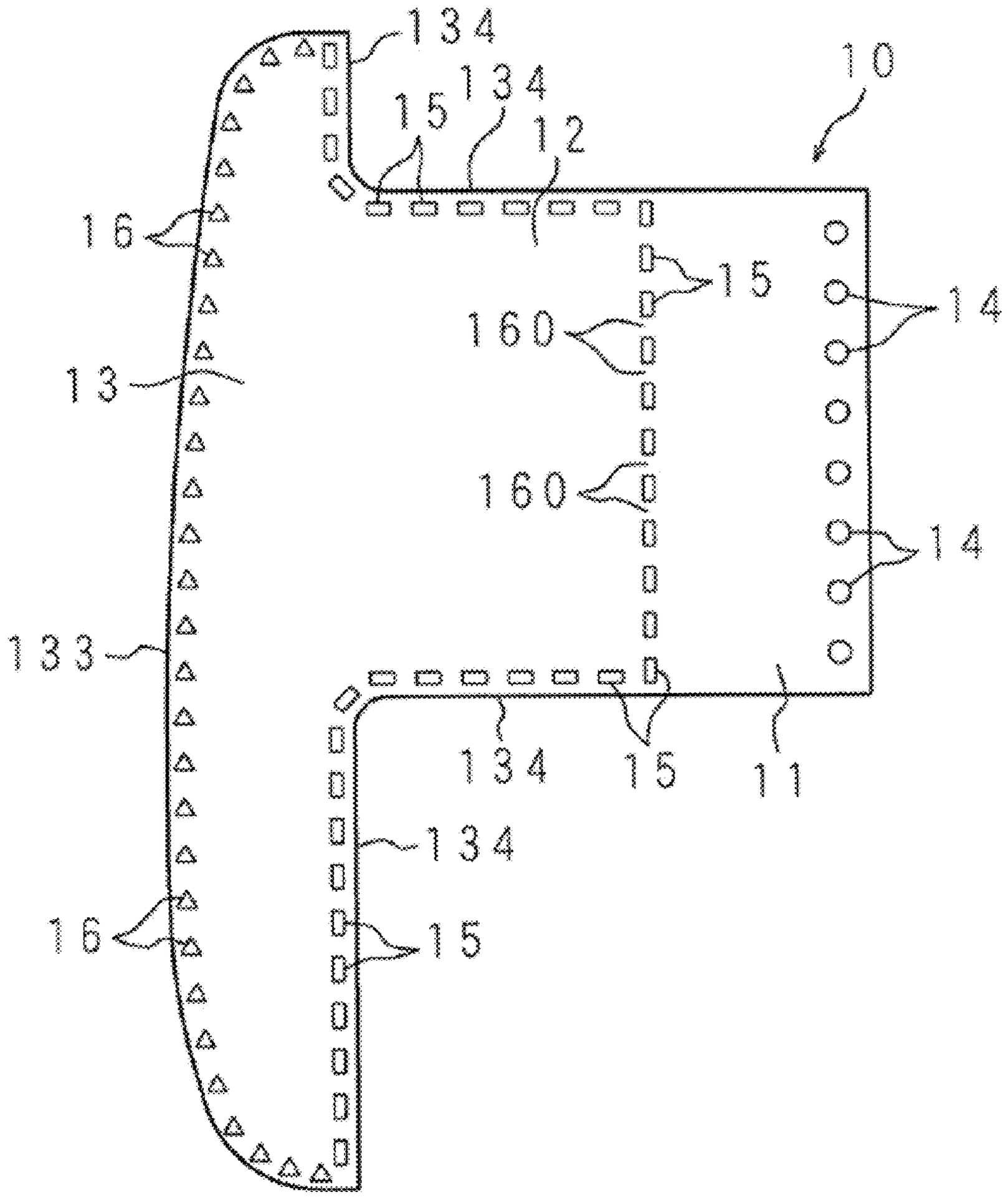

FIG. 1

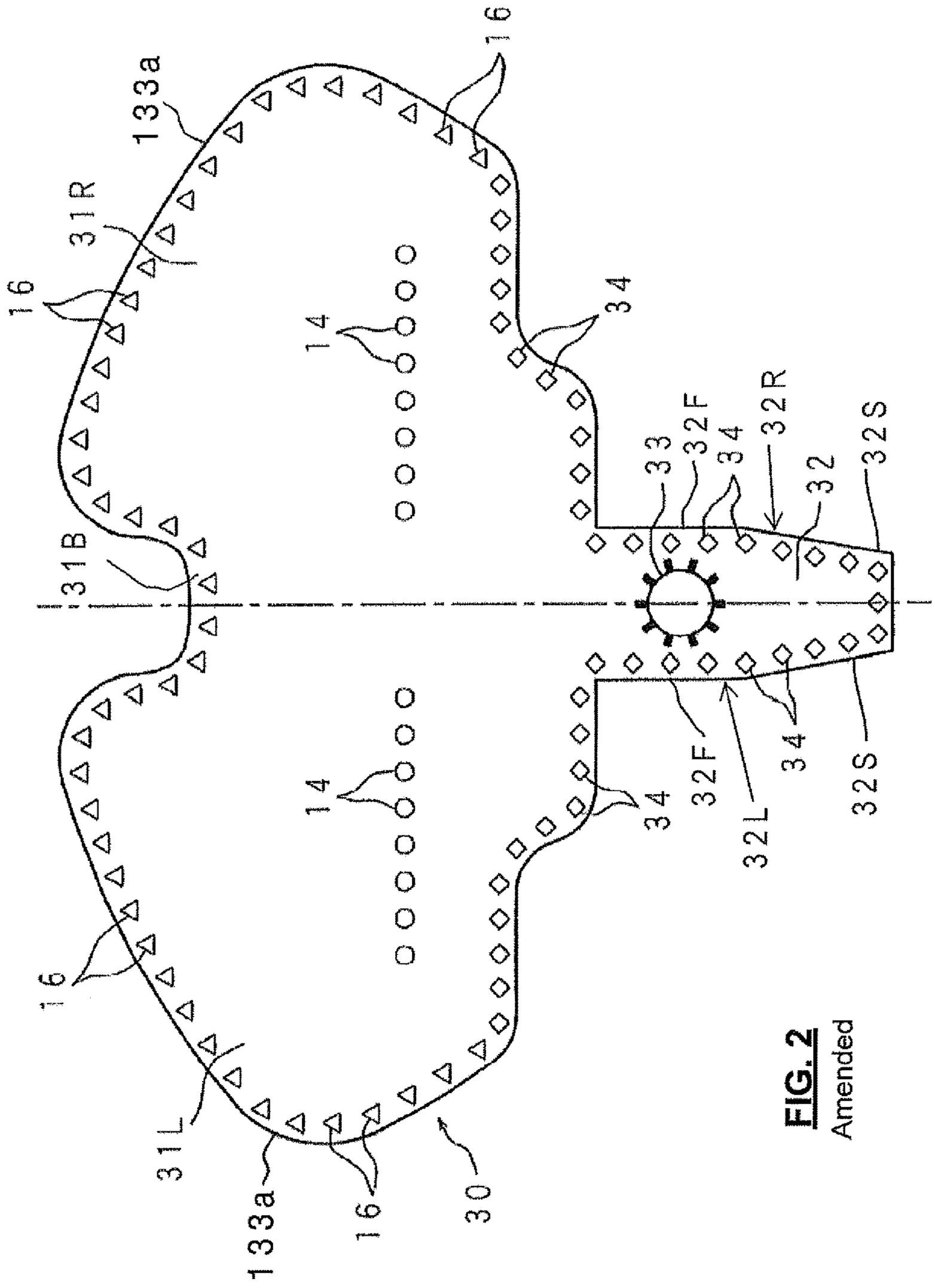

FIG. 2
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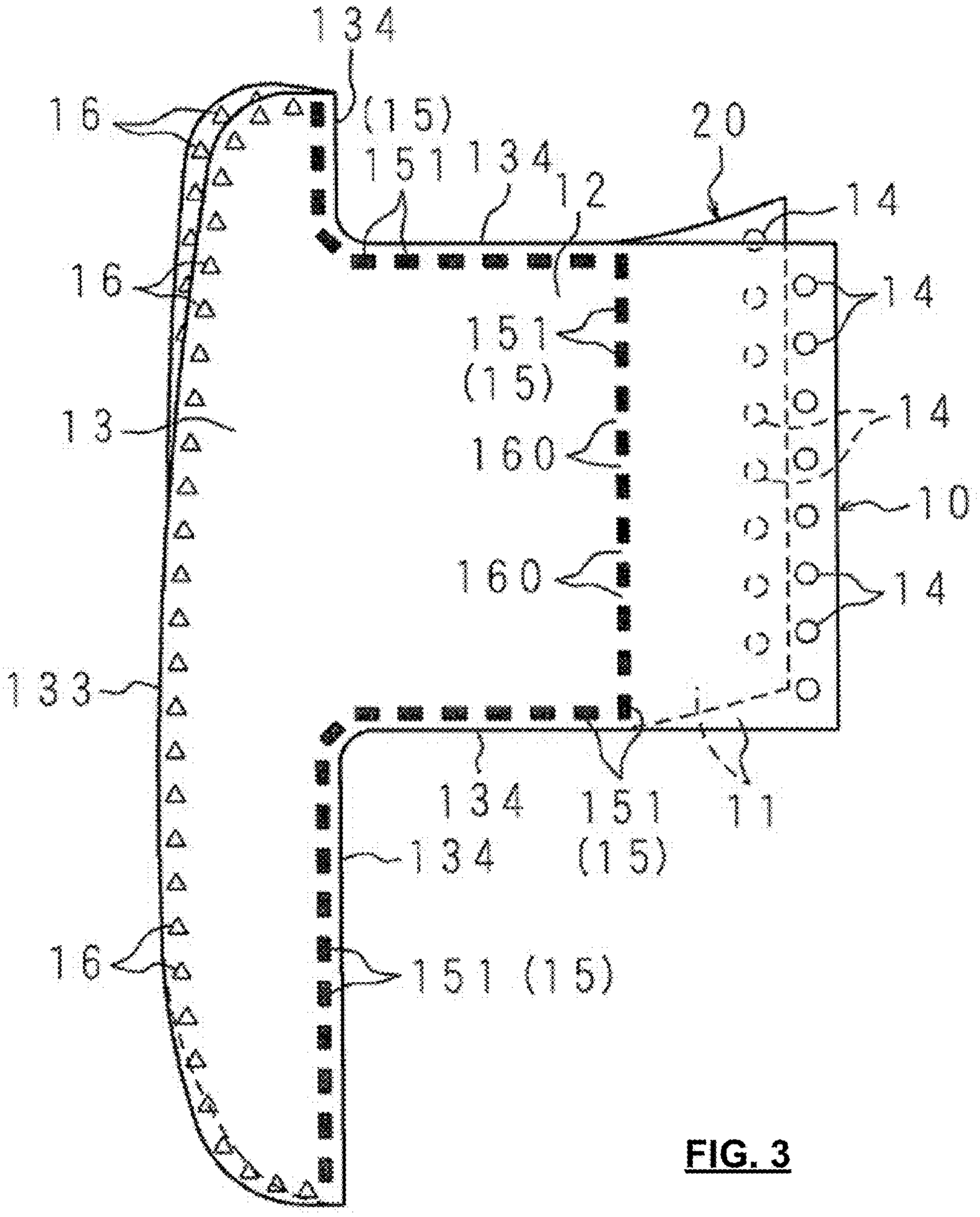
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FIG. 3

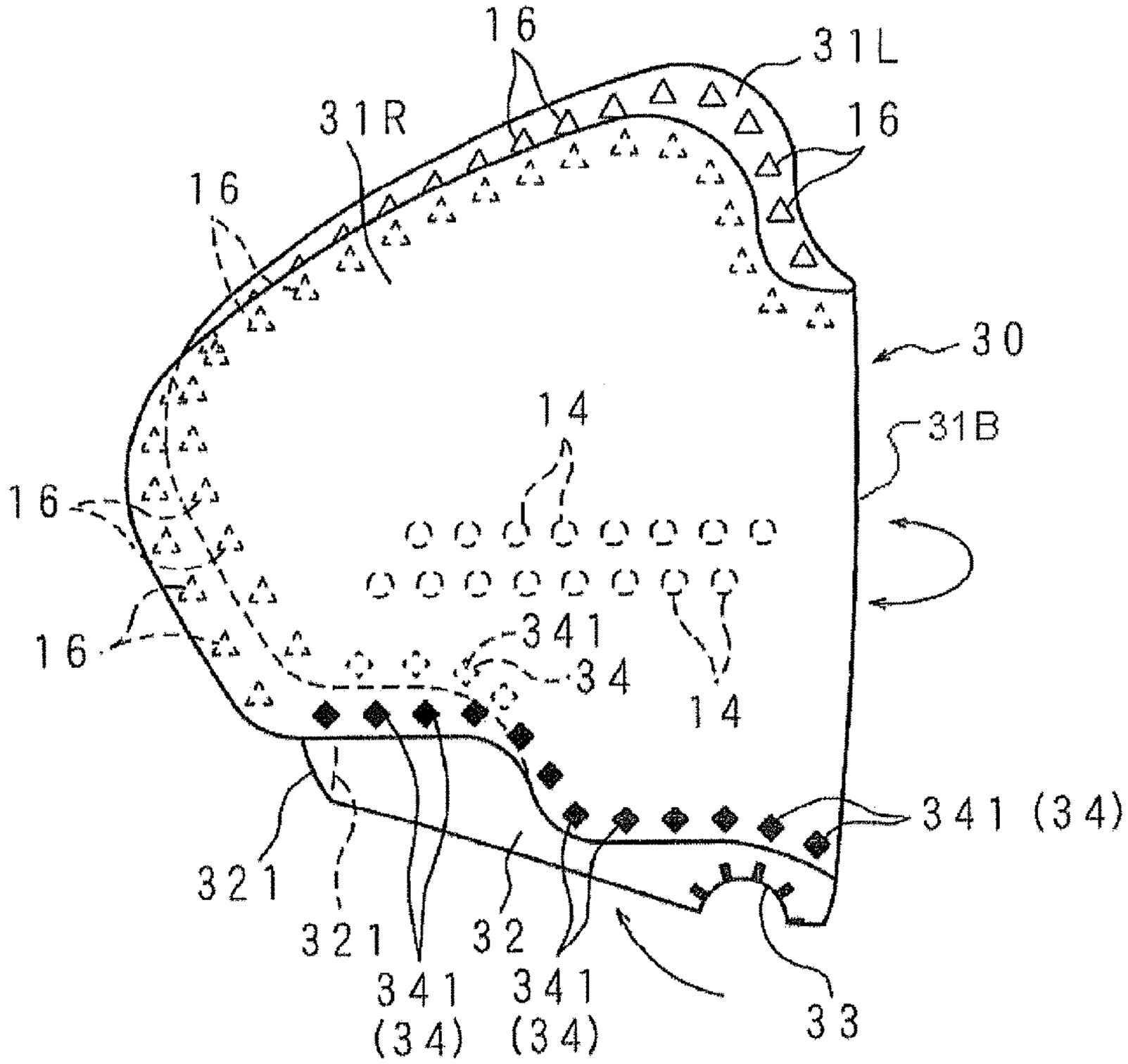

FIG. 4

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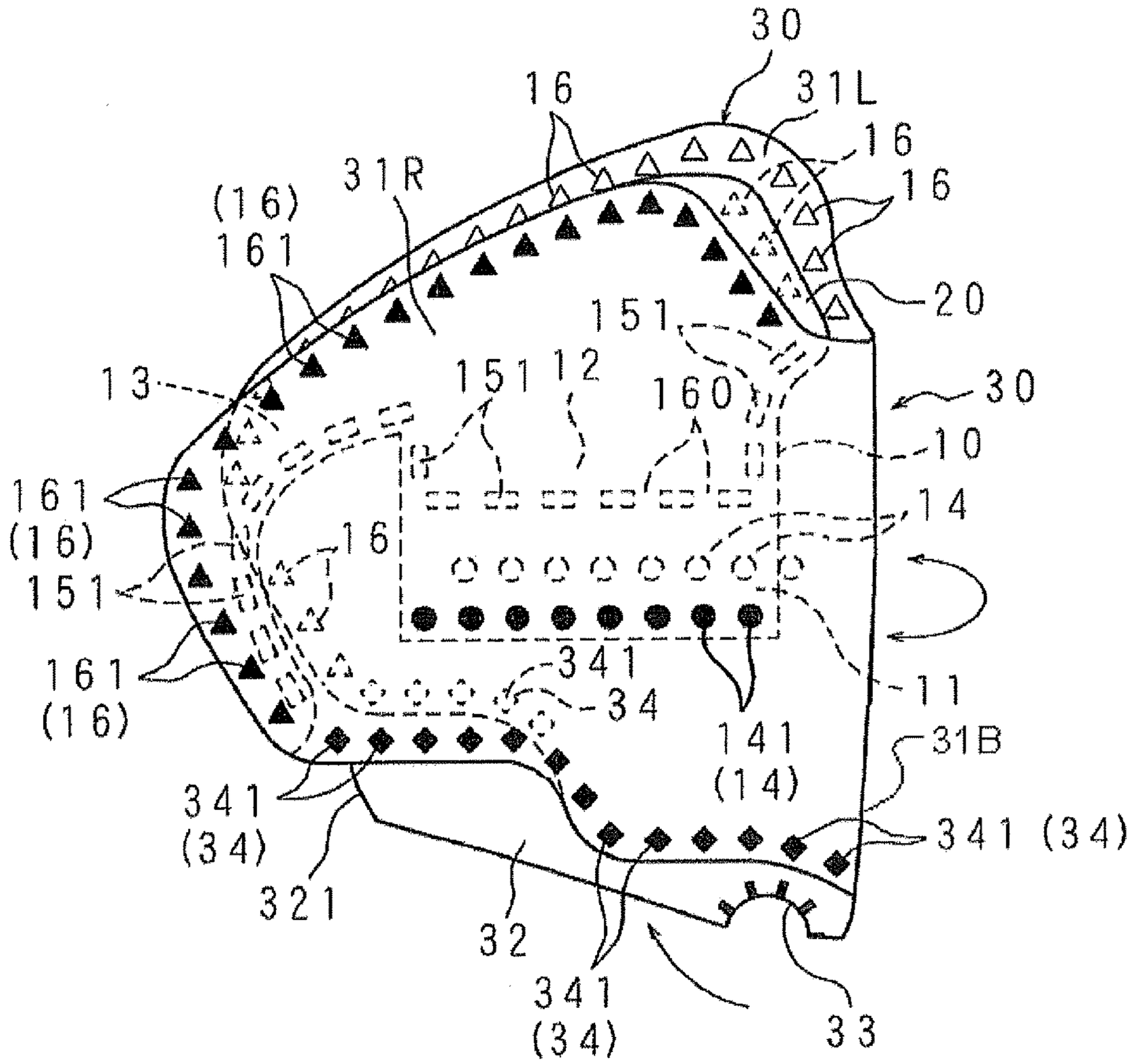

FIG. 5
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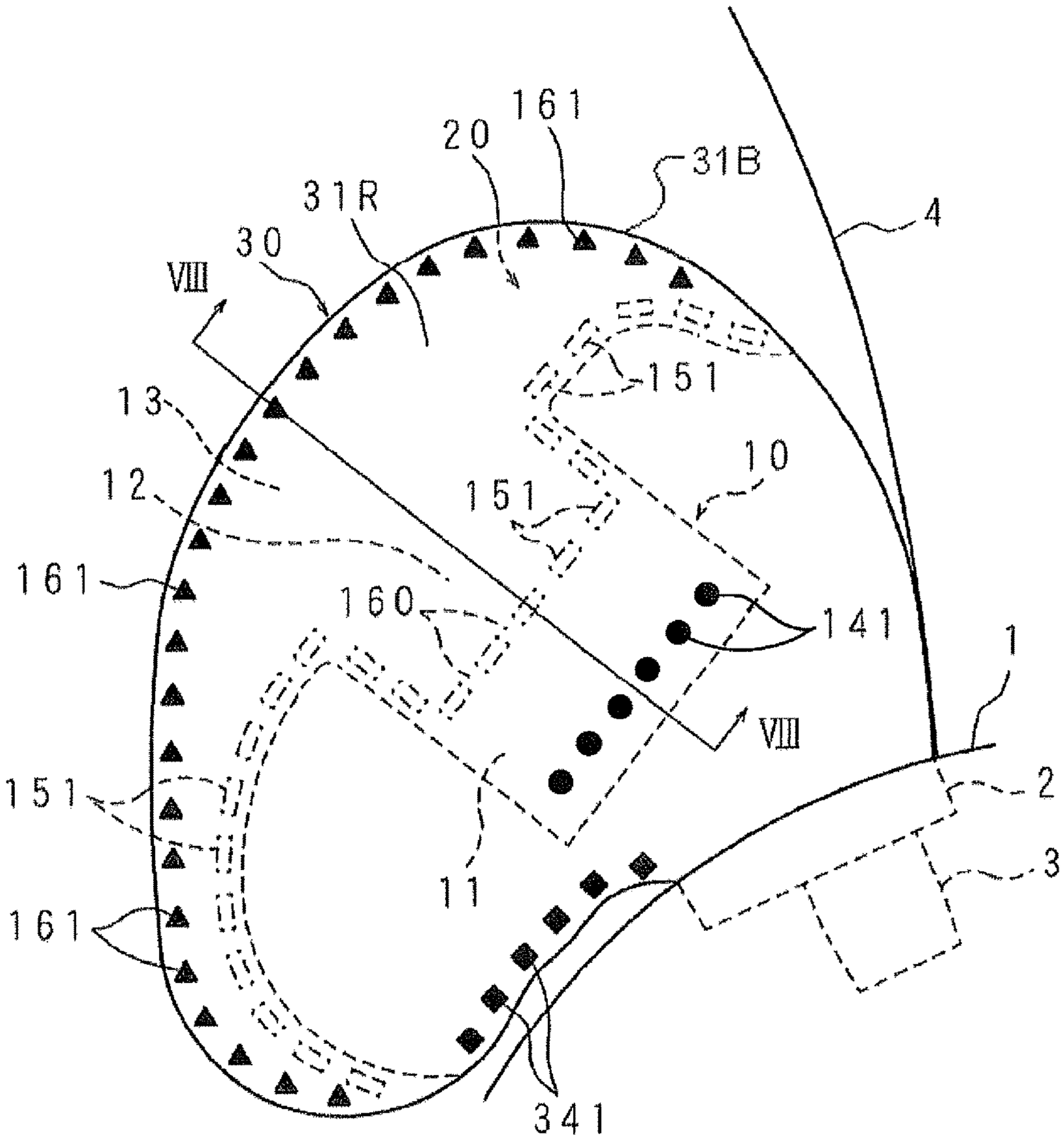

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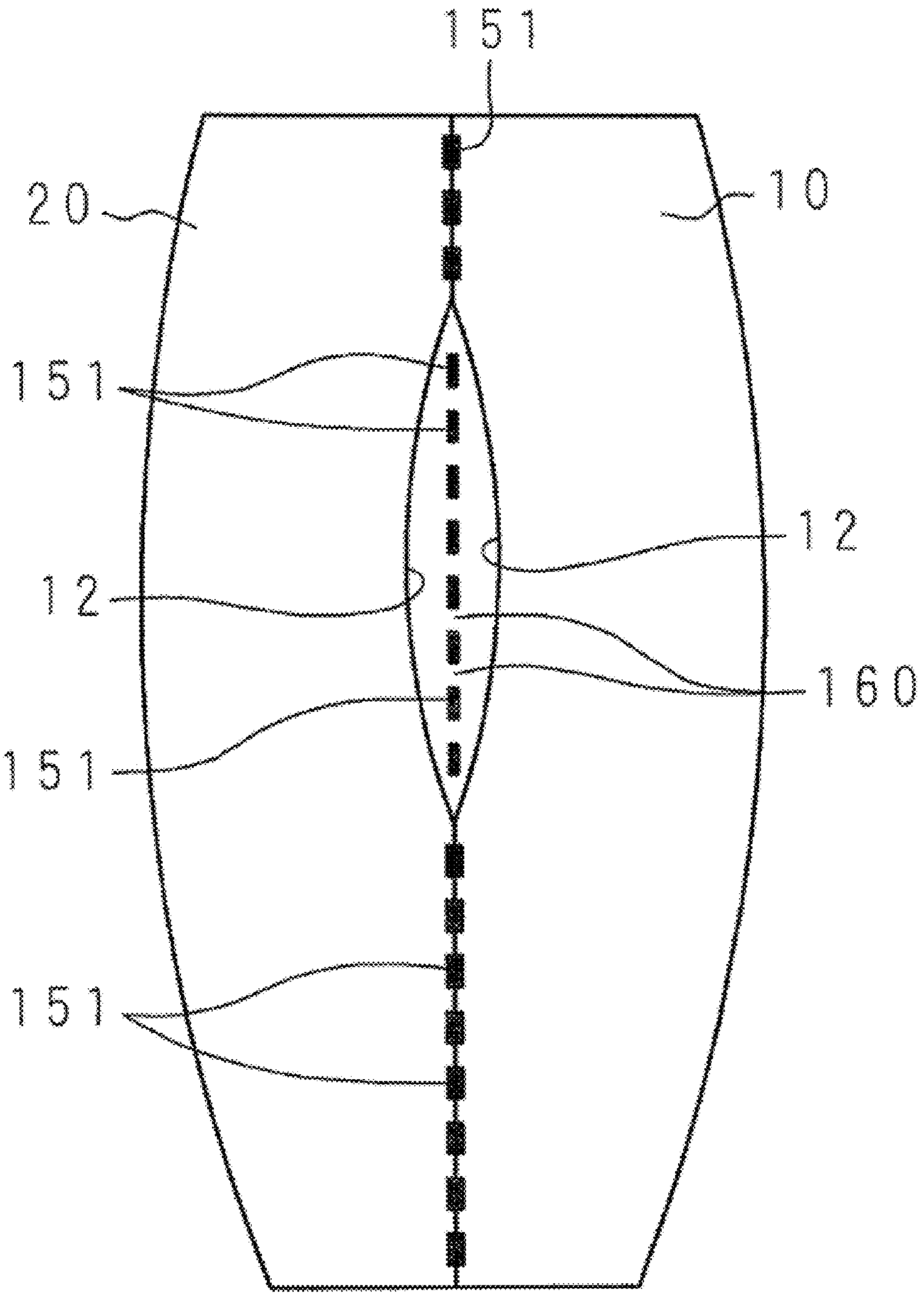
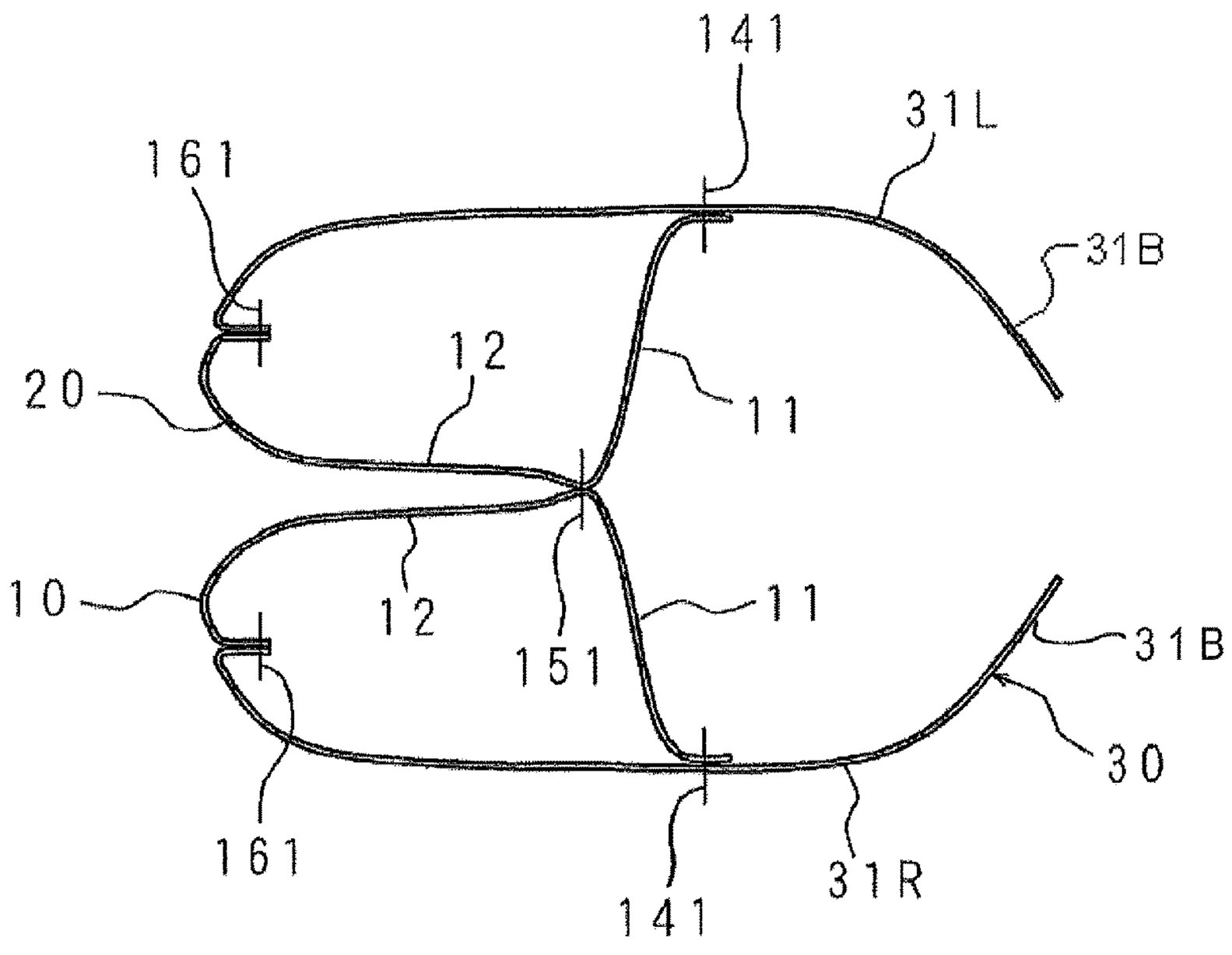


FIG. 7



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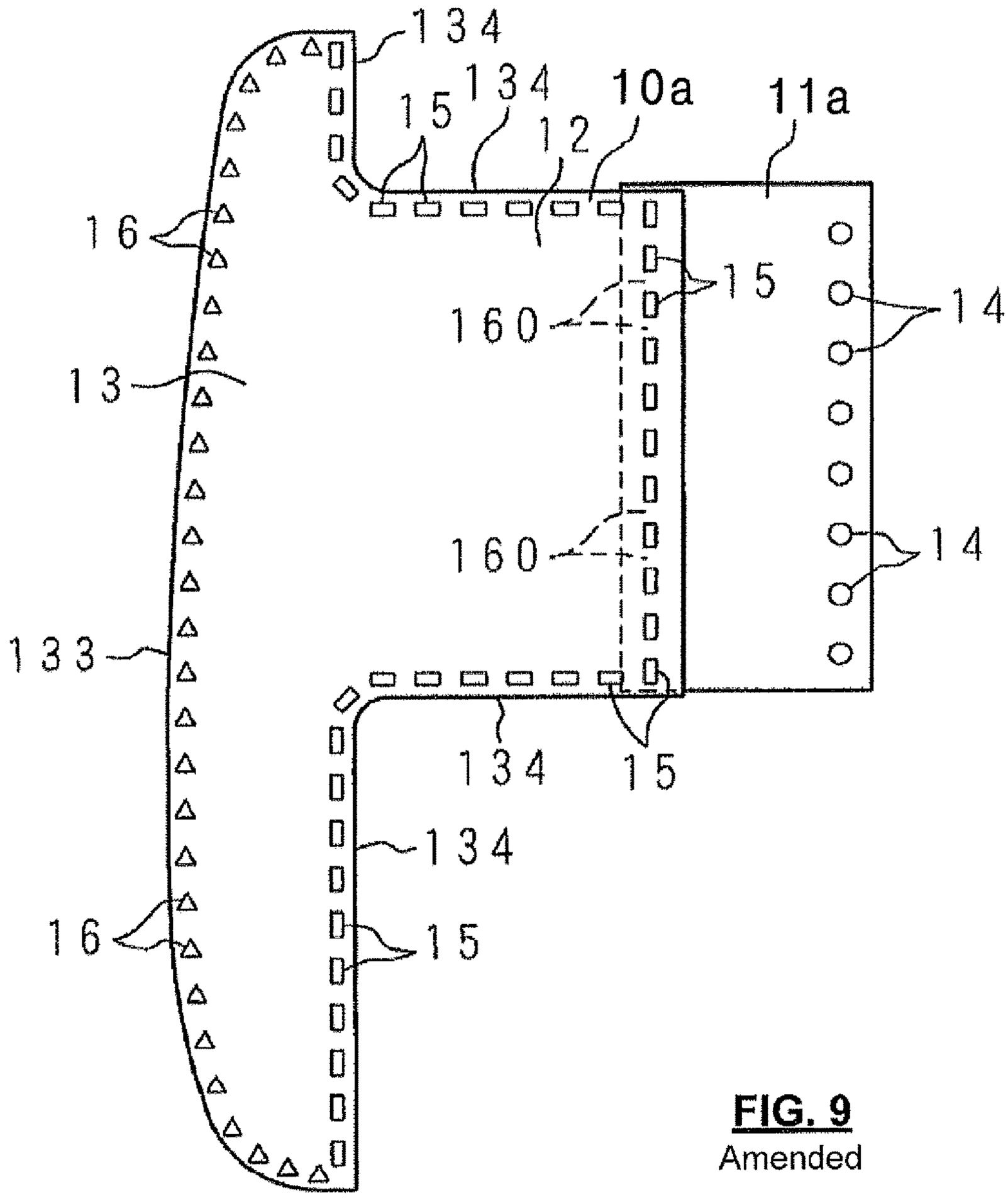

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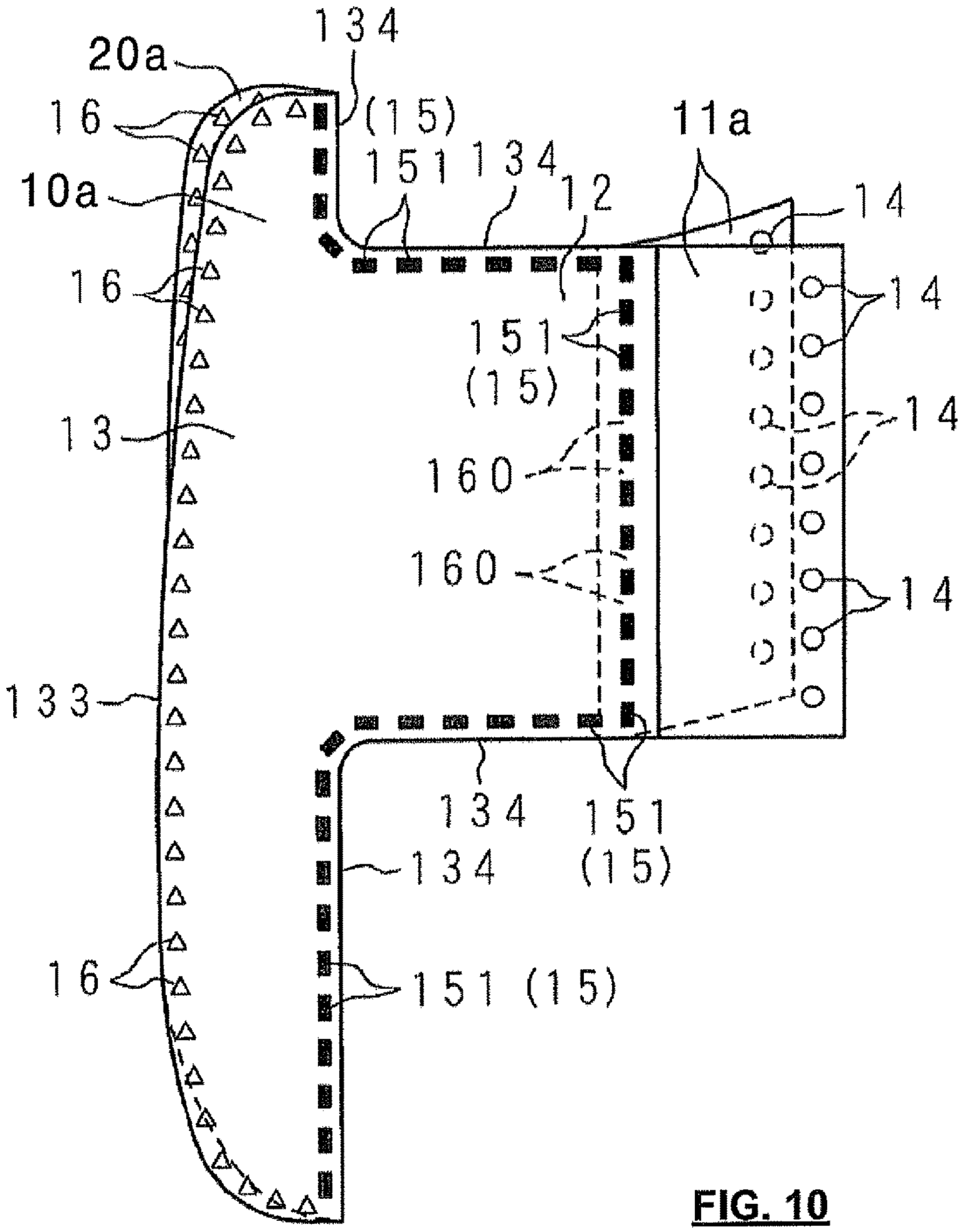

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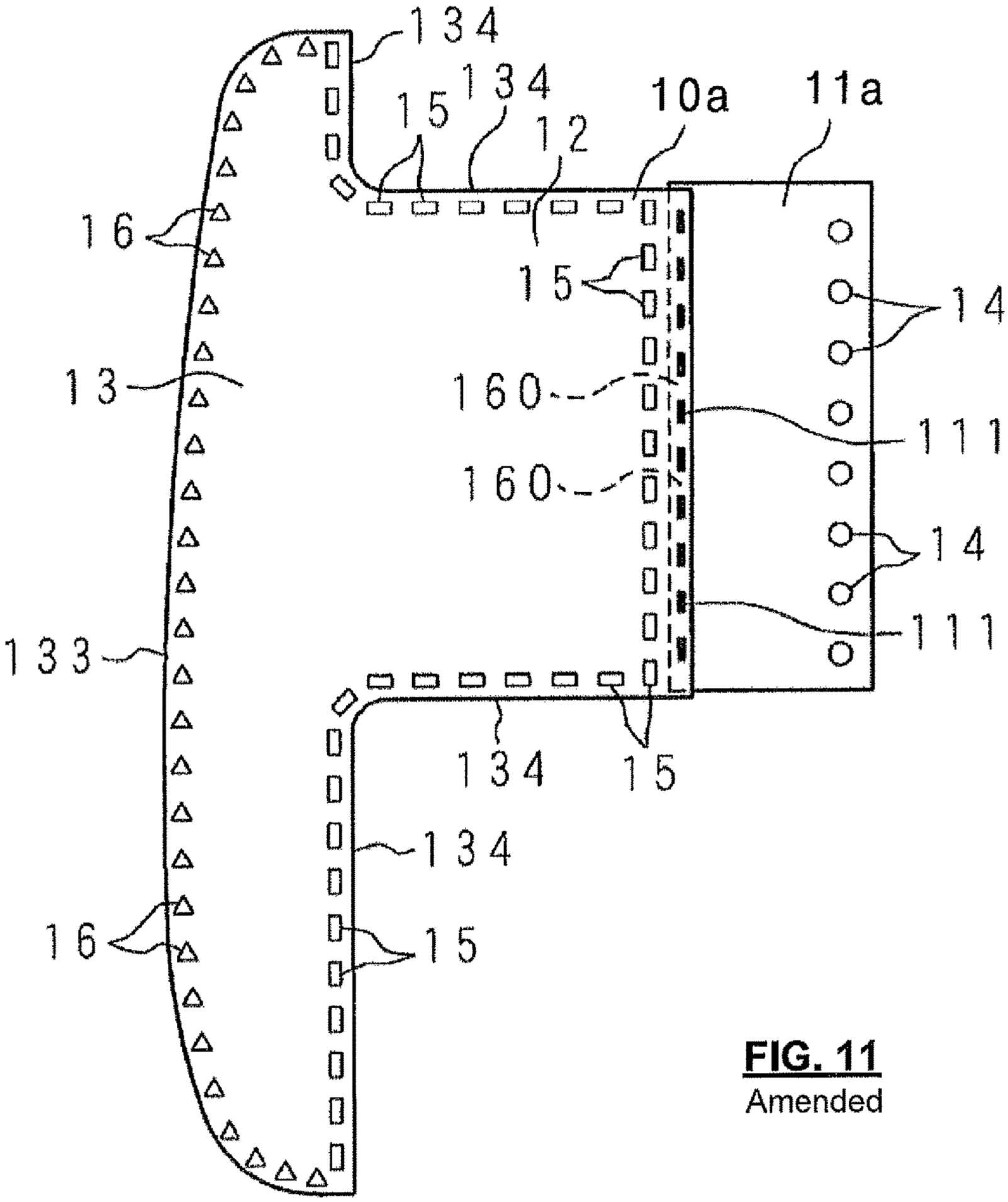

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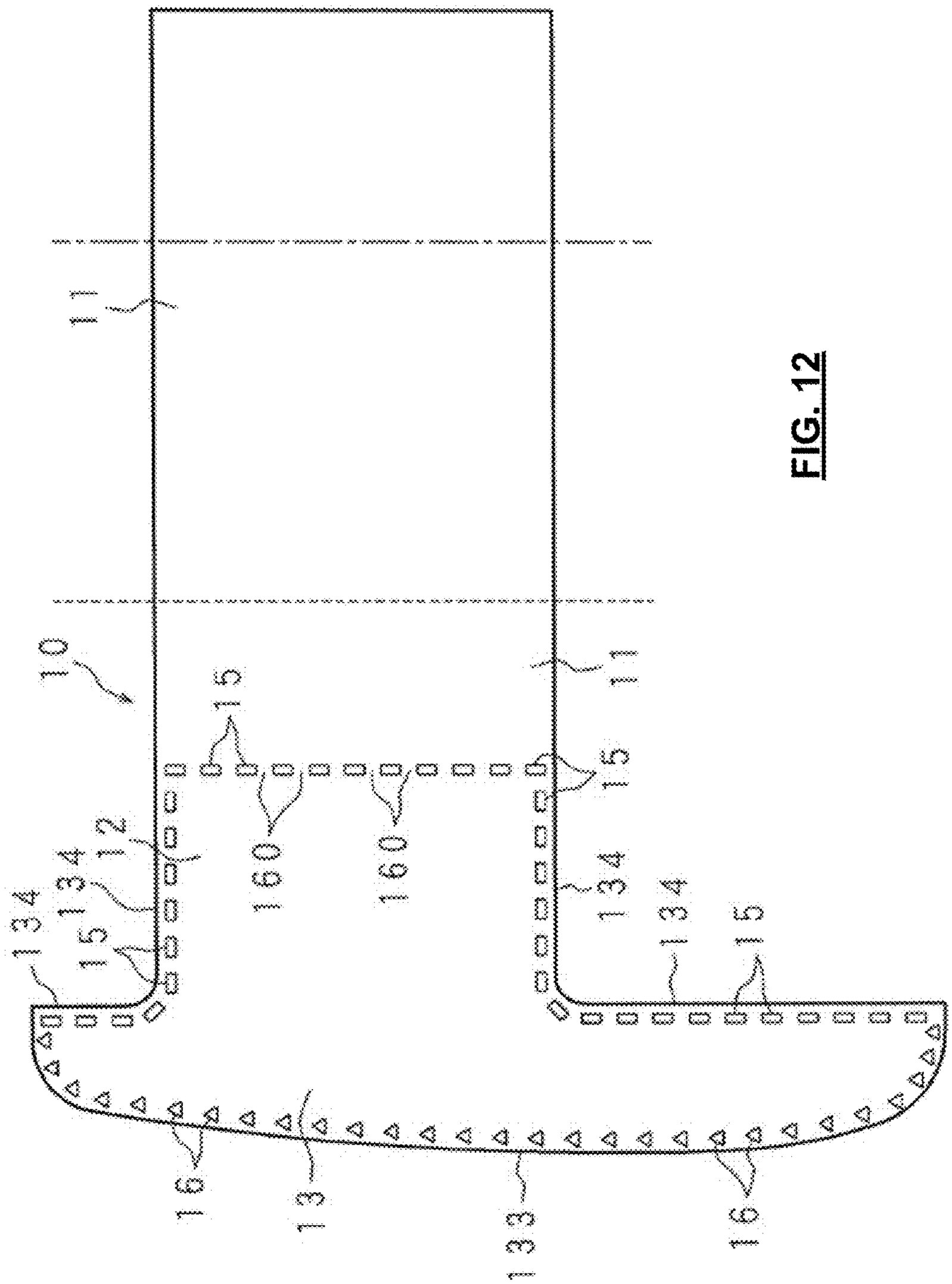

FIG. 12

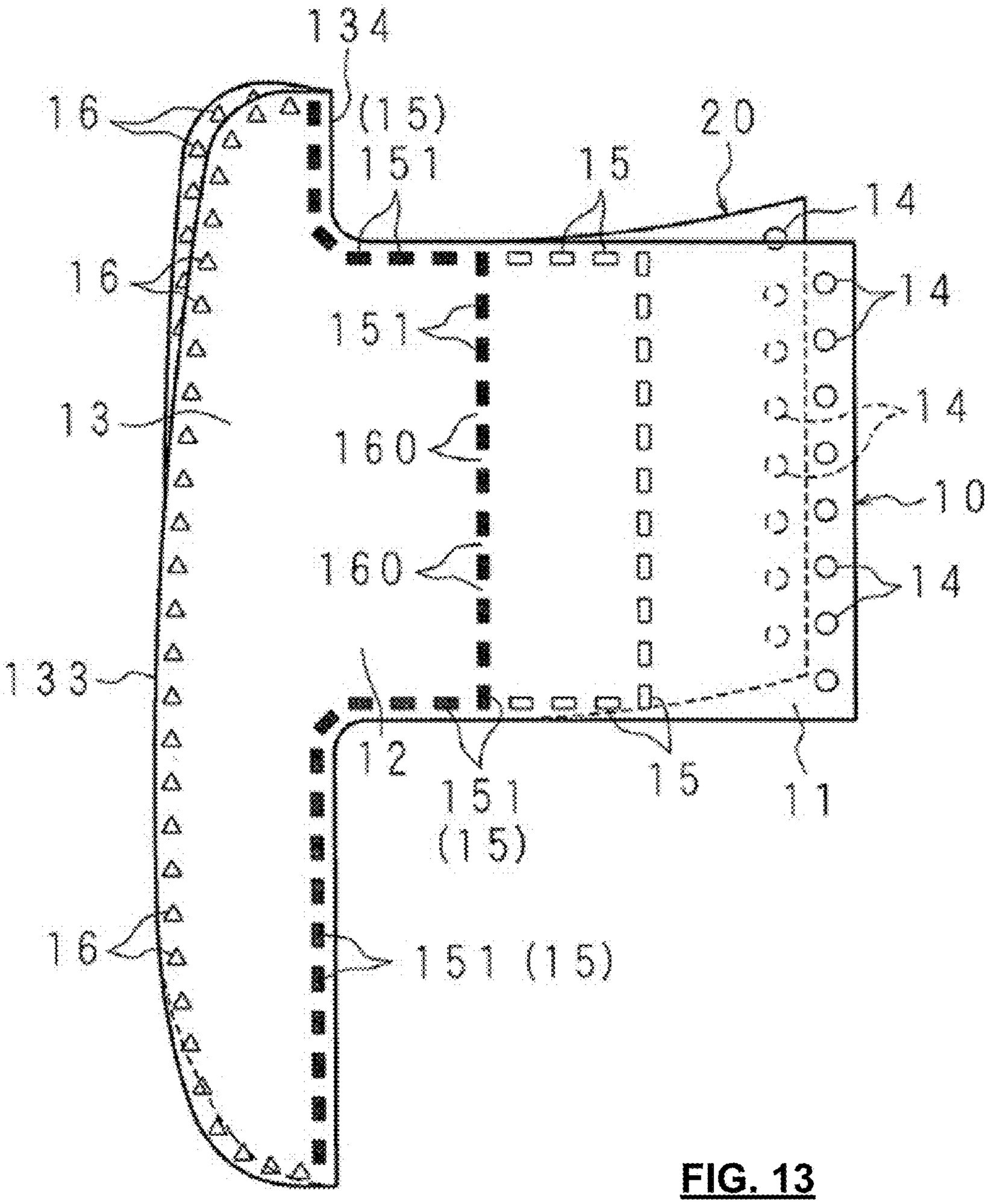
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FIG. 13

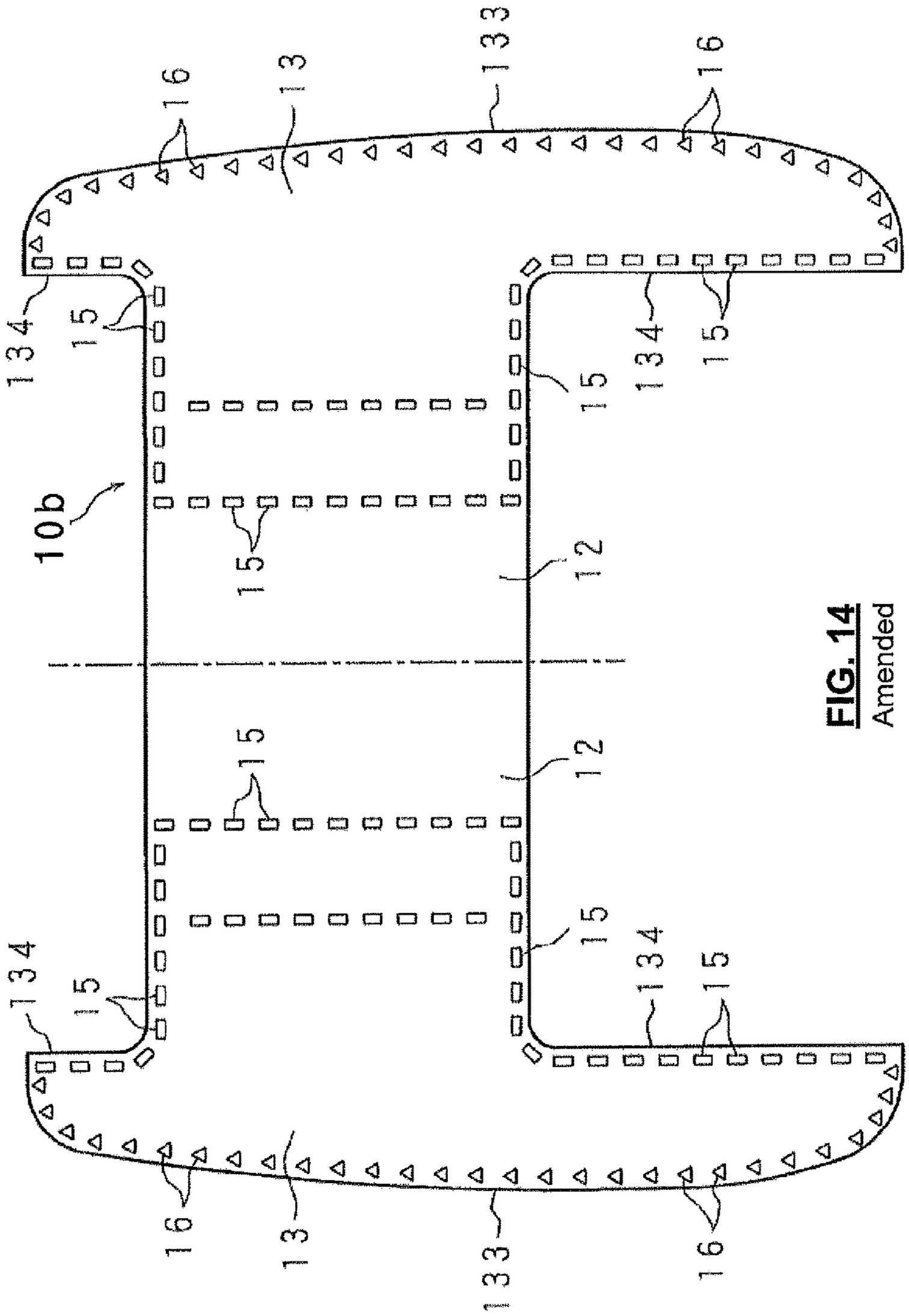

FIG. 14
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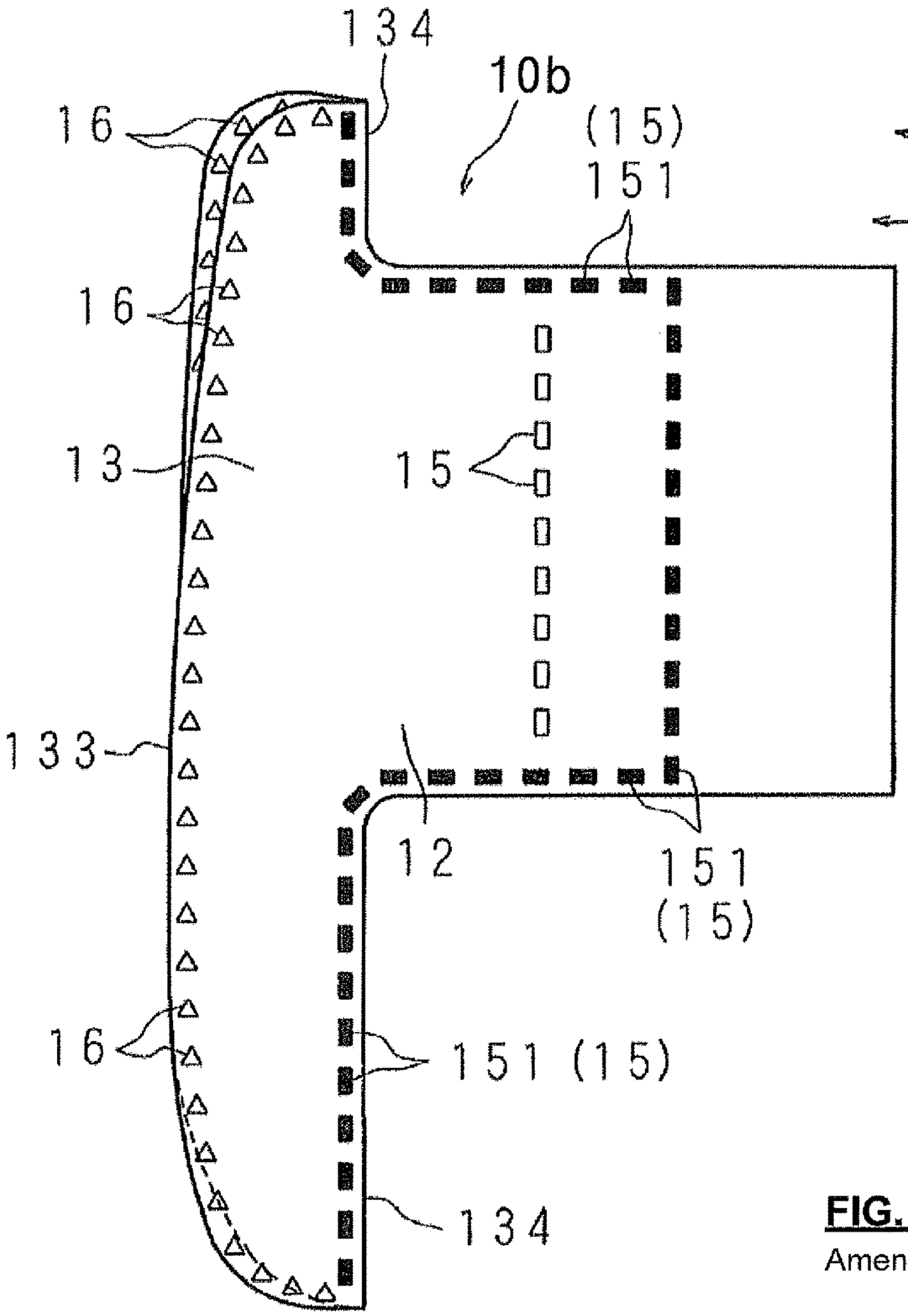

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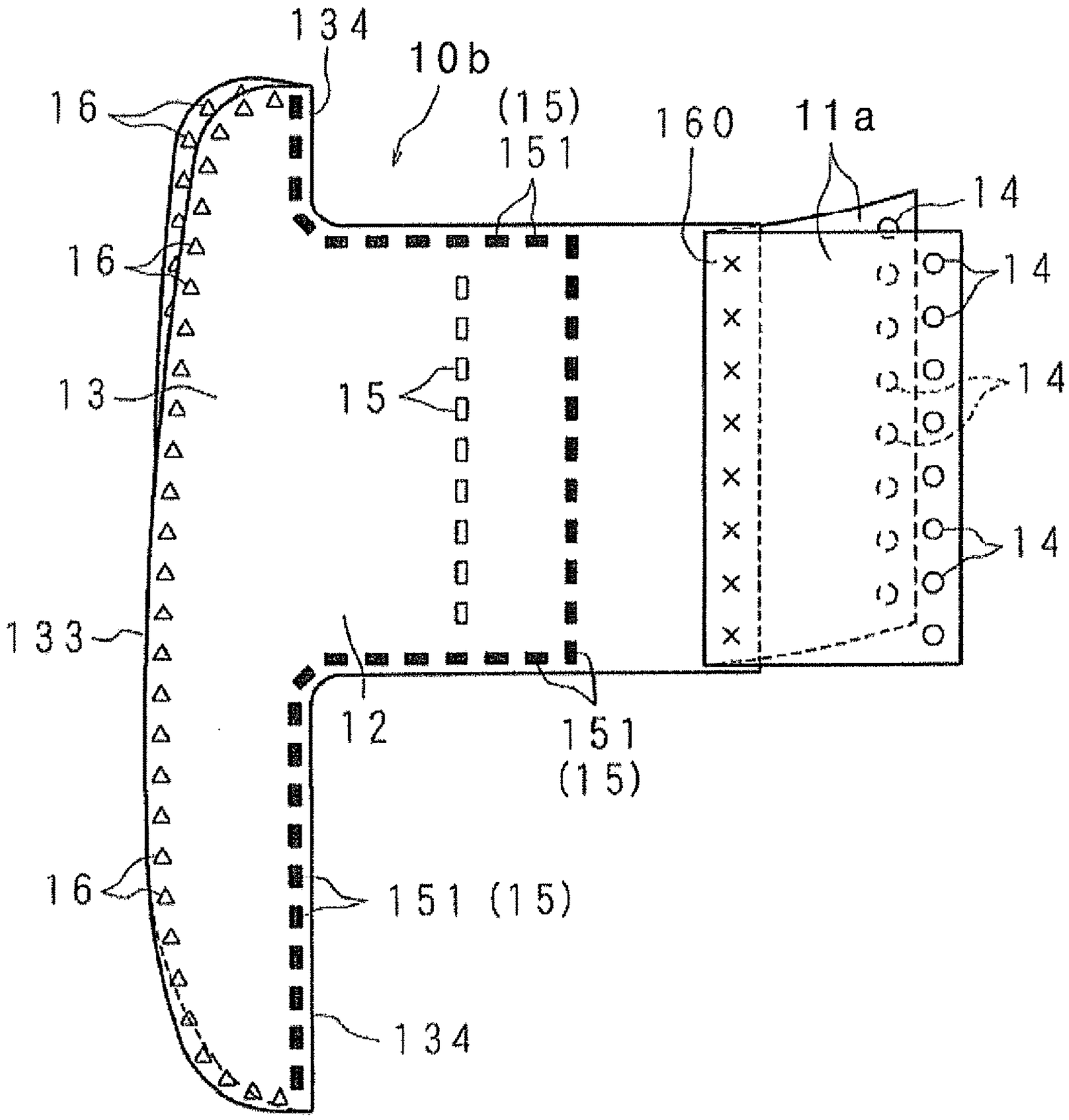

FIG. 16
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MANUFACTURING METHOD OF AIRBAG CUSHION, AND THE AIRBAG CUSHION

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.

CROSS-REFERENCE TO RELATED APPLICATIONS

This application *is a reissue application of U.S. application Ser. No. 12/441,455, now U.S. Pat. No. 7,909,362, which* is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/JP2007/067647, which has an International filing date of Sep. 11, 2007 and designated the United States of America.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a manufacturing method of an airbag cushion including a rear fabric panel and two front fabric panels, and to the airbag cushion thereby manufactured.

2. Description of Related Art

An airbag system is well known to be **[**equipped for**]** *used in* cars. When detecting an impact of car crash, the airbag system can **[**injects**]** *inject* gas generated by an inflator (gas generator) into an airbag cushion. Then, the generated gas inflates and deploys the airbag cushion. Thus, the airbag cushion can absorb the impact of the car crash to protect an occupant of the car, by interposing between the occupant and the car body. Furthermore, the airbag cushion is known to be equipped for a steering wheel or an instrumental panel on an assistant driver side to protect the face and the upper body of the occupants, for securing higher level safety.

Japanese Patent Application Laid-Open No. 2004-244005 discloses a technique of inflating and deploying an airbag cushion into a specific shape, to improve the safety level. The airbag cushion described therein includes a right-side section and a left-side section. In a deployed state, the right-side and left-side sections catch hard costae of **[**right-side and left-side chests**]** *the right side of the chest* of the occupant *and the left side of the chest of the occupant*, respectively. In addition, the airbag cushion described therein includes a cavity between the right-side section and the left-side section. In the deployed state, the cavity catches the **[**sternums**]** *sternum* located at the center of the chest to absorb the impact.

SUMMARY OF THE INVENTION

The airbag cushion according to Japanese Patent Application Laid-Open No. 2004-244005 requires, however, a large capacity to **[**to**]** be enclosed, because the airbag cushion **[**should be**]** *is* formed with six fabric panels including two front inner fabric panels, two front outer fabric panels, one rear inner fabric panel and one rear outer fabric panel. Furthermore, the airbag cushion according to Japanese Patent Application Laid-Open No. 2004-244005 needs much effort for sewing those fabric panels.

Moreover, the airbag cushion according to Japanese Patent Application Laid-Open No. 2004-244005 includes strings attached respectively to the front inner fabric panels and strings attached respectively to the front outer fabric panels, to prevent a left side face of the right-side section from moving away from a right side face of the right-side section, and to prevent a left side face of the left-side section from moving away from a right side face of the left-side section, beyond a predetermined distance. Therefore, the airbag cushion according to Japanese Patent Application Laid-Open No. 2004-244005 needs further effort for the manufacture.

The present invention has been accomplished in view of the foregoing situations, with an object to provide an airbag cushion and a manufacturing method of the airbag cushion **[**that save**]** *to reduce* the number of fabric panels and have a simpler sewing processing, with a rear fabric panel **[**and**]**, two front panels **[**protruding**]**, *and* tether portions **[**respectively**]** *protruding from the two front panels*, wherein each tether portion **[**are**]** *is* sewn to an inner face of the rear fabric panel, by sewing a **[**back**]** *first* end of each tether portion and parts of peripheries of two front fabric panels **[**in**]** *together to form* a recessed shape. Furthermore, the object includes a provision of such airbag cushion and such manufacturing method of the airbag cushion that can properly protect a head and a chest of an occupant by the configuration of *the* recessed shape.

In accordance with an aspect of the present invention, a manufacturing method of an airbag cushion having a rear fabric panel and at least two front fabric panels, comprises steps of: superimposing the two front fabric panels *on* each other, *with a tether portion protruding from* each of the front fabric panels **[**protrudes a tether portion to be sewn to an inner face of the rear fabric panel**]**; sewing on a **[**back**]** *first* end of the protruded tether **[**portion**]** *portions* and on parts of peripheries of the front fabric panels**[**, in**]** *to form* a recessed shape; sewing a **[**front**]** *second* end of the tether **[**portion**]** *portions* to **[**the**]** *an* inner face of the rear fabric panel; and sewing a periphery of the rear fabric panel to peripheries of the front fabric panels corresponding to the periphery of the rear fabric panel.

In a manufacturing method of an airbag cushion in accordance with an aspect of the present invention, the tether **[**portion is**]** *portions are* configured from a part of the front fabric panel.

In a manufacturing method of an airbag cushion in accordance with an aspect of the present invention, one end of each **[**the**]** front fabric **[**panels**]** *panel* is cut in advance.

In a manufacturing method of an airbag cushion in accordance with an aspect of the present invention, a depth of the recessed shape is **[**changed**]** *set* when sewing on the **[**back**]** *first* end of the tether portion and on the parts of peripheries of the front fabric panels **[**in**]** *to form* a recessed shape.

In accordance with an aspect of the present invention, a manufacturing method of an airbag cushion having a rear fabric panel and at least two front fabric panels, comprises steps of: superimposing the two front fabric panels *on* each other; sewing parts of the front fabric panels to tether portions that are sewn to an inner face of the rear fabric panel; sewing on parts of peripheries of the front fabric panels **[**in**]** *to form* a recessed shape; sewing **[**front**]** *second* ends of the tether portions to the inner face of the rear fabric panel; and sewing a periphery of the rear fabric panel to peripheries of the front fabric panels corresponding to the periphery of the rear fabric panel.

In accordance with an aspect of the present invention, a manufacturing method of an airbag cushion having a rear fabric panel and at least two front fabric panels, comprises

steps of: superimposing the front fabric panels *on* each other; superimposing parts of the front fabric panels on **[**back**]** *first* ends of tether portions that are sewn to an inner face of the rear fabric panel; sewing on parts of peripheries of the front fabric panels and on the **[**back**]** *first* ends of the tether portions**[**, in**]** *to form* a recessed shape; sewing **[**front**]** *second* ends of the tether portions to the inner face of the rear fabric panel; and sewing a periphery of the rear fabric panel and peripheries of the front fabric panels corresponding to the periphery of the rear fabric panel.

In accordance with an aspect of the present invention, a manufacturing method of an airbag cushion having a rear fabric panel and a front fabric panel, comprises steps of: folding the front fabric panel to **[**superimposing**]** *superimpose portions of* the front fabric panel; sewing on a part of the superimposed front fabric panel **[**in**]** *portions to form* a recessed shape; sewing an end of the front fabric panel to a **[**back**]** *first* end of *a* tether portion that is sewn to an inner face of the rear fabric panel; sewing a **[**front**]** *second* end of the tether portion to the inner face of the rear fabric panel; and sewing a periphery of the rear fabric panel and peripheries of the front fabric panels corresponding to the periphery of the rear fabric panel.

In a manufacturing method of an airbag cushion in accordance with an aspect of the present invention, a depth of the recessed shape is **[**changed**]** *set* when sewing on a part of *a* periphery of the front fabric panel **[**in**]** *to form* a recessed shape.

In accordance with an aspect of the present invention, an airbag cushion **[**sewn**]** *including* a rear fabric panel and at least two front fabric panels, comprises: a peripheral stitch portion where a periphery of the rear fabric panel and each periphery of the front fabric panels corresponding to the periphery of the rear fabric panel are sewn; a recessed stitch portion where the front fabric panels are sewn together **[**in**]** *to form* a recessed shape; and a tether portion that projects from the recessed stitch portion or a vicinity of the recessed stitch portion, wherein the tether portion is sewn to an inner face of the rear fabric panel.

In an airbag cushion in accordance with an aspect of the present invention, the tether portion is configured from a part of the front fabric panel, projects from the recessed stitch portion, and is sewn to the inner face of the rear fabric panel; and parts of peripheries of the front fabric panels and a **[**back**]** *first* end of the tether portion are sewn **[**in**]** *together to form* a recessed shape at the recessed stitch portion.

In an airbag cushion in accordance with an aspect of the present invention, the tether portion is a separate structure from the pair of front fabric panels, projects from the recessed stitch portion or a vicinity of the recessed stitch portion, and is sewn to the inner face of the rear fabric panel; and parts of peripheries of the front fabric panels and a **[**back**]** *first* end of the tether portion are sewn **[**in**]** *together to form* a recessed shape at the recessed stitch portion.

In an airbag cushion in accordance with an aspect of the present invention, parts of peripheries of the front fabric panels with the exception of the peripheral stitch portion and a **[**back**]** *first* end of the tether portion are sewn **[**in**]** *together to form* a recessed shape at the recessed stitch portion.

In accordance with an aspect of the present invention, an airbag cushion **[**sewn**]** *including* a rear fabric panel and at least two front fabric panels, comprises: a peripheral stitch portion where a periphery of the rear fabric panel and each periphery of the front fabric panels corresponding to the periphery of the rear fabric panel are sewn; a recessed stitch portion where the pair of front fabric panels are sewn together **[**in**]** *to form* a recessed shape; and a tether portion

whose **[**back**]** *first* end is sewn to each of the front fabric panels and whose **[**front**]** *second* end is sewn to an inner face of the rear fabric panel.

In accordance with an aspect of the present invention, an airbag cushion **[**sewn**]** *including* a rear fabric panel and a front fabric panel, comprises: a recessed stitch portion where the front fabric panel being folded is sewn **[**in**]** *to form* a recessed shape; a peripheral stitch portion where a periphery of the rear fabric panel and a periphery of the front fabric panel corresponding to the periphery of the rear fabric panel are sewn; and a tether portion whose **[**back**]** *first* end is sewn to an end of the front fabric panel and whose **[**front**]** *second* end is sewn to an inner face of the rear fabric panel.

According to the present invention, the airbag cushion includes a rear fabric panel and at least two front fabric panels. Firstly, the recessed stitch portion is formed by superimposing the front fabric panels *on* each other, *with a tether portion protruding from* each of the front fabric panels **[**protrudes a tether portion to be sewn to an inner face of the rear fabric panel**]**, and by sewing on a **[**back**]** *first* end of the protruded tether portion and on a part of a periphery of the front fabric panels**[**, in**]** *to form* a recessed shape. The **[**front**]** *second* end of the tether portion is then sewn to **[**the**]** *an* inner face of the rear fabric panel. In addition, the peripheral stitch portion is formed by sewing a periphery of the rear fabric panel to peripheries of the front fabric panels corresponding to the periphery of the rear fabric panel. Therefore, it is possible to prevent the rear fabric panel from being deployed beyond a predetermined width, because of the tether portion projecting from the pair of the front fabric panels and being sewn to the inner face of the rear fabric panel.

Furthermore, it is possible to properly protect the head or the sternum of the occupant with the use of a space defined by the recessed stitch portion, because the **[**back**]** *first* end **[**portion**]** *portions* of the projecting tether **[**portion**]** *portions* and a part of the periphery of the front fabric panels are sewn **[**in**]** *to form* a recessed shape **[**by**]** *at* the recessed stitch portion. Moreover, it is possible to properly protect the shoulder and the costae of the occupant because of the front fabric panels that **[**is**]** *are* properly inflated and deployed in the left and right direction respectively.

According to the present invention, the airbag cushion includes a rear fabric panel and a front fabric panel. Firstly, the front fabric panel is folded to superimpose *portions of the front fabric panel on each other*, and then the front fabric panel being folded is sewn **[**in**]** *to form* a recessed shape. The end of the front fabric panel is sewn to the **[**back**]** *first* end of the tether portion. The **[**front**]** *second* end of the tether portion is then sewn to the inner face of the rear fabric panel. In addition, a periphery of the rear fabric panel is sewn to a periphery of the front fabric panel corresponding to the periphery of the rear fabric panel.

According to the present invention, it is possible to prevent the rear fabric panel from being inflated and deployed beyond a predetermined width, because of the tether **[**portion**]** *portions* projecting from the pair of the front fabric panels. Furthermore, it is possible to properly protect the head or the sternum of the occupant with the use of a space of the recessed stitch portion, because the **[**back**]** *first* end **[**portion**]** *portions* of the projecting tether **[**portion**]** *portions* and parts of the peripheries of the front fabric panels are sewn **[**in**]** *to form* a recessed shape **[**by**]** *at* the recessed stitch portion. Moreover, it is possible to properly protect the shoulder and the costae of the occupant because of the front fabric panels that are properly inflated and deployed in the left and right direction respectively. In addition, it is possible to improve manufacturing efficiency

because of saving the number of panels and sewing processes. It is further possible to [save] *reduce* the *manufacturing* capacity *required* for installing the airbag cushion.

According to the present invention, it is possible to improve manufacturing efficiency and to [save] *reduce* the *manufacturing* capacity *required* for installing the airbag cushion and the like, because of the configuration with one rear fabric panel, one front fabric panel and a tether portion to prevent extra-inflation. Thus, the present invention provides further advantages as described above.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view showing a shape of a front fabric panel;

FIG. **2** is a plan view showing a shape of a rear fabric panel;

FIG. **3** is a plan view showing a state where two front fabric panels are sewn together;

FIG. **4** is a schematic perspective view showing the rear fabric panel folded along a folding line;

FIG. **5** is a schematic perspective view showing the [right] rear fabric panel sewn with the front fabric [panel] *panels*;

FIG. **6** is a schematic side view showing an airbag cushion that is equipped in an instrumental panel on an assistant driver side while being inflated and deployed;

FIG. **7** is a schematic front view showing the airbag cushion inflated and deployed;

FIG. **8** is a schematic cross-sectional view taken along a line VIII-VIII in FIG. **6**;

FIG. **9** is a plan view showing a shape of a front fabric panel and a tether portion according to a second embodiment;

FIG. **10** is a plan view showing front fabric panels, tether portions and a state where the front fabric panels and the tether portions are sewn together;

FIG. **11** is a plan view showing a shape of a front fabric panel and a tether portion according to a third embodiment.

FIG. **12** is a plan view showing a shape of a front fabric panel *according to a fourth embodiment*;

FIG. **13** is a plan view showing a state where two front fabric panels are sewn together;

FIG. **14** is a plan view showing a shape of a front fabric panel according to a fifth embodiment;

FIG. **15** is a plan view showing a state where the front fabric panel is sewn;

FIG. **16** is a plan view showing a state where the front fabric panel and the tether [portion] *portions* are sewn together;

1 Instrumental Panel
2 Airbag Cushion Case
3 Inflator
4 Front Glass
10 Front Fabric Panel
11 Tether Portion
12 Intermediate Portion
13 Head Portion
14 First Guide Mark
15 Second Guide Mark
16 Third Guide Mark
160 [Back] *First* end *of tether portion*
20 Front Fabric Panel
30 Rear Fabric Panel
31L Left Rear Portion
31R Right Rear Portion
32 Inflator Connection Portion
33 Inflator Inlet

34 Fourth Guide Mark
133 Arc-Shaped Peripheral Portion
134 L-Shaped Peripheral Portion
141 First Stitch Portion
151 Second Stitch Portion (Recessed Stitch Portion)
161 Third Stitch Portion (Peripheral Stitch Portion)
341 Fourth Stitch Portion

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment

Hereunder, embodiments of the present invention will be described referring to the drawings. An airbag cushion according to the present invention is manufactured with two front fabric panels and a rear fabric panel. FIG. **1** is a plan view showing a shape of the front fabric panel. In [FIG.] *FIGS.* **1** *and 3*, [a numeral] *numerals* **10** [designates] *and 20 designate* the front fabric [panel] *panels*. The front fabric panel **10** is made from a cloth woven with a nylon fiber, and is cut to make the plan view of the front fabric panel into an ocarina-like shape. The front fabric panel **10** is configured with a head portion **13** that is a substantial semi-elliptic shape, a tether portion **11** that is projecting in an opposite direction to the head portion **13**, and an intermediate portion **12** that is a rectangular shape to join the head portion **13** and the tether portion **11**. The front fabric panel **10** is formed in a similar shape to the other front fabric panel **20** (Ref. FIG. **3**).

The tether portion **11** is a rectangular shape. Further, [the tether portion **11** is longitudinally printed, at the side,] first guide marks **14**, **14**, . . . [that are] indicated by void circles *are longitudinally printed at the side of the tether portion 11*. As it will be described later, a longer side of the tether portion **11** is sewn to an inner face of the rear fabric panel, to prevent the rear fabric panel from moving away from the front fabric panel **10** beyond a predetermined distance when the airbag cushion is inflated and deployed. The first guide marks **14**, **14**, . . . are used to sew the tether portion *11* to the inner face of the rear fabric panel in a proper alignment. Further, the tether portion **11** has a [back] *first* end **160** that is linear, at another side opposite to the side [printed] *on which* the first guide marks **14**, **14**, . . . *are printed*. As it will be described later, second guide marks **15**, **15**, . . . are printed on the [back] *first* end **160**. It should be noted that this embodiment is explained with the printed first guide marks **14**, **14**, . . . for ease of illustration. [Thus] *However, in various embodiments, the* first guide marks **14**, **14**, . . . may not be printed [for visualization]. Also, it should be noted that the tether portion **11** may be another suitable shape, although this embodiment is explained with the tether portion **11** of a rectangular shape. For example, the tether portion **11** may be such a trapezoidal shape that the side printed with the first guide marks **14**, **14**, . . . is shorter than the opposite side formed with the [back] *first* end **160**.

The intermediate portion **12** is a rectangular shape, and is joined to the [back] *first* end **160** of the tether portion **11** at the side and to the head portion **13** at other side opposite to the [back] *first* end **160**. The joining of intermediate portion **12** to the head portion **13** is at *an* upper position [than] *relative to* a center position of the substantial semi-elliptic-shaped head portion **13**. The periphery of the head portion **13** and the intermediate portion **12** is configured from an arc-shaped peripheral portion **133** that is sewn to a periphery

of the rear fabric panel and substantial L-shaped peripheral portions **134**, **134** where the front fabric panel **10** is sewn to the front fabric panel **20**.

The front fabric panel **10** has the second guide marks **15**, **15**, . . . printed along the L-shaped peripheral portions **134**, **134**, and the linear **[**back**]** *first* end **160**, while the second guide marks **15**, **15**, . . . are used to sew the front fabric panel **10** to the front fabric panel **20** in a proper alignment. Each of the second guide marks **15**, **15**, . . . , indicated by a panel rectangle, is *used to sew the front fabric panel 10 to the front fabric panel 20 and thereby form the front fabric panels 10, 20 in* a recessed shape in the plan view. A recessed direction of **[**the**]** each **[**second guide mark **15]** *of the front fabric panels 10, 20* is the same as a projecting direction of the tether portion **11**. Furthermore, the front fabric panel **10** has third guide marks **16**, **16**, . . . , which are indicated by void triangles, printed along the arc-shaped peripheral portion **133** of the head portion **13**.

The third guide marks **16**, **16**, . . . are used to sew the rear fabric panel to the arc-shaped peripheral portion **133** of the front fabric panel **10** in a proper alignment, while being different from the second guide marks **15**, **15**, . . . that are used to sew the front fabric panel **10** to the front fabric panel **20** in a proper alignment.

FIG. **2** is a plan view showing a shape of the rear fabric panel. In FIG. **2**, a numeral **30** designates the rear fabric panel whose silhouette looks like an elephant with the ears, the nose, and the head. The rear fabric panel **30** is made from a cloth woven with a nylon fiber, as well as the front fabric panel **10**. While having a folding line indicated by dash-dot lines at the center, the rear fabric panel **30** includes a left rear portion *or left lateral side* **31**L **[**and**]**, a right rear portion *or right lateral side* **31**R, *and a rear or back side 31B, with the left and right rear portions 31L and 31R extending from the back side 31B toward the front fabric panels 20 and 10, respectively*. In addition, the rear fabric panel **30** includes an inflator connection portion **32** projecting downward along the folding line, and is symmetrical with respect to the folding line. The inflator connection portion **32** has *a first longitudinal side 32L, a second longitudinal side 32R, and* an inflator inlet **33** at the upper center. *Each of the first and second longitudinal sides 32L and 32R includes a first side portion 32F that is substantially parallel to the folding line and a second side portion 32S that tapers inward toward the folding line as the inflator connection portion 32 projects from the left and right rear portions 31L and 31R.* The inflator inlet **33** is formed in a circular shape by cutting. Through the inflator inlet **33**, gas from a gas generator (not shown) is injected into the airbag cushion when the airbag cushion is deployed.

The rear fabric panel **30** has fourth guide marks **34**, **34**, . . . , which are indicated by void diamond shapes, printed along a periphery of the inflator connection portion **32** and lower peripheries of the left rear portion **31**L and the right rear portion **31**R. *As shown in FIG. 2, the lower peripheries of the left and right rear portions 31L and 31R are substantially perpendicular to the folding line.* The fourth guide marks **34**, **34**, . . . are used to sew one longitudinal side of the inflator connection portion **32** to the lower periphery of the left rear portion **31**L and the other longitudinal side of the inflator connection portion **32** to the lower periphery of the right rear portion **31**R, in a proper alignment. The fourth guide marks **34**, **34**, . . . for the one longitudinal side of the inflator connection portion **32** **[**is**]** *are* printed symmetrically with respect to other fourth guide marks **34**, **34**, . . . for the other longitudinal side of the inflator connection portion **32**.

An arc-shaped peripheral portion **133***a* of the left rear portion **31**L corresponds to the arc-shaped peripheral portion **133** of the front fabric panel **10**. The left rear portion **31**L has the third guide marks **16**, **16**, . . . , which are indicated by void triangles, printed along the peripheral portion with exception of the portion where the fourth guide marks **34**, **34**, . . . are printed. Further, the left rear portion **31**L has the first guide marks **14**, **14**, . . . , which are indicated by the void circles, printed **[**at**]** *in a row extending through* the substantial center *or substantial midpoint of the left rear portion 31L* in an orthogonal direction to the folding line. The first guide marks **14**, **14**, . . . on the inner face of the left rear portion **31**L correspond to the first guide marks **14**, **14**, . . . printed along one side (**[**front**]** *second* end) of the projecting tether portion **11** *opposite* from the front fabric panel **10**, as shown in FIG. **1**. The right rear portion **31**R has the first guide marks **14**, **14**, . . . , the third guide marks **16**, **16**, . . . and the fourth guide marks **34**, **34**, . . . that are printed at the symmetrical positions with those on the left rear portion **31**L, respectively. It should be noted that this embodiment is explained with the first guide marks **14**, **14**, . . . , the second guide marks **15**, **15**, . . . , the third guide marks **16**, **16**, . . . , and the fourth guide marks **34**, **34**, . . . printed on the front fabric panels **10**, **20** or the rear fabric panel **30**, for ease of illustration. As described above, *in various embodiments, the* first guide marks **14**, **14**, . . . , *the* second guide marks **15**, **15**, . . . , *the* third guide marks **16**, **16**, . . . , and *the* fourth guide marks **34**, **34**, . . . may not be printed **[**for visualization**]**.

It will be described about the processing to manufacture the airbag cushion with the two front fabric panels **10**, **20** and the rear fabric panel **30**. Firstly, a processing will be described to sew together the front fabric panels **10**, **20**. FIG. **3** is a plan view showing a state where the two front fabric panels **10**, **20** are sewn together. The front fabric panel **10** is superimposed on the front fabric panel **20** to keep the conformity in positions of the peripheral portions, as the front fabric panel **10** is substantially the same shape as the front fabric panel **20**. The front fabric panel **10** and the front fabric panel **20** are then sewn together along the second guide marks **15**, **15**, . . . , to form second stitch portions (recessed stitch portion) **151**, **151**, . . . **[**in a recessed shape**]** which are indicated by solid rectangles. The second stitch portions **151**, **151**, . . . are formed along the L-shaped peripheral portions **134**, **134**, and the linear **[**back**]** *first* end **160**, as well as the second guide marks **15**, **15**, . . . , to **[**make**]** *form the front fabric panels 10, 20 in* a recessed shape. Therefore, **[**a space is**]** *the front fabric panels 10, 20 are* formed in a recessed shape by sewing together the front fabric panel **10** and the front fabric panel **20**. It is possible for the space to catch the head or sternum of the occupant when the airbag cushion is inflated and deployed.

Next, another processing will be described to sew the rear fabric panel **30**. FIG. **4** is a schematic perspective view showing the rear fabric panel **30** folded along the folding line. The rear fabric panel **30** shown in FIG. **2** is folded along the folding line in a direction from the sheet face toward the viewer about the folding line, to superimpose the right rear portion **31**R on the left rear portion **31**L. The inflator connection portion **32** and the inflator inlet **33** are also folded in the same direction (from the sheet face toward the viewer) along the folding line. As the inflator connection portion **32** is folded in a direction indicated by an arrow, the fourth guide marks **34**, **34**, . . . at one of the longitudinal sides of the inflator connection portion **32** are superimposed on the fourth guide marks **34**, **34**, . . . on the right panel **31**R to sew together. Thus, fourth stitch portions **341**, **341**, . . . are

formed, which are indicated by solid diamond shapes, by sewing the fourth guide marks **34**, **34**, . . . of the inflator connection portion **32** and the right panel **31**R. The inflator connection portion **32** is then sewn **[**up**]** *in* the areas **321**, **321** of the shorter **[**front**]** *second* end. Therefore, in a side view of the rear fabric panel **30**, the inflator inlet **33** is arranged in a semicircular shape at a bottom of the rear fabric panel **30** and is opened toward outside of the rear fabric panel **30**.

Finally, another processing will be described to sew the two front fabric panels **10**, **20** and the rear fabric panel **30**. FIG. **5** is a schematic perspective view showing the right rear portion **31**R sewn to the front fabric panel **10**. The front fabric panel **10** and the front fabric panel **20** are inserted from the tether **[**portion**]** *portions* **11** into the inwardly folded rear fabric panel **30**, while the second stitch portions **151**, **151**, . . . keep the front fabric panel **10** and the front fabric panel **20** **[**to be sewn**]** *together*. The first guide marks **14**, **14**, . . . along one side of the tether portion **11** projecting from the front fabric panel **10** are superimposed on the first guide marks **14**, **14**, . . . printed on the inner face of the right rear portion **31**R, to sew up together. Thus, first stitch portions **141**, **141**, . . . are formed, which are indicated by solid circles, by sewing the first guide marks **14**, **14**, . . . of the tether portion **11** and the right panel **31**R. Therefore, it is possible for the first stitch portions **141**, **141**, . . . to prevent the front fabric panel **10** from moving away from the right panel **31**R beyond a predetermined width.

Next, the front fabric panel **10** is folded to conform **[**the**]** *its* own arc-shaped peripheral portion **133** to the arc-shaped peripheral portion **133***a* of the right rear portion **31**R. The third guide marks **16**, **16**, . . . of the front fabric panel **10** are then superimposed on the third guide marks **16**, **16**, . . . of the right rear portion **31**R, to sew up together. Thus, third stitch portions (peripheral stitch portions) **161**, **161**, . . . are formed, which are indicated by solid triangles, by sewing the third guide marks **16**, **16**, . . . of the front fabric panel **10** and the right panel **31**R. In the similar manner, the first guide marks **14**, **14**, . . . of the front fabric panel **20** are superimposed on the first guide marks **14**, **14**, . . . of the left rear portion **31**L, to sew up together. Thus, other first stitch portions **141**, **141**, . . . (not shown) are formed by sewing the first guide marks **14**, **14**, . . . of the front fabric panel **20** and the left rear portion **31**L. Further, the third guide marks **16**, **16**, . . . printed on the front fabric panel **20** are then superimposed on the third guide marks **16**, **16**, . . . printed on the left rear portion **31**L, to sew up together. Thus, other third stitch portions **161**, **161**, . . . (not shown) are formed by sewing the third guide marks **16**, **16**, . . . of the front fabric panel **20** and the left panel **31**L. It should be noted that, *in* this embodiment, *it* is explained that the tether **[**portion**]** *portions* **11** **[**is**]** *are* sewn to the right rear portion **31**R or the left rear portion **31**L by forming the first stitch portions **141**, **141** . . . before sewing the front fabric panel **10** and the right rear portion **31**R or the front fabric panel **20** and the left rear portion **31**L by forming the third stitch portions (peripheral stitch **[**portion**]** *portions*) **161**, **161**, . . . , for illustration. Thus, the airbag cushion may be manufactured by reverse processing. In other words, after sewing the front fabric panel **10** and the right rear portion **31**R or the front fabric panel **20** and the left rear portion **31**L by forming the third stitch portions (peripheral stitch **[**portion**]** *portions*) **161**, **161**, . . . , the tether **[**portion**]** *portions* **11** may be sewn to the right rear portion **31**R or the left rear portion **31**L by forming the first stitch portions **141**, **141** . . . , and then the inflator connection portion **32** may be sewn to *the left rear portion 31L and the right rear portion 31R to form* the fourth stitch portions **341**, **341**, ... In short, the sequence of the sewing process may be modified as desired, according to the manufacturing condition.

FIG. **6** is a schematic side view showing the airbag cushion equipped in the instrumental panel on an assistant driver side, in a deployed state; FIG. **7** is a schematic front view showing the airbag cushion in the deployed state; and FIG. **8** is a schematic cross-sectional view taken along a line VIII-VIII in FIG. **6**. The airbag cushion, which is manufactured through the sewing processing described above, is folded in a predetermined shape and stored in an airbag cushion case **2**. A gas supply pipe (not shown) of an inflator **3** is inserted **[**to**]** *into* the inflator inlet **33** shown in FIG. **5**. The inflator **3** and the airbag cushion case **2** are equipped inside the instrumental panel **1** on the assistant driver side. In the case of inflating and deploying the airbag cushion because of collision or the like, the gas is supplied through the gas supply pipe (not shown) of the inflator **3**, and then the supplied gas is injected into the airbag cushion through the inflator inlet **33**. It should be noted that the inflator inlet **33** and the inflator connection portion **32** are not shown in FIG. **6** for abbreviation.

The airbag cushion is inflated and deployed along the instrumental panel **1** and a front glass **4**. The injected gas is loaded into a space defined by **[**three**]** stitch portions on the right rear portion **31**R **[**and**]** *and/or* the front fabric panel **10**: the second stitch portions **151**, **151**, . . . formed to make *the front fabric panel 10 in* a recessed shape, the first stitch portions **141**, **141**, . . . *formed to prevent the front fabric panel 10 from moving away from the right rear portion 31R beyond a predetermined width, the third stitch portions 161, 161* . . . formed **[**in**]** *to join* the **[**arc-shapes**]** *arc-shaped peripheral portion 133a of the right rear portion 31R to the arc-shaped peripheral portion 133 of the front fabric panel 10*, and the fourth stitch portions **341**, **341**, . . . *formed to join the inflator connection portion 32 to the right rear portion 31R*. In the similar manner, the injected gas is loaded into a space defined by **[**three**]** stitch portions on the left rear portion **31**L **[**and**]** *and/or* the front fabric panel **20**: the second stitch portions **151**, **151**, . . . formed to make *the front panel 20* a recessed shape, the first stitch portions **141**, **141**, . . . *formed to prevent the front fabric panel 20 from moving away from the left rear portion 31L beyond a predetermined width, the third stitch portions 161, 161* . . . formed **[**in**]** *to join* the arc-**[**shapes**]***shaped peripheral portion 133a of the left rear portion 31L to the arc-shaped peripheral portion 133 of the front fabric panel 20*, and the fourth stitch portions **341**, **341**, . . . *formed to join the inflator connection portion 32 to the left rear portion 31L.*

Accordingly, as shown in FIG. **7**, the airbag cushion is inflated and deployed **[**with symmetry of the pattern**]** *in a symmetric shape*, while directing the front fabric panel **10** and the front fabric panel **20** toward the occupant. Since the front fabric panel **10** and the front fabric panel **20** are sewn together via the second stitch portions **151**, **151**, . . . , **[**the airbag cushion is prevented**]** the front fabric panel **10** *is prevented* from moving away from the front fabric panel **20**. In addition, the second stitch portions **151**, **151**, . . . are formed to make *the front fabric panels 10, 20 in* a recessed shape **[**in side view**]**. Accordingly, a recessed **[**bag**]** *portion of the airbag* is formed **[**with**]** *by* the intermediate portions **12**, **12**, while **[**having**]** the **[**back end**]** *first ends* **160** of the tether **[**portion**]** *portions* **11** **[**as the end face**]** *form the bottom of the recessed portion*. At the moment of inflation/deployment, the front fabric panel **10** and the front fabric panel **20** contact the shoulders or the costae of the occupant to absorb the impact. Moreover, the recessed bag catches the head or

the chest to absorb the impact properly. The tether [portion] *portions* **11** [configures a part] *are parts* of the front fabric [panel] *panels* **10**, *20*. In other words, *one of* the tether [portion] *portions* **11** is a part of the front fabric panel **10**, *and the other one of the tether portions 11 is a part of the front fabric panel 20. In this regard, a first continuous fabric member may define the front fabric panel 10 and one of the tether portions 11, and a second continuous fabric member may define the front fabric panel 20 and the other one of the tether portions 11.* Therefore, it is possible to manufacture the airbag cushion through a simplified processing, because of sewing the [front end] *second ends* of the tether [portion] *portions* **11** to the rear fabric panel.

While the tether portions **11**, **11** project from the front fabric panel **10** and the front fabric panel **20** away from the third stitch portions **161**, **161**, . . . , [each] one side ([front]*second* end) of *each of* the tether portions **11**, **11** is sewn at first stitch portions **141**, **141**, . . . on an inner face of (*or disposed on*) the left rear portion **31**L or on an inner face of (*or disposed on*) the right rear portion **31**R *that is different than and opposes the inner face of the left rear portion 31L*, as shown in FIGS. **6** and **8**. Accordingly, it is possible to limit a spacing between the front fabric panel **10** and the right rear portion **31**R, as well as a spacing between the front fabric panel **20** and the left rear portion **31**L, within bounds corresponding to a [spacing] *distance* between the one side ([front]*second* end) of *each of* the tether [portion] *portions* **11** [defined by] *that is sewn at* the first stitch portions **141**, **141**, . . . and the [back] *first* end **160** on the other side of *each of* the tether [portion] *portions* **11** [defined by] *that is sewn at* the second stitch portions **151**, **151**, . . . , at the moment of the inflation/deployment of the airbag cushion.

It should be noted that, *in* this embodiment, *it* is explained to equip the airbag cushion inside the instrumental panel **1** on the assistant driver side, for illustration. For example, the airbag cushion may be equipped inside a steering wheel on a driver side, a back side of a front seat to protect an occupant on a rear seat, or a handle component of a motorcycle. Furthermore, it should be noted that this embodiment is explained to manufacture the airbag cushion with the rear fabric panel **30**, the front fabric panel **10**, the front fabric panel **20** and two tether portions **11**, **11**, for illustration. An additional fabric panel may be utilized to manufacture the airbag cushion as appropriate.

Second Embodiment

The first embodiment is explained to have the tether [portion] *portions* **11** that [is] *are* a part of the front fabric [panel] *panels* **10**, *20*. However, the tether [portion] *portions* **11** may be a separate structure from the front fabric [panel] *panels* **10**, *20*. [FIG.] *FIGS.* **9** [is a] *and 10 are* plan [view] *views* showing a shape of [the] front fabric [panel] *panels* **10***a*, *20a* and [the] tether [portion] *portions* **11***a* according to a second embodiment. The front fabric [panel] *panels* **10***a*, *20a* of the second embodiment [is] *are* shorter than the front fabric [panel] *panels* **10**, *20* of the first embodiment by a size corresponding to the tether [portion] *portions* **11***a*, because the tether [portion] *portions* **11***a* of the second embodiment [is a] *are* separate [structure] *structures* from the front fabric [panel] *panels* **10***a*, *20a*. The tether [portion] *portions* **11***a* [is] *are* formed in a rectangular shape, and made of the same material as that of the front fabric [panel] *panels* **10***a*, *20a* or a composite material containing an elastic material such as a polyurethane fiber. On *one of* the tether [portion] *portions* **11***a*, the front fabric panel **10***a* is placed to arrange the [back] *first* end **160** of the tether portion **11***a* under the second guide marks **15** of the front fabric panel **10***a*. A configuration for the front fabric panel **20***a* is similar to the configuration for the front fabric panel **10***a* and, accordingly, will not be described in detail.

FIG. **10** is a plan view showing a state where the front fabric panel **10***a* and *one of* the tether [portion] *portions* **11***a*, as well as the front fabric panel **20***a* and *the other one of* the tether [portion] *portions* **11***a*, are sewn up together. The tether portions **11***a*, **11***a* are inserted into a space between the front fabric panel **10***a* and the front fabric panel **20***a*. Thus, each tether portion **11***a* partially overlaps the front fabric panel **10***a* or the front fabric panel **20***a*. The [back] *first* ends **160**, **160** of the tether portions **11***a*, **11***a* are sewn to the front fabric panels **10***a*, **20***a* along the second guide marks **15**, **15**, . . . , after confirming that the [back] *first* ends **160**, **160** of the tether portions **11***a*, **11***a* are located between the second guide [mark] *marks* **15** of the front fabric panel **10***a* and the second guide [mark] *marks* **15** of the front fabric panel **20***a*. Thus, the second stitch portions (recessed stitch [portion] *portions*) **151**, **151**, . . . are formed [to make a recessed shape], which are indicated by solid triangles, by sewing the [back] *first* ends **160**, **160** of the tether portions **11***a*, **11***a* and the front fabric panels **10***a*, **20***a together to make a recessed shape. In addition, the tether portions 11a, 11a may be joined to one another at an intersection between the front fabric panels 10a, 20a and the tether portions 11a, 11a, and the tether portions 11a, 11a may be joined directly to the front fabric panels 10a, 20a.* It should be noted that this embodiment is explained to have the tether [portion] *portions* **11***a* which [is] *are* vertically long with a rectangular shape, for illustration. The tether [portion] *portions* **11***a* may be horizontally long with a rectangular shape. It is possible to improve design flexibility for the tether [portion] *portions* **11***a* which [is] *are* configured to be [a] separate [structure] *structures* from the front fabric [panel] *panels* **10***a*, *20a*. For example, it is possible to modify the material of the tether [portion] *portions* **11***a* to an elastic material, as appropriate. Furthermore, it is possible to simplify the processing to manufacture the airbag cushion, [for] *by* sewing together the [back] *first* ends **160**, **160** of the tether portions **11***a*, the front fabric panel **10***a* and the front fabric panel **20***a* along the second stitch portions **151**, **151**, . . . at [a] *the same* time.

Some configurations and advantages of the second embodiment are described above. Other configurations that are the same as those of the first embodiment are given the identical numerals to the first embodiment and, accordingly, those other configurations and other advantages will not described in detail.

Third Embodiment

According to a third embodiment, the [back end portion] *first ends* **160** of the tether [portion] *portions* **11***a* may be sewn separately from the second stitch portions **151**. FIG. **11** is a plan view showing a shape of the front fabric panel **10***a* and the tether [portion] *portions* **11***a* according to the third embodiment. The front fabric panel **10***a* and the tether [portion] *portions* **11***a* of the third embodiment are formed in the same shapes as those of the second embodiment. The tether [portion] *portions* **11***a* of the third embodiment [is] *are* further made of the same material as that of the second embodiment. On *one of* the tether [portion] *portions* **11***a*, the front fabric panel **10***a* is placed to arrange the [back] *first* end **160** of the tether portion **11***a* between a [front] *second* end of the front fabric panel **10***a* and the second guide marks **15**,

15, . . . of the front fabric panel **10***a*. It should be noted that the tether portion **11***a* may be placed on the front fabric panel **10***a*.

The [back] *first* end **160** of the tether portion **11***a* is then sewn to a portion between the [front] *second* end of the front fabric panel **10***a* and the second guide marks **15**, **15**, ... Thus, fifth stitch portions **111**, **111**, . . . are formed by sewing the [back] *first* end **160** and the front fabric panel **10***a*. Therefore, it is possible to join the [back] *first* end **160** of the tether portion **11***a* to the front fabric panel **10***a* which is a separate structure from the tether portion **11***a*. The front fabric panel **10***a* and the front fabric panel **20***a* are then sewn together, as shown with FIG. **3** in the first embodiment, to form second stitch portions (recessed stitch [portion] *portions*) **151**, **151**, . . . to make a recessed shape. In this configuration, the tether [portion] *portions* **11***a* [projects] *project* from a vicinity of the second stitch portions **151**, **151**, ... A configuration for the front fabric panel **20***a* is similar to the configuration for the front fabric panel **10***a* and, accordingly, will not be described in detail.

Some configurations and advantages of the third embodiment are described above. Other configurations that are the same as those of the first and second embodiments are given the identical numerals to the first and second embodiments and, accordingly, those other configurations and other advantages will not described in detail.

Fourth Embodiment

According to a fourth embodiment, *some portions of* the front fabric [panel] *panels* **10**, **20** may be cut [some portions], in accordance with a design. FIG. **12** is a plan view showing a shape of a front fabric panel. The *tether portion 11 protruding from* front fabric panel **10** of the fourth embodiment [protrudes] *is* longer *than the* tether portion **11** [than that] of the first embodiment. The tether portion **11** is a rectangular shape that [projecting direction] is longer *in the projecting direction*. In accordance with a design *parameter*, such as a size, an inflation tolerance, an equipped position of the airbag and the like, the tether portion **11** is cut from a direction crossing [to] the projecting direction.

The tether portion **11** may be cut from a direction crossing [to] the projecting direction, for example, at a position indicated by *the* dash line or *the* alternate long and short dash line in FIG. **12**. If the tether portion **11** needs to be [longer] *shorter*, it is cut from a direction crossing [to] the projecting direction, at a position indicated by *the* dash line [near] *nearer* the head portion **13**. If the tether portion **11** needs to be [shorter] *longer*, it is cut from a direction crossing [to] the projecting direction, at a position indicated by *the* alternate long and short dash line [away] *further* from the head portion **13**. The front fabric panel **20** also has the tether portion **11** cut at a position to [lead] *leave* the same length as the tether portion **11** of the front fabric panel **10**, although it is not shown. If the tether [portion] *portions* **11** [needs] *need* to be further longer, each *of* the front fabric [panel] *panels* **10**, **20** [protruding] *from which* the tether [portion] *portions* **11** *protrude* is utilized without cutting. These configurations allow making each *of* the front fabric panels **10**, **20** *to* have the tether [portion] *portions* with suitable length in accordance with a design.

In addition, a shape of the recessed stitch portion **151** may be changed in accordance with a design. FIG. **13** is a plan view showing a state where two front fabric panels **10**, **20** are sewn together. A depth of the recessed portion of the recessed stitch portion **151** also may be changed in accordance with a design. If the tether [portion] *portions* **11** [needs] *need* to be longer, the recessed stitch portion **151** may be sewn, for example, to have a shallower depth. On the other hand, if the tether [portion] *portions* **11** [needs] *need* to be shorter, the recessed stitch portion **151** may be sewn, for example, to have a deeper depth.

FIG. **13** is an illustration for the recessed stitch portion **151** having a shallower depth. If the tether [portion] *portions* **11** [needs] *need* to be longer, the front fabric panel **10** may be sewn to the front fabric panel **20** at a position for shallower depth of the recessed portion, i.e. at a position [near] *nearer* the head [portion] *portions* **13**, to form a second stitch portion (recessed stitch [portion] *portions*) **151** indicated by solid rectangle shapes. On the other hand, if the tether [portion] *portions* **11** needs to be shorter, the front fabric panel **10** may be sewn to the front fabric panel **20** at a position [away] *further* from the head [portion] *portions* **13** for deeper depth of the recessed portion, i.e. at the second guide marks **15** indicated *by* void rectangular shapes in FIG. **13**. These configurations allow making each the front fabric panels **10**, **20** have the tether [portion] *portions* with suitable length in accordance with a design.

Some configurations and advantages of the forth embodiment are described above. Other configurations that are the same as those of the first, second and third embodiments are given the identical numerals to the first, second and third embodiments and, accordingly, those other configurations and other advantages will not described in detail.

Fifth Embodiment

According to a fifth embodiment, the airbag has one front fabric panel **10***b*. FIG. **14** is a plan view showing a shape of a front fabric panel according to the fifth embodiment. The front fabric panel **10***b* includes two head portions **13**, **13** and two intermediate portions **12**, **12** joining respectively to the two head portions **13**, **13**. The front fabric panel **10***b* is a symmetrical shape relative to a substantial center in the longitudinal direction indicated by *the* alternate long and short dash line. The intermediate [portion] *portions* **12** [is] *are* joined to the head [portion] *portions* **13**, at *an* upper position [than] *relative to* a center position of the substantial semi-elliptic-shaped head [portion] *portions* **13**. A periphery of the head [portion] *portions* **13** joined to the intermediate [portion] *portions* **12** includes the arc-shaped peripheral portions **133**, **133**, . . . that are sewn to a periphery of the rear fabric panel and the substantial L-shaped peripheral portions **134**, **134**, . . . that are sewn together after folding the front fabric panel **10***b* along a position *or fold line* indicated by *the* alternate long and short dash line.

The [front panel **10** is printed the] second guide marks **15**, **15**, . . . indicated by [alternate long and short dash line] *void rectangle shapes*, *are printed* at some portions *of the front panel 10b*. The second guide marks **15**, **15**, . . . are used to sew after superimposing each *of* the head portions **13**, **13** and each *of* the intermediate portions **12**, **12** in a proper alignment by folding. For example, the second guide marks **15**, **15**, . . . are printed along the periphery of the front fabric panel **10***b*, as shown by *the* void rectangle shapes. The second guide marks **15**, **15**, . . . are printed at the intermediate portion **12** of the front fabric panel **10***b*, in a vertical direction crossing [to] the longitudinal direction of the front fabric panel **10***b*, too. To adjust the depth of the recessed portion, [the front panel **10** may be printed] plural lines of the second guide marks **15**, **15**, . . . extending in the vertical direction crossing [to] the longitudinal direction *may be printed on the front panel 10b*. It should be noted that this embodiment is explained to have two lines of the second

guide marks **15**, **15**, . . . extending in the vertical direction crossing **[**to**]** the longitudinal direction, for illustration. *Each of the two lines of the second guide marks 15, 15, . . . extending in the vertical direction are substantially parallel to and spaced apart from the fold line indicated by the alternate long and short dash line.*

If the recessed depth should be shallower, the front fabric panel **10***b* may be sewn along the second guide marks **15** **[**near**]** *nearer* the head **[**portion**]** *portions* **13** to form the recessed shape. On the other hand, if the recessed depth should be deeper, the front fabric panel **10***b* may be sewn along the second guide marks **15** **[**away**]** *further* from the head **[**portion**]** *portions* **13**, near the center, to form the recessed shape. **[**Along**]** *Printed along* the arc-shaped peripheral **[**portion**]** *portions* **133** of the head **[**portion**]** *portions* **13[**,**]** *of* the front fabric panel **[10** is printed**]** *10b are* the third guide marks **16**, **16**, . . . **[**that**]**, *which* are indicated by void triangle shapes. The third guide marks **16**, **16**, . . . are used to sew the rear fabric panel **30** and the arc-shaped peripheral portions **133**, **133** of the front fabric panel **10***b* in a proper alignment.

FIG. **15** is a plan view showing a state where the front fabric panel *10b* is sewn. The front fabric panel **10***b* is folded along the alternate long and short dash line. Respective head portions **13**, **13**, as well as respective intermediate portions **12**, **12**, are properly superimposed. Then, the front fabric panel **10***b* is sewn along one of the lines of the second guide **[**mark**]** *marks* **15** to form a second stitch **[**portion**]** *portions* (recessed stitch **[**portion**]** *portions*) **151** *and thereby form the front fabric panel 10b* in a recessed shape. In FIG. **15**, the front fabric panel **10***b* is sewn along the second guide **[**mark**]** *marks* **15** positioned **[**away**]** *further* from the head **[**portion**]** *portions* **13**, to make the recessed depth deeper.

FIG. **16** is a plan view showing a state where the front fabric panel *10b* and the tether **[**portion**]** *portions* **11***a* are sewn together. The **[**back end**]** *first ends* **160** of the tether **[**portion**]** *portions* **11***a* **[**is**]** *are* sewn to a portion of the front panel **10***b* **[**for folding**]**. This embodiment is explained to have the tether **[**portion**]** *portions* **11***a* that is configured from two rectangular tether portions **11***a*, **11***a*, for illustration. It should be noted that one rectangular tether portion may be utilized, for example, **[**to fold**]** *by folding along* the substantial center *of the one rectangular tether portion in the same manner as the front fabric panel 10b,* and **[**to be sewn**]** *sewing* the folded portion **[**as the back end **160]** *of the one rectangular tether portion* to a portion of the front fabric panel **[10**, in the same manner**]** *10b just* as *the first ends 160 are sewn to* the front fabric panel **10***b*.

One **[**back**]** *first* end **160** of the tether **[**portion**]** *portions* **11***a* is put on the one surface of the front fabric panel **10***b*, and the other **[**back**]** *first* end **160** of the tether **[**portion**]** *portions* **11***a* is put on the reverse surface of the front fabric panel **10***b*. Firstly, the one **[**back**]** *first* end **160** of the tether **[**portion**]** *portions* **11***a* is then sewn. Secondly, the one surface and reverse surface of the front fabric are sewn. Finally, the other **[**back**]** *first* end **160** of the tether **[**portion**]** *portions* **11***a* is sewn. Therefore, **[**it is configured**]** a sewn component *is made* from the front fabric panel **10***b* and the tether **[**portion**]** *portions* **11***a*. How to sew the sewn component to the rear panel **30** is in the same manner as that of the first embodiment and, accordingly, will not have been described in detail.

Some configurations and advantages of the fifth embodiment are described above. Other configurations that are the same as those of the first, second, third and **[**forth**]** *fourth* embodiments are given the identical numerals to the first, second, third and **[**forth**]** *fourth* embodiments and, accordingly, those other configurations and other advantages will not described in detail. The embodiments of the manufacturing method of airbag cushion and the airbag cushion described herein are only preferred illustrations of the present invention. Thus, various modifications may be made thereto. Unless otherwise specified to have restrictions in the description, the present invention is not limited and restricted by the shape, the size, the arrangement and the like of the figures. In addition, phrases and terms in the description are utilized for illustration. Thus, unless otherwise specified to have restrictions in the description, the present invention is not limited and restricted by the phrases and terms.

As this invention may be embodied in several forms wihout departing from the spirit of essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, since the scope of the invention is defined by the appended claims rather than by the description preceding them, and all changes that fall within metes and bounds of the claims, or equivalence of such metes and bounds thereof are therefore intended to be embraced by the claims.

What is claimed is:

1. A **[**manufacturing**]** method of *manufacturing* an airbag cushion, comprising *the* steps of:

superimposing a first front fabric panel of the airbag cushion on a second front fabric panel of the airbag cushion, wherein **[**the first front fabric panel protrudes**]** a first tether portion *protrudes from the first front fabric panel* and **[**the second front fabric panel protrudes**]** a second tether portion *protrudes from the second front fabric panel*;

sewing a part of a periphery of the superimposed first and second front fabric panels;

sewing a **[**back**]** *first* end of the first tether portion **[**and**]** *directly to* a **[**back**]** *first* end of the second tether portion **[**together**]**;

sewing a **[**front**]** *second* end of the first tether portion to **[**an**]** *a first* inner face of a rear fabric panel of the airbag cushion;

sewing a **[**front**]** *second* end of the second tether portion to **[**an**]** *a second* inner face of the rear fabric panel;

sewing *a part of* a periphery of the rear fabric panel to *a part of* a periphery of the first front fabric panel; and

sewing *a part of* a periphery of the rear fabric panel to *a part of* a periphery of the second front fabric panel.

2. A **[**manufacturing**]** method of *manufacturing* an airbag cushion according to claim **1**, further comprising *the* steps of:

sewing a part of the first front fabric panel to the **[**back**]** *first* end of the first tether portion; and

sewing a part of the second front fabric panel to the **[**back**]** *first* end of the second tether portion.

3. A **[**manufacturing**]** method of *manufacturing* an airbag cushion according to claim **1**, further comprising a step of:

superimposing the **[**back**]** *first* end of the first tether portion, the **[**back**]***first* end of the second tether portion, and **[**a part**]** *portions* of the superimposed first and second front fabric panels.

4. A **[**manufacturing**]** method of *manufacturing* an airbag cushion according to claim **1**, wherein*:*

the first tether portion **[**is a part of**]** *and* the first front fabric panel *are defined by a first continuous fabric member*; and

the second tether portion **[**is a part of**]** *and* the second front fabric panel *are defined by a second continuous fabric member*.

5. A [manufacturing] method of *manufacturing* an airbag cushion according to claim 1, further comprising *the* steps of:

cutting an end of the first front fabric panel; and

cutting an end of the second front fabric panel.

6. A [manufacturing] method of *manufacturing* an airbag cushion according to claim 1, further comprising a step of:

[adjusting] *setting* a depth of a recessed portion formed by sewing the [back] *first* end of the first tether portion, the [back] *first* end of the second tether portion, and the part of a periphery of the superimposed first and second front fabric panels.

7. An airbag cushion, comprising:

a first front fabric panel *portion*;

a second front fabric panel *portion*;

a rear fabric panel;

a recessed stitch portion where the first front fabric panel *portion* is sewn to the second front fabric panel *portion*;

a *first* peripheral stitch portion where *a part of* a periphery of the first front fabric panel[, a periphery of the second front fabric panel,] *portion* and *a part of* a periphery of the rear fabric panel are sewn;

a second peripheral stitch portion where a part of a periphery of the second front fabric panel portion and a part of a periphery of the rear fabric panel are sewn;

a first tether portion that joins the recessed stitch portion to [an] *a first* inner face of the rear fabric panel; and

a second tether portion that joins the recessed stitch portion to [an] *a second* inner face of the rear fabric panel *that is different than the first inner face, wherein the first and second inner faces of the rear fabric panel oppose one another.*

8. An airbag cushion according to claim 7, wherein*:*

the first front fabric panel *portion* and the second front fabric panel *portion* are parts of one front fabric panel; and

the [recessed stitch portion is] *first and second front fabric panel portions are* formed by folding the one front fabric panel *along a fold line.*

9. An airbag cushion according to claim 7, wherein

the recessed stitch portion is formed [in a recessed shape] by sewing *a part of a periphery of the first front fabric panel portion to a part of a periphery of the second front fabric panel portion.*

10. An airbag cushion according to claim 7, wherein*:*

a [front] *second* end of the first tether portion is sewn to the *first* inner face of the rear fabric panel and a [back] *first* end of the first tether portion is sewn to the first front fabric panel *portion*; and

a [front] *second* end of the second tether portion is sewn to the *second* inner face of the rear fabric panel and a [back] *first* end of the second tether portion is sewn to the second front fabric panel *portion*.

11. An airbag cushion according to claim 7, wherein*:*

the first tether portion [is a part of] *and* the first front fabric panel *portion are defined by a first continuous fabric member,* and *the first tether portion* projects from the recessed stitch portion;

the second tether portion [is a part of] *and* the second front fabric panel *portion are defined by a second continuous fabric member,* and *the second tether portion* projects from the recessed stitch portion; and

the recessed stitch portion is positioned at a [back] *first* end of the first tether portion and at a [back] *first* end of the second tether portion.

12. An airbag cushion according to claim 7, wherein*:*

the first tether portion is a separate structure from the first front fabric panel *portion* and [arranged to project] *projects* from the recessed stitch portion; and

the second tether portion is a separate structure from the second front fabric panel *portion* and [arranged to project] *projects* from the recessed stitch portion.

13. An airbag cushion according to claim 7, wherein*:*

the first tether portion is a separate structure from the first front fabric panel *portion* and [arranged to project] *projects* from a vicinity of the recessed stitch portion; and

the second tether portion is a separate structure from the second front fabric panel *portion* and [arranged to project] *projects* from a vicinity of the recessed stitch portion.

14. An airbag cushion according to claim 7, wherein

the recessed stitch portion is [sewn] *formed by sewing* on a [back] *first* end of the first tether portion, on a [back] *first* end of the second tether portion, on a [part of] periphery of the first front fabric panel *portion* with [a] *an* exception of the *first* peripheral stitch portion, and on a [part of] periphery of the second front fabric panel *portion* with [a] *an* exception of the *second* peripheral stitch portion.

15. An airbag cushion according to claim 8, wherein

the recessed stitch portion is [sewn on a back end of the first tether portion, on a back end of the second tether portion,] *formed by sewing* on a [part of] periphery of the first front fabric panel *portion* with [a] *an* exception of the *first* peripheral stitch portion[,] and on a [part of] periphery of the second front fabric panel *portion* with [a] *an* exception of the *second* peripheral stitch portion.

16. An airbag cushion according to claim 9, wherein

the recessed stitch portion is [sewn] *formed by sewing* on a [back] *first* end of the first tether portion, on a [back] *first* end of the second tether portion, on a [part of] periphery of the first front fabric panel *portion* with [a] *an* exception of the *first* peripheral stitch portion, and on a [part of] periphery of the second front fabric panel *portion* with [a] *an* exception of the *second* peripheral stitch portion.

17. An airbag cushion according to claim 10, wherein

the recessed stitch portion is [sewn] *formed by sewing* on a [back] *first* end of the first tether portion, on a [back] *first* end of the second tether portion, on a [part of] periphery of the first front fabric panel *portion* with [a] *an* exception of the *first* peripheral stitch portion, and on a [part of] periphery of the second front fabric panel *portion* with [a] *an* exception of the *second* peripheral stitch portion.

18. An airbag cushion according to claim 11, wherein

the recessed stitch portion is [sewn] *formed by sewing* on a [back] *first* end of the first tether portion, on a [back] *first* end of the second tether portion, on a [part of] periphery of the first front fabric panel *portion* with [a] *an* exception of the *first* peripheral stitch portion, and on a [part of] periphery of the second front fabric panel *portion* with [a] *an* exception of the *second* peripheral stitch portion.

19. An airbag cushion according to claim 12, wherein

the recessed stitch portion is [sewn] *formed by sewing* on a [back] *first* end of the first tether portion, on a [back] *first* end of the second tether portion, on a [part of] periphery of the first front fabric panel *portion* with [a] *an* exception of the *first* peripheral stitch portion, and

on a [part of] periphery of the second front fabric panel *portion* with [a] *an* exception of the *second* peripheral stitch portion.

20. An airbag cushion according to claim **13**, wherein the recessed stitch portion is [sewn] *formed by sewing* on [a back end of the first tether portion, on a back end of the second tether portion, on] a [part of] periphery of the first front fabric panel *portion* with [a] *an* exception of the *first* peripheral stitch portion[,] and on a [part of] periphery of the second front fabric panel *portion* with [a] *an* exception of the *second* peripheral stitch portion.

21. An airbag cushion according to claim 7, wherein:

the first front fabric panel portion and the first tether portion are defined by a first continuous fabric member;

the second front fabric panel portion and the second tether portion are defined by a second continuous fabric member; and

the first continuous fabric member is sewn to the second continuous fabric member at locations where the first and second front fabric panel portions intersect the first and second tether portions, respectively, to form the recessed stitch portion.

22. An airbag cushion according to claim 7, wherein:

the first tether portion has a first end that is joined to the first front fabric panel portion and a second end that is sewn to the first inner face of the rear fabric panel;

the second tether portion has a first end that is joined to the second front fabric panel portion and a second end that is sewn to the second inner face of the rear fabric panel; and

the first end of the first tether portion is sewn directly to the first end of the second tether portion.

23. An airbag cushion according to claim 8, wherein the recessed stitch portion is formed by stitching along guide marks on the first and second front fabric panel portions that are substantially parallel to and spaced apart from the fold line.

24. An airbag cushion comprising:

a rear fabric panel and at least one front fabric panel sewn together, the rear fabric panel including a left lateral side, a right lateral side, and a rear side, the left and right lateral sides extending from the rear side toward the at least one front fabric panel;

a peripheral stitch portion where a part of a periphery of the rear fabric panel and a part of a periphery of the at least one front fabric panel corresponding to the part of the periphery of the rear fabric panel are sewn; and

two tether portions that project from the at least one front fabric panel and are sewn to the rear fabric panel, wherein:

the two tether portions each include a first end that is joined to the at least one front fabric panel and a second end that is stitched to the rear fabric panel;

the second end of one of the tether portions is sewn to an inner face of the right lateral side of the rear fabric panel, and the second end of the other one of the tether portions is sewn to an inner face of the left lateral side of the rear fabric panel; and

the first end of one of the tether portions is sewn directly to the first end of the other one of the tether portions.

25. An airbag cushion according to claim 24, wherein

the second end of the one of the tether portions is sewn to a substantial midpoint of the inner face of the right lateral side of the rear fabric panel in an orthogonal direction to a folding line between the left and right lateral sides of the rear fabric panel, and the second end of the other one of the tether portions is sewn to a substantial midpoint of the inner face of the left lateral side of the rear fabric panel in an orthogonal direction to the folding line.

26. An airbag cushion according to claim 25, wherein a guide mark for sewing is printed at the substantial midpoint of the inner face of the right lateral side of the rear fabric panel to which the one of the tether portions is sewn, and at the substantial midpoint of the inner face of the left lateral side to which the other one of the tether portions is sewn.

27. An airbag cushion according to claim 24, wherein the tether portions are separate structures from the at least one front fabric panel.

28. An airbag cushion according to claim 27, wherein the tether portions are attached to the at least one front fabric panel via stitching.

29. An airbag cushion according to claim 24, wherein the tether portions are formed from the same material as the at least one front fabric panel.

30. An airbag cushion according to claim 24, wherein the tether portions are formed from a different material than the at least one front fabric panel.

31. An airbag cushion according to claim 24, wherein the two tether portions are joined to one another at an intersection between the at least one front fabric panel and the two tether portions.

32. An airbag cushion according to claim 24, wherein the two tether portions are joined directly to the at least one front fabric panel.

33. An airbag cushion according to claim 24, wherein a first continuous fabric member defines a first front fabric panel of the at least one front fabric panel and a first tether portion of the two tether portions, and a second continuous fabric member defines a second front fabric panel of the at least one front fabric panel and a second tether portion of the two tether portions.

34. An airbag cushion comprising:

a rear fabric panel and at least one front fabric panel sewn together, the rear fabric panel including a left lateral side, a right lateral side, and a rear side, the left and right lateral sides extending from the rear side toward the at least one front fabric panel;

a peripheral stitch portion where a part of a periphery of the rear fabric panel and a part of a periphery of the at least one front fabric panel corresponding to the part of the periphery of the rear fabric panel are sewn; and

two tether portions that project from the at least one front fabric panel and are sewn to the rear fabric panel, wherein:

the two tether portions each include a first end that is joined to the at least one front fabric panel and a second end that is stitched to the rear fabric panel;

the second end of one of the tether portions is sewn to an inner face of the right lateral side of the rear fabric panel, and the second end of the other one of the tether portions is sewn to an inner face of the left lateral side of the rear fabric panel; and

at least one of the tether portions and at least a portion of the at least one front fabric panel are defined by a continuous fabric member.

35. A method of manufacturing an airbag cushion, comprising the steps of:

superimposing a first front fabric panel of the airbag cushion on a second front fabric panel of the airbag cushion, wherein a first tether portion protrudes from the first front fabric panel and a second tether portion protrudes from the second front fabric panel;

sewing a part of a periphery of the superimposed first and second front fabric panels;

sewing a first end of the first tether portion to a first end of the second tether portion;

sewing a second end of the first tether portion to a first inner face of a rear fabric panel of the airbag cushion;

sewing a second end of the second tether portion to a second inner face of the rear fabric panel;

sewing a part of a periphery of the rear fabric panel to a part of a periphery of the first front fabric panel; and

sewing a part of a periphery of the rear fabric panel to a part of a periphery of the second front fabric panel, wherein:

the second inner face of the rear fabric panel is different than the first inner face of the rear fabric panel; and

the first and second inner faces oppose one another.

36. A method of manufacturing an airbag cushion, comprising the steps of:

superimposing a first front fabric panel of the airbag cushion on a second front fabric panel of the airbag cushion, wherein a first tether portion protrudes from the first front fabric panel and a second tether portion protrudes from the second front fabric panel;

sewing a part of a periphery of the superimposed first and second front fabric panels;

sewing a first end of the first tether portion to a first end of the second tether portion;

sewing a second end of the first tether portion to a first inner face of a rear fabric panel of the airbag cushion;

sewing a second end of the second tether portion to a second inner face of the rear fabric panel;

sewing a part of a periphery of the rear fabric panel to a part of a periphery of the first front fabric panel; and

sewing a part of a periphery of the rear fabric panel to a part of a periphery of the second front fabric panel, wherein:

the second inner face of the rear fabric panel is different than the first inner face of the rear fabric panel;

the rear fabric panel includes a left lateral side, a right lateral side, and a rear side;

the left lateral side extends from the rear side toward one of the first and second front fabric panels;

the right lateral side extends from the rear side toward the other one of the first and second front fabric panels;

the first inner face of the rear fabric panel is disposed on one of the left and right lateral sides of the rear fabric panel; and

the second inner face of the rear fabric panel is disposed on the other one of the left and right lateral sides of the rear fabric panel.

37. An airbag cushion, comprising:

a first front fabric panel portion;

a second front fabric panel portion;

a rear fabric panel;

a recessed stitch portion where the first front fabric panel portion is sewn to the second front fabric panel portion;

a first peripheral stitch portion where a part of a periphery of the first front fabric panel portion and a part of a periphery of the rear fabric panel are sewn;

a second peripheral stitch portion where a part of a periphery of the second front fabric panel portion and a part of a periphery of the rear fabric panel are sewn;

a first tether portion that joins the recessed stitch portion to a first inner face of the rear fabric panel; and

a second tether portion that joins the recessed stitch portion to a second inner face of the rear fabric panel that is different than the first inner face, wherein:

the rear fabric panel includes a left lateral side, a right lateral side, and a rear side;

the left lateral side extends from the rear side toward one of the first and second front fabric panel portions;

the right lateral side extends from the rear side toward the other one of the first and second front fabric panel portions;

the first inner face of the rear fabric panel is disposed on one of the left and right lateral sides of the rear fabric panel; and

the second inner face of the rear fabric panel is disposed on the other one of the left and right lateral sides of the rear fabric panel.

38. An airbag cushion comprising:

a rear fabric panel and at least one front fabric panel sewn together, the rear fabric panel including a left lateral side, a right lateral side, and a rear side, the left and right lateral sides extending from the rear side toward the at least one front fabric panel;

a peripheral stitch portion where a part of a periphery of the rear fabric panel and a part of a periphery of the at least one front fabric panel corresponding to the part of the periphery of the rear fabric panel are sewn; and

two tether portions that project from the at least one front fabric panel and are sewn to the rear fabric panel, wherein:

the two tether portions each include a first end that is joined to the at least one front fabric panel and a second end that is stitched to the rear fabric panel;

the second end of one of the tether portions is sewn to an inner face of the right lateral side of the rear fabric panel, and the second end of the other one of the tether portions is sewn to an inner face of the left lateral side of the rear fabric panel;

the rear fabric panel includes a left rear portion, a right rear portion, and an inflator connection portion;

the left rear portion and the right rear portion are joined together along a folding line;

the inflator connection portion is joined to the left and right rear portions and projects from the left and right rear portions along the folding line; and

the inflator connection portion has longitudinal sides that each include at least one of a first side portion that is substantially parallel to the folding line and a second side portion that tapers inward toward the folding line as the inflator connection portion projects from the left and right rear portions.

39. An airbag cushion according to claim 38, wherein the longitudinal sides of the inflator connection portion each include both of the first and second side portions.

40. An airbag cushion according to claim 38, wherein the left and right rear portions have lower peripheries that are stitched to portions of the longitudinal sides of the inflator connection portion and that are substantially perpendicular to the folding line.

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