



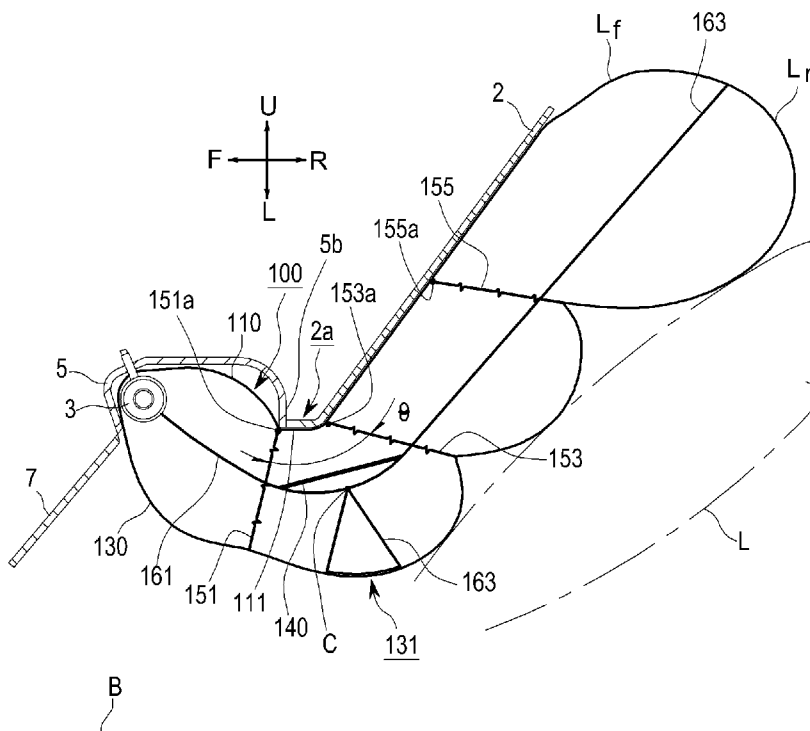
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- (54) Title:** AIRBAG FOR KNEE AIRBAG APPARATUS



(57) Abstract: Disclosed is an airbag for a knee airbag apparatus which is rapidly deployed upward along a shape of an instrument panel. The airbag includes a front panel; and a rear panel coupled to the front panel to form an inflation chamber, wherein the front panel neighbors to the instrument panel and the rear panel neighbors to knees of a passenger when the airbag is inflated, and the rear panel includes a wrinkle portion which is deployed at a position corresponding to a housing connecting portion to which the instrument panel and a rear end of the housing neighbor when the airbag is inflated, so that an additional inflation chamber is formed.



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Description

Title of Invention: AIRBAG FOR KNEE AIRBAG APPARATUS

Technical Field

- [1] The present invention relates to a knee airbag apparatus. More particularly, the present invention relates to an airbag for a knee airbag apparatus which is manufactured to allow a rear panel of the airbag to have a length longer than that of a front panel, so that the airbag deploys upward along an instrument panel.

Background Art

- [2] A knee airbag apparatus protects legs of a passenger upon a collision by deploying an airbag between an instrument panel and the lower legs, for example, tibias of the passenger.
- [3] The airbag prevents a passenger from colliding with the instrument panel at a high acceleration upon a vehicle collision. The instrument pane is made of a high stiffness material so a high force is applied to the legs of the passenger when the passenger collides with the instrument panel at a high acceleration.
- [4] The airbag allows the passenger to collide with the airbag instead of the components of a vehicle, so that relatively low impact is applied to the passenger.
- [5] The knee airbag apparatus, which is located behind the instrument panel, is configured to be deployed through a door or chute placed on a surface of the instrument panel.
- [6] To the contrary, the knee airbag apparatus, which is installed at a low portion of the instrument panel, is deployed toward the bottom of the vehicle at the first stage, and then, is deployed upward along the instrument panel of the vehicle (this knee airbag apparatus is called a low mounting knee airbag apparatus).
- [7] Thus, the study and research have been performed on various deployment paths of the knee airbag apparatus for effectively deploying the airbag of the knee airbag apparatus toward an upper portion of a vehicle along a shape of an instrument panel.
- [8] (Patent document 1) U.S. Patent publication No. 2012/0025498 A1

Disclosure of Invention

Technical Problem

- [9] Accordingly, it is an object of the present invention to provide an airbag for a knee airbag apparatus in which, when the airbag is deployed, an airbag is deployed more rapidly toward an upper portion of a vehicle by inducing the airbag to be stood near a portion at which a housing and an instrument panel are coupled to each other.
- [10] Further, it is another object of the present invention to provide an airbag for a knee airbag apparatus which utilizes a margin generated in fabricating an airbag without

employing an additional member as a deployment guide member for inducing an airbag deployment upward.

Solution to Problem

- [11] According to the present invention, there is provided an airbag for a knee airbag apparatus. The airbag for a knee airbag apparatus includes a front panel; and a rear panel coupled to the front panel to form an inflation chamber, wherein the front panel neighbors to the instrument panel and the rear panel neighbors to knees of a passenger when the airbag is inflated, and the rear panel includes a wrinkle portion which is deployed at a position corresponding to a housing connecting portion to which the instrument panel and a rear end of the housing neighbor when the airbag is inflated, so that an additional inflation chamber is formed.
- [12] The front and rear panels are fabricated as one piece such that the front and rear panels face each other about a first folding line, a vertical length from the first folding line to an upper end of the front panel is shorter than a length from the first folding line to an upper end of the rear panel, the front and rear panels include a front inclined end and a rear inclined end, respectively, which are gradually inclined outward from the first folding line to upper ends of the front and rear panels, and the front and rear panels include front and rear flaps protruding outward from the front and rear inclined ends and symmetrical to each other about the first folding line.
- [13] The front and rear flaps include lower ends placed in the front and rear panels when the front and rear flaps are folded in a horizontal direction at a position spaced apart from the first folding line; and side ends corresponding to the front and rear inclined ends.
- [14] The airbag includes a first sewing line for sewing lower portions of the front and rear panels folded about the first folding line; a second sewing line connected to the first sewing line for sewing lower ends of the front and rear flaps; and a third sewing line formed by sewing the front and rear panels along peripheries of the front and rear panels after lower portions of the front and rear panels sewed along the first and second sewing lines are folded onto a top surface of the front panel and upper ends of the front and rear panels are aligned to each other to form a second folding line.
- [15] The first sewing line is sewed in parallel with the first folding line, such that the first sewing line crosses the third sewing line.
- [16] The front and rear panels are fabricated as one piece such that the front and rear panels face each other about a folding line, a vertical length from the folding line to an upper end of the front panel is shorter than a vertical length from the folding line to an upper end of the rear panel, the wrinkle portion is implemented by folding a lower portion of the rear panel to allow an upper end of the front panel to be aligned with an

upper end of the rear panel, and both sides of the wrinkle portion are fixed by a sewing line formed along peripheries of the front and rear panels.

[17] The front panel has a vertical length equal to a vertical length of the rear panel, and the rear panel includes a cutting line formed in a horizontal direction and an additional panel connected to a periphery of the cutting line to form the wrinkle portion.

[18] When the airbag is inflated, the airbag is initially deployed toward a bottom of the vehicle and then deployed upward between the instrument panel and the knee of the passenger.

Advantageous Effects of Invention

[19] As described above, according to the present invention, the airbag of the low mounting knee airbag apparatus includes a deployment plane concaved toward a position corresponding to the connecting portion between the instrument panel and the housing, so that the upward deployment of the airbag can be rapidly induced.

[20] According to the present invention, the airbag of the low mounting knee airbag apparatus can induce the upward deployment of the airbag by using the margin and the sewing lines of the front and rear panels.

[21] In addition, the number of components and the fabrication cost can be reduced, the fabrication method can be simplified, and the airbag which induces the airbag to be effectively stood upward can be fabricated.

[22]

Brief Description of Drawings

[23] FIG. 1 is a longitudinal sectional view showing a folded state of an airbag of a knee airbag apparatus according to an embodiment of the present invention;

[24] FIG. 2 is a longitudinal sectional view showing an inflated state of an airbag of a knee airbag apparatus according to an embodiment of the present invention;

[25] FIG. 3 is a perspective view showing a non-inflated state of an airbag of a knee airbag apparatus according to an embodiment of the present invention;

[26] FIG. 4 is a front view showing an airbag of a knee airbag apparatus according to an embodiment of the present invention;

[27] FIG. 5 is a sectional view taken along line 5-5 of FIG. 4;

[28] FIG. 6a is a development view of the airbag of FIG. 3;

[29] FIG. 6b is a sectional view taken along line 6b-6b of FIG. 6a;

[30] FIG. 7a is a development view showing a state of connecting a tether to a front panel of an airbag according to an embodiment of the present invention;

[31] FIG. 7b is a sectional view taken along line 7b-7b of FIG. 7a;

[32] FIG. 8a is a view showing a state of folding a front panel along arrow A about the first folding line F1 of FIG. 7a;

- [33] FIG. 8b is a sectional view taken along line 8b-8b of FIG. 8a;
- [34] FIG. 9a is a view showing a state of coupling low portions of the front and rear panels according to an embodiment of the present invention;
- [35] FIG. 9b is a sectional view taken along line 9b-9b of FIG. 9a;
- [36] FIG. 10a is a view showing a state of adjusting positions of top ends of the front and rear panels in a state of folding low portion of the front and rear panels along arrow B about a virtual line V of FIG. 9a;
- [37] FIG. 10b is a sectional view taken along line 10b-10b of FIG. 10a;
- [38] FIG. 11a is a view showing a state of sewing peripheries of the front and rear panels of the airbag according to an embodiment of the present invention; and
- [39] FIG. 11b is a sectional view taken along line 11b-11b of FIG. 11a.

Mode for the Invention

- [40] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to accompanying drawings. However, the present invention is not limited to the following embodiments, but various modifications may be realized. The present embodiments are provided to make the disclosure of the present invention perfect and to make those skilled in the art perfectly comprehend the scope of the present invention.
- [41] In the following description, directional terms described below, such as "upper direction", "lower direction", "forward direction", and "rearward direction", will be defined based on an airbag housing in a state that the airbag housing is coupled to a low portion of an instrument panel. That is, a direction toward the roof of a vehicle is defined as an upper direction (U), a direction toward the bottom of a vehicle is defined as a lower direction (L), a direction toward a passenger is defined as a rearward direction (R), and a direction toward a front of a vehicle is defined as a forward direction (F).
- [42] FIG. 1 is a longitudinal sectional view showing a folded state of an airbag of a knee airbag apparatus according to an embodiment of the present invention.
- [43] Referring to FIGS. 1 and 2, the knee airbag apparatus 1 is installed at a low portion of an instrument panel 2.
- [44] The Knee airbag apparatus 1 includes an airbag 100, an inflator for supply gas to the airbag 100 upon collision of a vehicle, an airbag housing 5 for receiving the airbag 100 and the inflator 3, and a door 7 for covering an opening 5a in the airbag housing 5.
- [45] The airbag 100 includes a front panel 110 which neighbors on the instrument panel 2 and a rear panel 130 which neighbors on low legs L of a passenger when the airbag 100 is inflated.
- [46] A vertical length Lf of the front panel 130 is shorter than a length Lr of the rear panel

130. Thus, when the front and rear panels 110 and 130 are coupled correspondingly to each other, a wrinkle portion 131, which is unfolded out when inflating the airbag, is formed at the rear panel 130.

[47] The wrinkle portion 131 is formed at a low portion of the rear panel 130 in a horizontal direction such that the wrinkle portion 131 is unfolded near a housing connecting portion 2a to which the housing 5 and the instrument panel 2 are coupled.

[48] A plurality of tethers (for example, first to third tethers 151 to 155) are connected between the front and rear panels 110 and 130 and are spaced apart from each other by a predetermined gap such that the forward and rearward deployments of the airbag 110 may be restrained.

[49] Preferably, when the airbag 100 is inflated, the first tether 151 is unfolded from a portion 2a (hereinafter, referred to as housing connecting portion) to which a rear end 5a of the housing 5 and the instrument panel 2 neighbor, toward the bottom of the vehicle in a substantially vertical direction, and the second tether 153 is unfolded from the portion 2a (hereinafter, referred to as housing connecting portion) to which the rear end 5a of the housing 5 and the instrument panel 2 neighbor, toward a low legs L of a passenger in a horizontal direction.

[50] That is, one end of the first tether 151 may be coupled to one position of the front panel 110 corresponding to a front end of the housing connecting portion 2a through a first tether sewing line 151a, and one end of the second tether 153 may be coupled to another position of the front panel 110 corresponding to a rear end of the housing connecting portion 2a spaced apart from the first tether sewing line 151a by a predetermined distance.

[51] A middle portion 111 of the front panel 110 which is connected between the first and second tethers 151 and 152 as described above performs a function of a hinge portion of deploying the airbag 100 upward and slope-wise along the shape of the instrument panel 2.

[52] Reference numeral 155a denotes a third tether sewing line which allows the third tether 155 to be coupled to the front panel 110.

[53] The knee airbag apparatus 1 may be a low mounted knee airbag apparatus which is installed at a low portion of the instrument panel 2 of driver and passenger seats to allow the airbag 100 to be deployed upward after the airbag 100 is initially deployed toward the bottom of the vehicle.

[54] In addition, the knee airbag apparatus 1 may be installed below a steering wheel at a driver side or at various positions such as a rear side of the vehicle.

[55] FIG. 3 is a perspective view showing a deployment state of the knee airbag apparatus according to an embodiment of the present invention. FIG. 4 is a sectional view taken along line 4-4 of FIG. 3.

- [56] Referring to FIGS. 3 and 4, the airbag 100 includes a front panel 110 having an inflator insertion hole 113 and a rear panel 130 having a shape corresponding to the front panel 110 and the wrinkle portion 131 formed by folding a portion of a low portion thereof in a horizontal direction.
- [57] The front and rear panels 110 and 130 are formed of one piece by folding the one piece having a substantially corresponding shape about a first folding line F1 in a central portion of them.
- [58] The first folding line F1 corresponds substantially to low ends 115 and 135 of the front and rear panels 110 and 130.
- [59] The airbag 100 includes a first sewing line 161 formed by sewing low portions of the front and rear panels 110 and 130 which are overlapped by folding the front and rear panels 110 and 130 about the first folding line F1, and a second sewing line 162 which extends from the first sewing line 161 and is formed by sewing the front and rear panels 110 and 130 in parallel with the first folding line F1.
- [60] In the airbag 100, the first folding line F1 is positioned on the top surface of the front panel 110 by folding the low portions of the front and rear panels 110 and 130 upward to the front panel 110, the second folding line F2 is formed in the rear panel 130 by fitting the upper end of the rear panel 130 to the upper end of the front panel 110, and then, a third sewing line 163 is formed by sewing the front and rear panel 110 and 130 along peripheries of the front and rear panel 110 and 130.
- [61] The second folding line F2 corresponds substantially to a low end 131a of the wrinkle portion 131 of the rear panel 130.
- [62] A cross point C is formed at a position corresponding to that of the wrinkle portion 131 by crossing the second and third sewing lines 162 and 163. The cross point C performs a function of a hinge point of guiding the airbag 100 to be deployed upward according to the shape of the instrument panel 2 when the airbag 100 is inflated (referring to FIG. 2).
- [63] A deployment guide member 140, which guides the airbag 100 to be stood upward, may be additionally provided on a portion at which the second sewing line 162 of the front and rear panels 110 and 130 are formed.
- [64] The deployment guide member 140 may be implemented by using the seam margin M formed at a portion, on which the second sewing line 162 of the front and rear panels 110 and 130 is formed.
- [65] Hereinafter, a method, which fabricates the airbag of the knee airbag apparatus configured above, will be described in more detail.
- [66] FIGS. 5a to 10b are views showing a process of fabricating an airbag of a low mounting airbag apparatus according to an embodiment of the present invention. The tethers will be omitted from each sectional view.

- [67] In the following description, the directional terms, such as "upper end", "lower end", "vertical direction", "horizontal direction" and the like will be defined as follows. In detail, in a state that the non-inflated airbag is unfolded on a plane, a portion adjacent to a portion connected to an inflator is defined as a lower portion, an end of the lower portion is defined as a lower end, a portion facing the lower portion is defined as an upper portion, an end of the upper portion is defined as an upper end, a direction parallel with the upper end of the airbag is defined as a horizontal direction, and a direction perpendicular to the horizontal direction is defined as a vertical direction.
- [68] Referring to FIGS. 5a and 5b, the front and rear panels 110 and 130 constituting the airbag 100 are formed of one piece by folding the one piece about the first folding line F1 provided at the substantially central portion of the front and rear panels 110 and 130.
- [69] The front panel 110 has a vertical length L_f from the first folding line F1 to the top end of the front panel 110, and the rear panel 130 has a vertical length L_r from the first folding line F1 to the top end 137 of the rear panel 130.
- [70] The vertical length L_r of the rear panel 130 is longer than the vertical length L_f of the front panel 110 so that the rear panel 130 has the wrinkle portion 131.
- [71] The front and rear panels 110 and 130 have a front inclined end 114 and a rear inclined end 134 which are gradually inclined upward at low edges of them. Therefore, the front and rear panels 110 and 130 are substantially formed in a trapezoid shape.
- [72] The front and rear panels 110 and 130 include front and rear flaps 112 and 132 which are protruded from the front and rear inclined ends 114 and 134 to an outside and are symmetrical to each other about the first folding line F1.
- [73] The front and rear flaps 112 and 132 include low ends 112a and 132a placed in the front and rear panels 110 and 130 when the front and rear panels 110 and 130 are folded at a place spaced apart from the first folding line F1 by a predetermined distance, and side ends 112b and 132b corresponding to the front and rear inclined ends 114 and 134.
- [74] Preferably, the low ends 112a and 132a of the front and rear flaps 112 and 132 are formed to be inclined toward the upper ends of the front and rear panels 110 and 130.
- [75] Referring to FIGS. 6a and 6b, ends of the first to third tethers 151, 153 and 155 are connected to inner surfaces of the front and rear panels 110 and 130 through the first to third tether sewing lines 151a, 153a and 155a.
- [76] Although the state of connecting the first to third tethers 151, 153 and 155 to the front panel 110 is only shown in the drawings for easy description, the opposite ends of the first to third tethers 151, 153 and 155 are connected to the rear panel 130 in a similar manner.
- [77] Referring to FIGS. 7a and 7b, the front panel 110 overlaps the rear panel 130 by

folding the front panel 110 on the inner surface of the rear panel 130 along arrow A with respect to the first folding line F1, so that the front and rear flaps 112 and 132 are overlapped.

[78] The vertical length L_r of the rear panel 130 is longer than the vertical length L_f of the front panel 110, so that the top end 137 of the rear panel 130 is located at a higher position than that of the top end 117 of the front panel 110.

[79] Referring to FIGS. 8a and 8b, both sides of the low portions of the front and rear panels 110 and 130 overlapped through the first sewing line 161 are connected to each other, and the second sewing line 162 extending from the first sewing line 161 is formed in the front and rear flaps 112 and 132 so that the front and rear flaps 112 and 132 are combined with each other. The second sewing line 162 is formed in parallel with the first folding line F1 substantially in a horizontal direction.

[80] Continuously, the low portions of the front and rear panels 110 and 130 are folded in the direction of arrow B with respect to a virtual line V denoted over the second sewing line 162, so that the first folding line F1 is placed on the external top surface of the front panel 110.

[81] Referring to FIGS. 9a and 9b, in the state that the low portions of the front and rear panels 110 and 130 are folded with respect to the virtual line V, the rear panel 130 is allowed to move such that the top end 117 of the front panel 110 corresponds to the top end 137 of the rear panel 130.

[82] Thus, the rear panel 130 is folded under the virtual line V so that the second folding line 130 is formed. The second folding line F2 serves as the bottom end 131a of the wrinkle portion 131 shown in FIG. 4.

[83] Referring to FIGS. 10a and 10b, the third sewing line 163 is formed by sewing them from one side of the second folding line F2 to on opposite side of the second folding line F2 along the edges of the front and rear panels 110 and 130.

[84] The cross point C is formed by crossing the third sewing line 163 and the second sewing line 162 formed at the front and rear flaps 112 and 132, so that the third sewing line 163 performs the function of a hinge for guiding the airbag 100 to allow the airbag 100 to be deployed upward when the airbag 100 is inflated.

[85] The margin M extends toward the top ends of the front and rear panels 110 and 130 so that the bottom ends of the front and rear flaps 112 and 132, in which the second sewing line 162 is formed. The margin M extends from the cross point C at which the first and third sewing lines 162 and 163 are crossed, by a predetermined length H.

[86] Therefore, when the airbag 100 is inflated, the margin M pulls the airbag 100 toward the instrument panel 2, the margin M performs a function of the deployment guide member of guiding the airbag 100 to be deployed rapidly and upward.

[87] FIG. 11a is a front view showing an airbag according to another embodiment of the

present invention. FIG. 11b is a sectional view taken along line 11b-11b of FIG. 11a.

[88] Referring to FIGS. 11a and 11b, an airbag 200 includes a front panel 210 and a rear panel 230 having a wrinkle portion 231.

[89] Both sides of the wrinkle portion 231 are fixed through a sewing line 261 formed by sewing the front and rear panels 210 and 230 along peripheries of the front and rear panels 210 and 230 after overlapping the front and rear panels 210 and 230.

[90] FIG. 12 is a development view of the airbag 200.

[91] Referring to FIG. 12, the airbag 200 includes the front and rear panel 210 and 230 formed of one piece by folding the one piece having a substantially corresponding shape about a folding line F3 in a central portion thereof.

[92] The vertical length L_r from the folding line F3 to the top end 237 of the rear panel 230 is longer than the vertical length L_f from the folding line F3 to the top end 217 of the front panel 210.

[93] A portion 231 of the rear panel 230 of the airbag 200 is folded in zigzag to form the wrinkle portion 231, and a sewing line 261 is formed by sewing the front and rear panels 210 and 230 along the peripheries of the front and rear panels 210 and 230 after the front and rear panels 210 and 230 are overlapped by folding the front panel 210 in the direction of arrow D.

[94] The sewing line 261 is formed by simultaneously sewing both sides of the wrinkle portion 231 so that both sides of the wrinkle portion 231 are fixed.

[95] FIG. 13 is a development view showing a knee airbag according to still another embodiment of the present invention.

[96] Referring to FIG. 13, the airbag 300 includes the front and rear panel 310 and 330 formed of one piece by folding the one piece having a substantially corresponding shape about a folding line F3 in a central portion thereof.

[97] The vertical length L_r from the folding line F3 to the top end 237 of the rear panel 230 is equal to the vertical length L_f from the folding line F3 to the top end 217 of the front panel 210.

[98] A cutting line 331 is formed in the rear panel 330 in a horizontal direction and an additional panel 340 is coupled to the rear panel 330 around the cutting line 331.

[99] A wrinkle portion is formed in the additional panel 340 in the state that the airbag 300 is folded, and an inflation gas, which is provided into the airbag 300 when the airbag 300 is inflated, is exhausted through the cutting line 331, so that the additional panel 340 is additionally inflated by the exhaust pressure. Thus, the deployment length of the rear panel 330 is substantially longer than the deployment length of the front panel 310.

[100] As a result, the time taken to apply tension to the front panel 310 is shorter than the time taken to apply tension to the rear panel 330, so that the airbag is rapidly deployed

toward the upper portion of the vehicle along the shape of the instrument panel.

[101] The wrinkle portion formed by the additional panel 340 may be in the state that the wrinkle portion is inserted into the airbag 300 while being folded. To the contrary, the wrinkle portion may be in the state that the wrinkle portion is drawn out of the rear panel 330 through the cutting line 331.

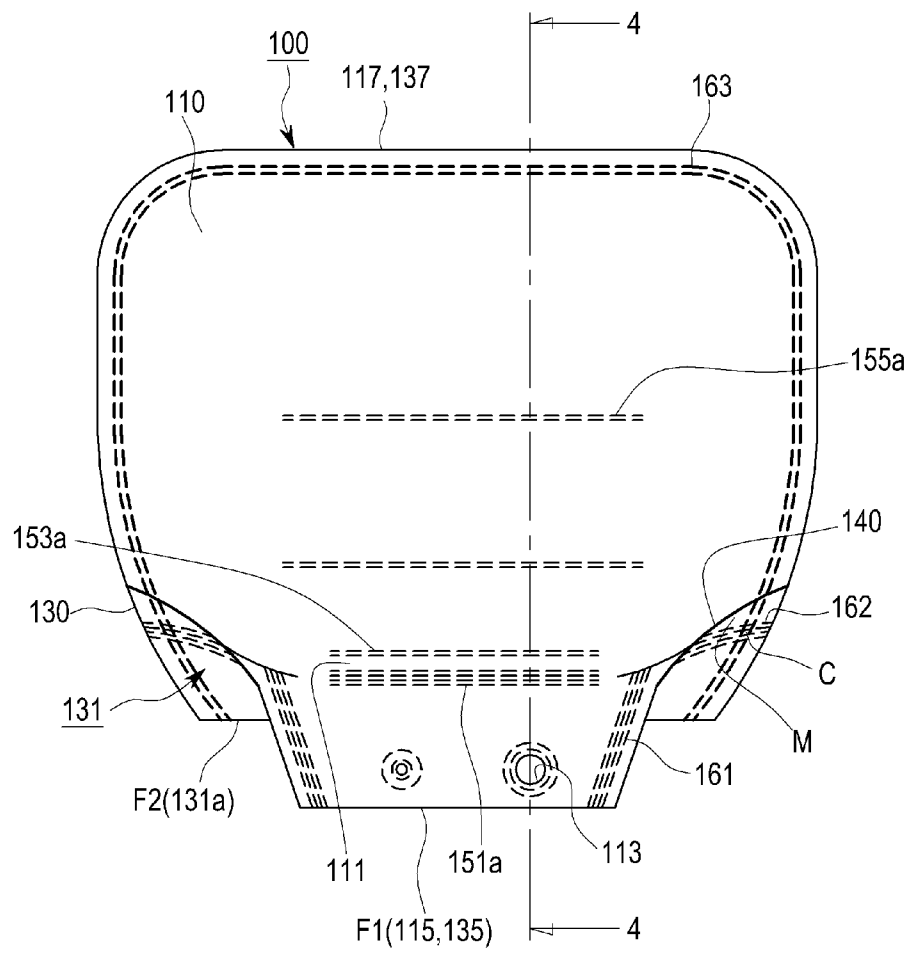
[102] Although an exemplary embodiment of the present invention has been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

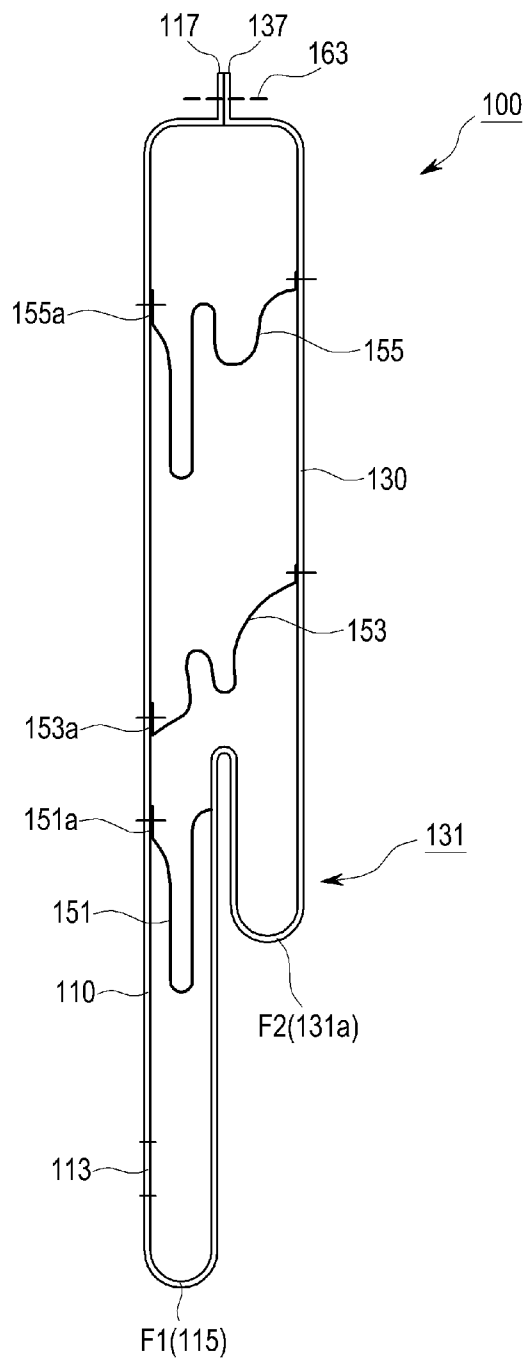
- [Claim 1] An airbag for a knee airbag apparatus which is received in a housing coupled to an instrument panel of a vehicle and inflatable in the housing, the airbag comprising:
a front panel; and
a rear panel coupled to the front panel to form an inflation chamber, wherein the front panel neighbors to the instrument panel and the rear panel neighbors to knees of a passenger when the airbag is inflated, and the rear panel includes a wrinkle portion which is deployed at a position corresponding to a housing connecting portion to which the instrument panel and a rear end of the housing neighbor when the airbag is inflated, so that an additional inflation chamber is formed.
- [Claim 2] The airbag of claim 1, wherein the front and rear panels are fabricated as one piece such that the front and rear panels face each other about a first folding line,
a vertical length from the first folding line to an upper end of the front panel is shorter than a length from the first folding line to an upper end of the rear panel,
the front and rear panels include a front inclined end and a rear inclined end, respectively, which are gradually inclined outward from the first folding line to upper ends of the front and rear panels, and
the front and rear panels include front and rear flaps protruding outward from the front and rear inclined ends and symmetrical to each other about the first folding line.
- [Claim 3] The airbag of claim 2, wherein the front and rear flaps include:
lower ends placed in the front and rear panels when the front and rear flaps are folded in a horizontal direction at a position spaced apart from the first folding line; and
side ends corresponding to the front and rear inclined ends.
- [Claim 4] The airbag of claim 3, wherein the airbag includes:
a first sewing line for sewing lower portions of the front and rear panels folded about the first folding line;
a second sewing line connected to the first sewing line for sewing lower ends of the front and rear flaps; and
a third sewing line formed by sewing the front and rear panels along peripheries of the front and rear panels after lower portions of the front and rear panels sewed along the first and second sewing lines are

- folded onto a top surface of the front panel and upper ends of the front and rear panels are aligned to each other to form a second folding line.
- [Claim 5] The airbag of claim 4, wherein the first sewing line is sewed in parallel with the first folding line, such that the first sewing line crosses the third sewing line.
- [Claim 6] The airbag of claim 1, wherein the front and rear panels are fabricated as one piece such that the front and rear panels face each other about a folding line,
a vertical length from the folding line to an upper end of the front panel is shorter than a vertical length from the folding line to an upper end of the rear panel,
the wrinkle portion is implemented by folding a lower portion of the rear panel to allow an upper end of the front panel to be aligned with an upper end of the rear panel, and
both sides of the wrinkle portion are fixed by a sewing line formed along peripheries of the front and rear panels.
- [Claim 7] The airbag of claim 1, wherein the front panel has a vertical length equal to a vertical length of the rear panel, and
the rear panel includes a cutting line formed in a horizontal direction and an additional panel connected to a periphery of the cutting line to form the wrinkle portion.
- [Claim 8] The airbag of one of claims 1 to 7, wherein, when the airbag is inflated, the airbag is initially deployed toward a bottom of the vehicle and then deployed upward between the instrument panel and the knee of the passenger.

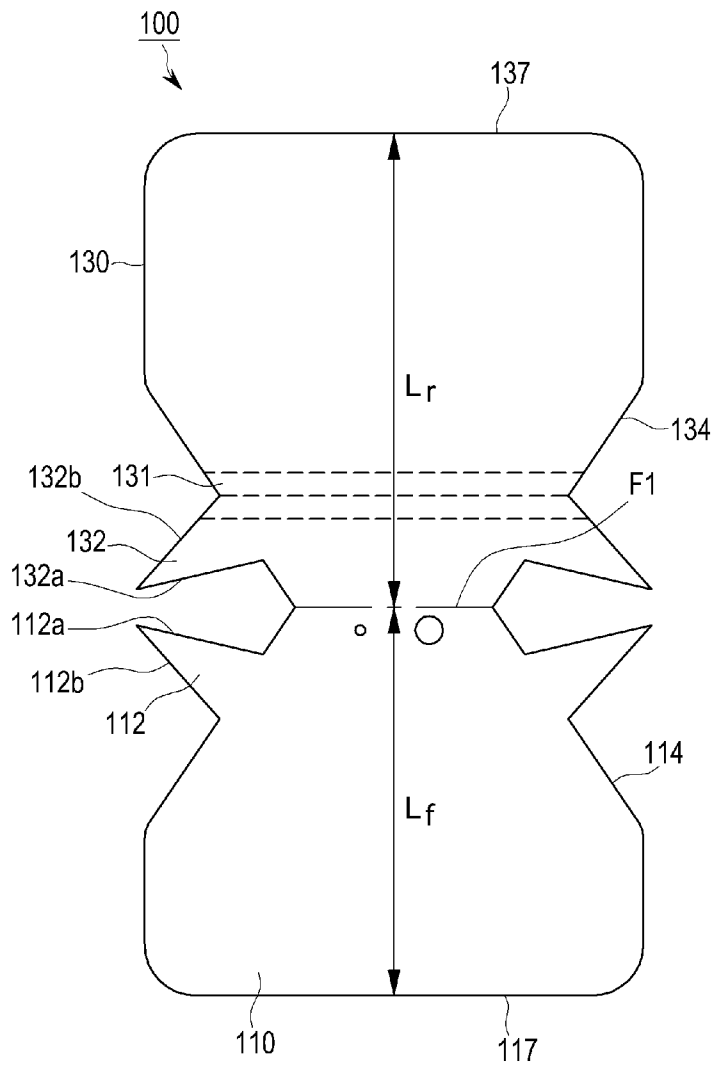
[Fig. 3]



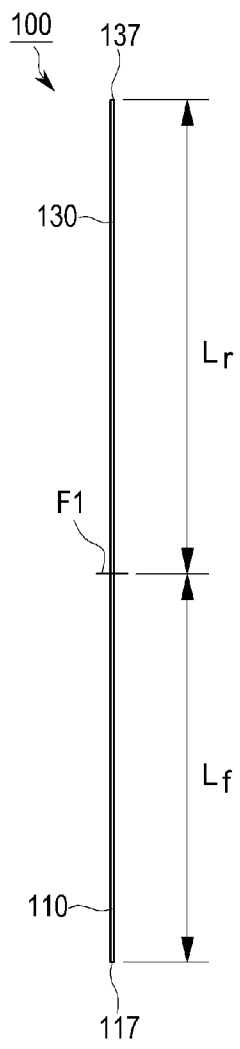
[Fig. 4]



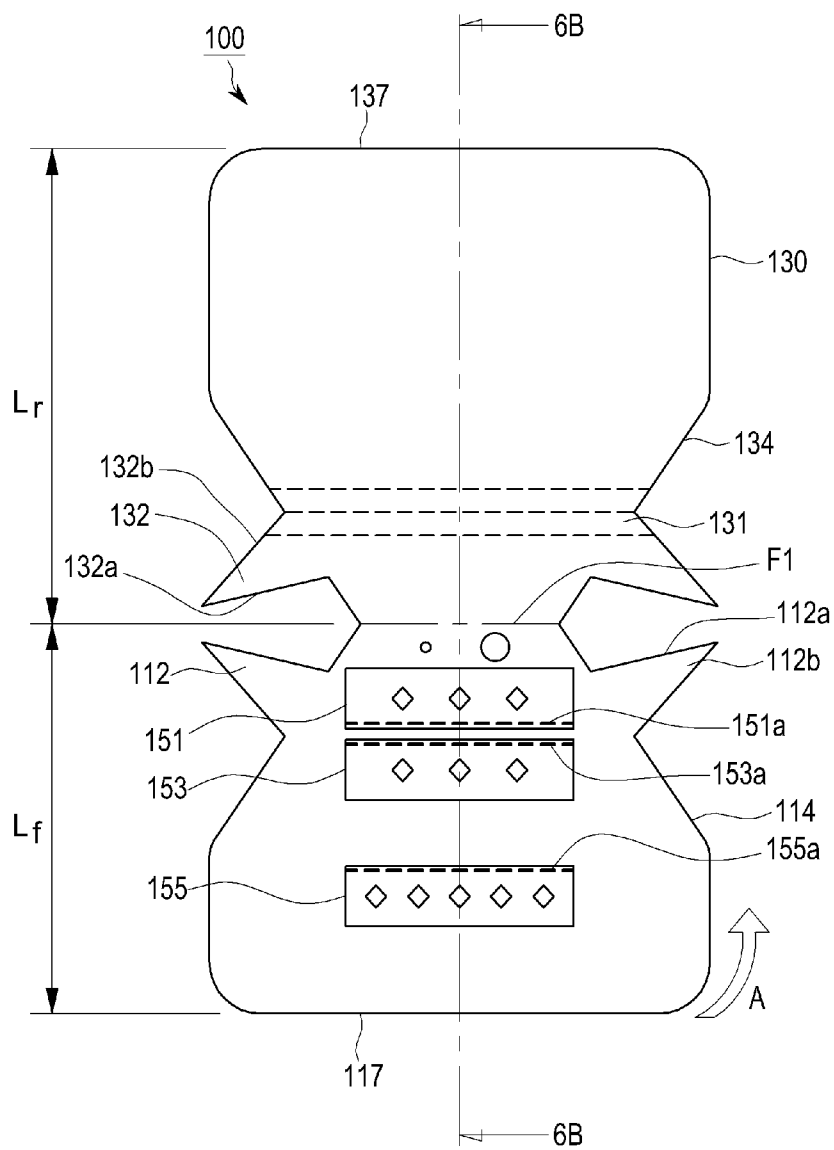
[Fig. 5a]



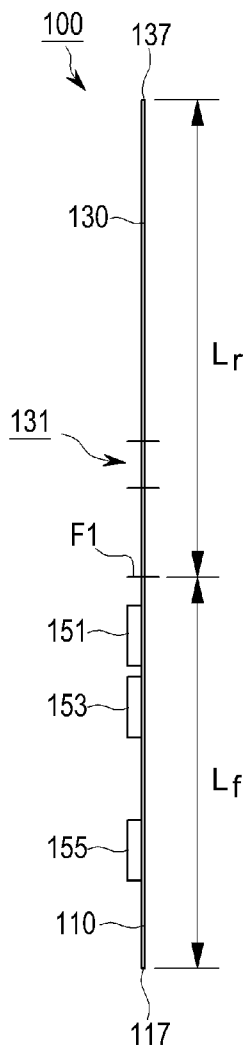
[Fig. 5b]



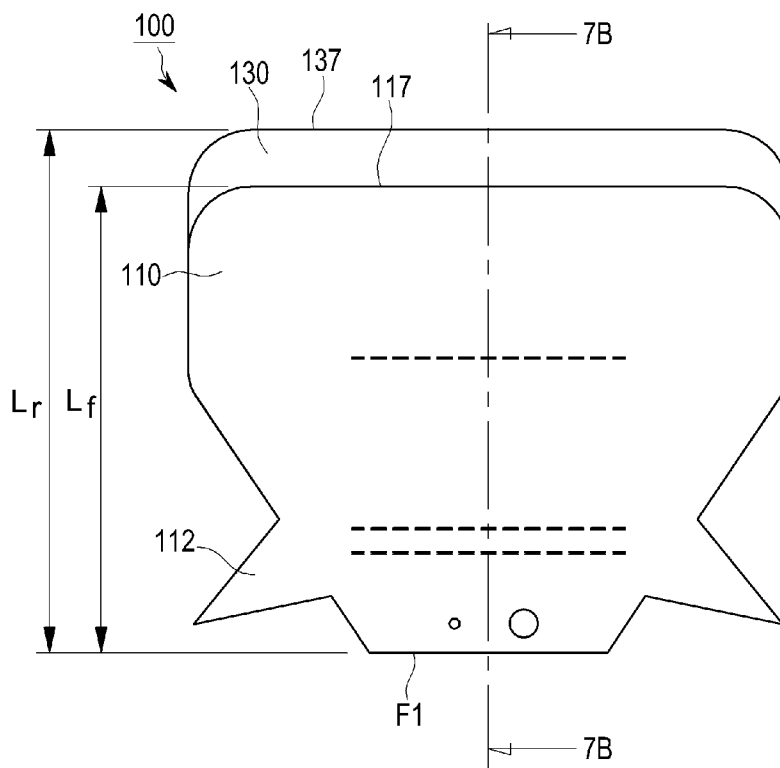
[Fig. 6a]



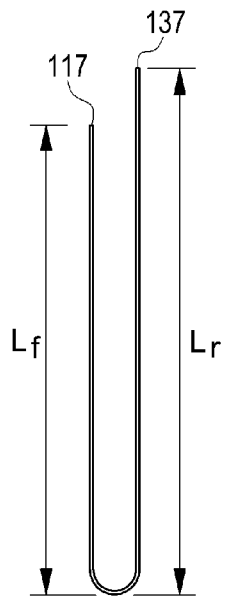
[Fig. 6b]



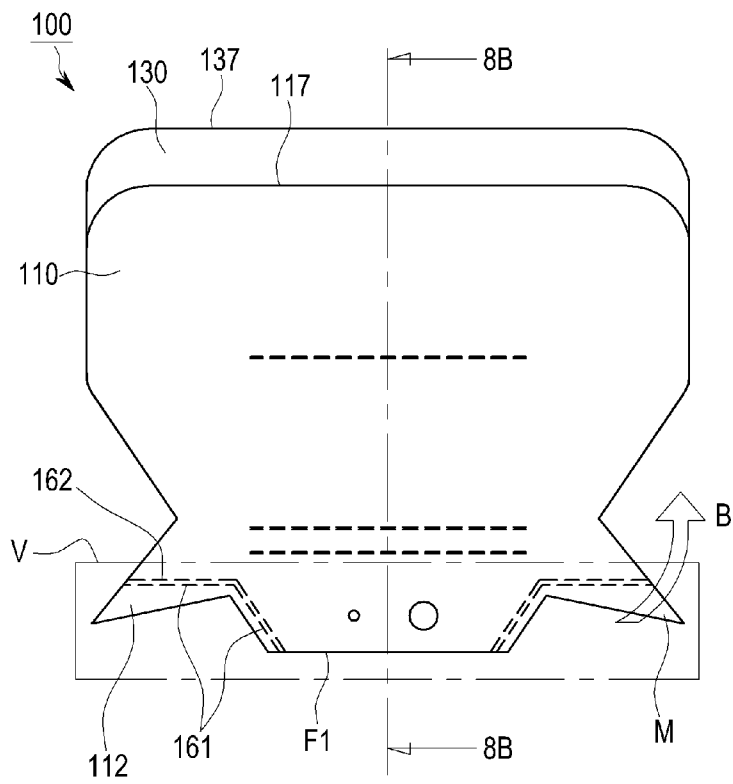
[Fig. 7a]



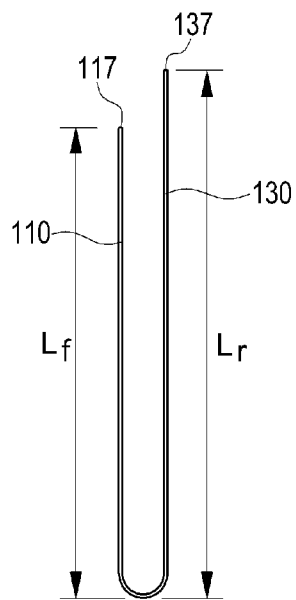
[Fig. 7b]



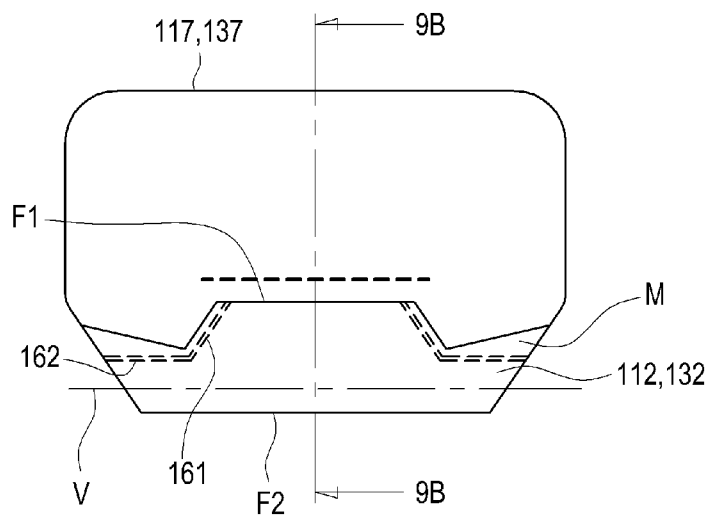
[Fig. 8a]



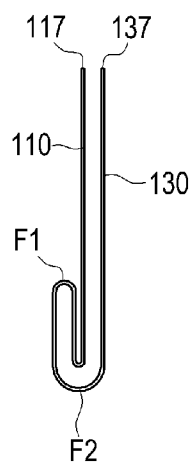
[Fig. 8b]



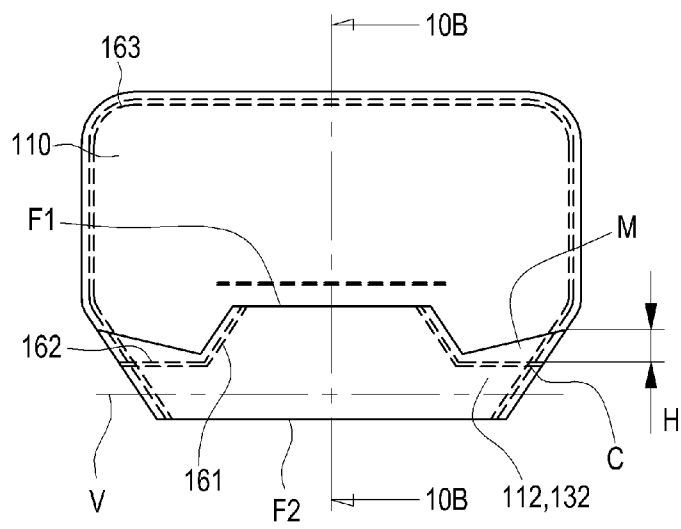
[Fig. 9a]



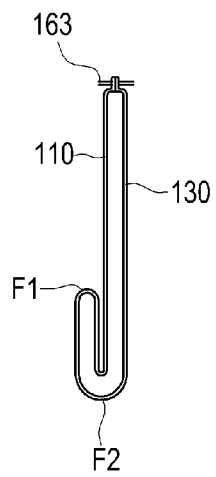
[Fig. 9b]



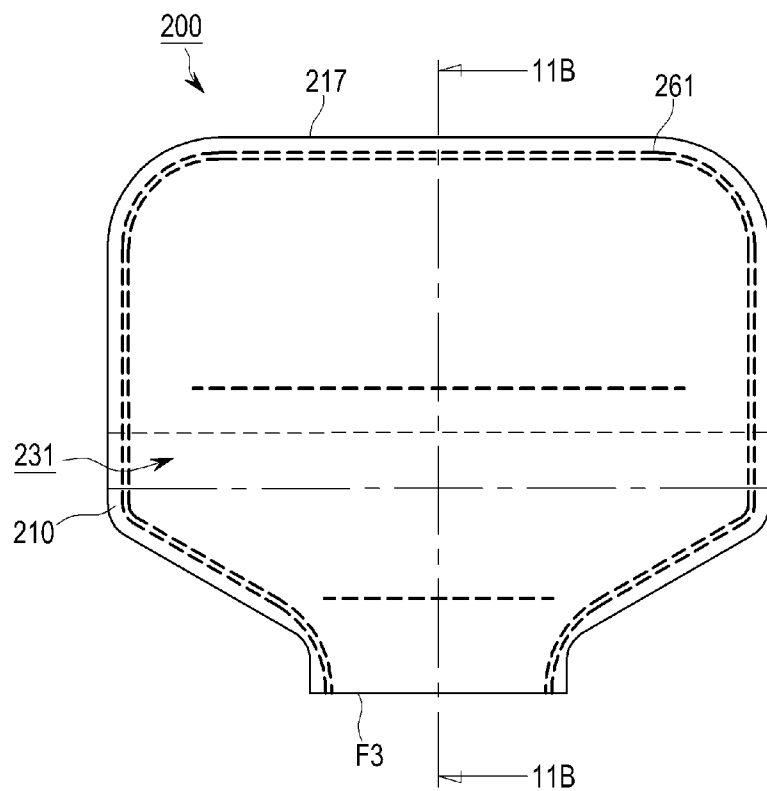
[Fig. 10a]



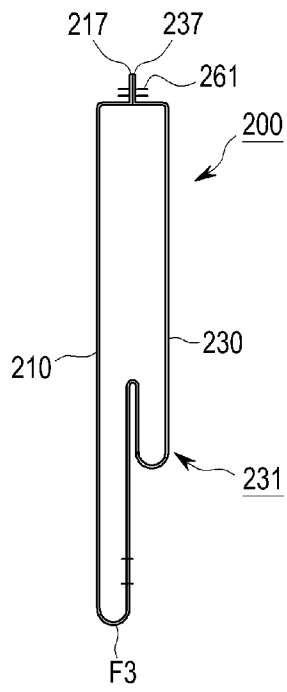
[Fig. 10b]



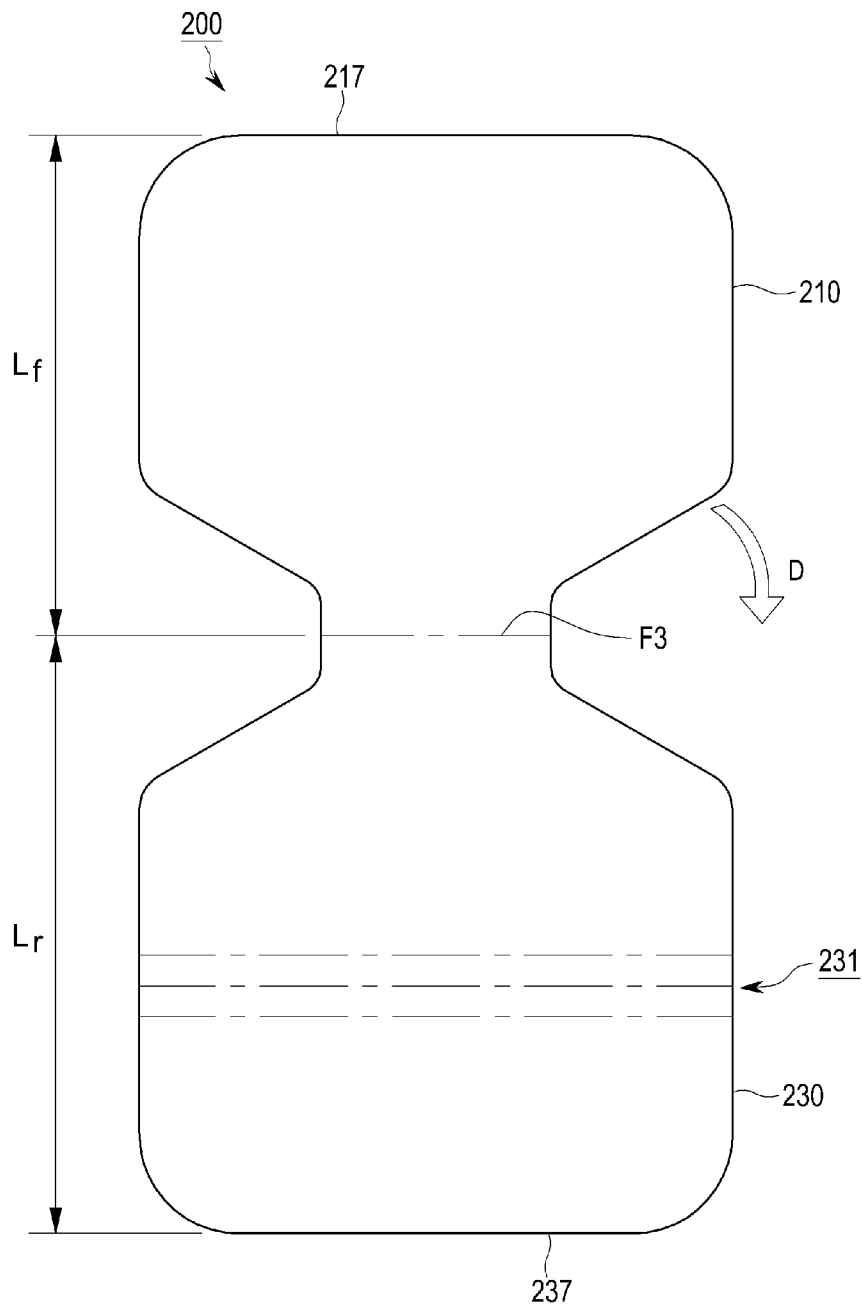
[Fig. 11a]



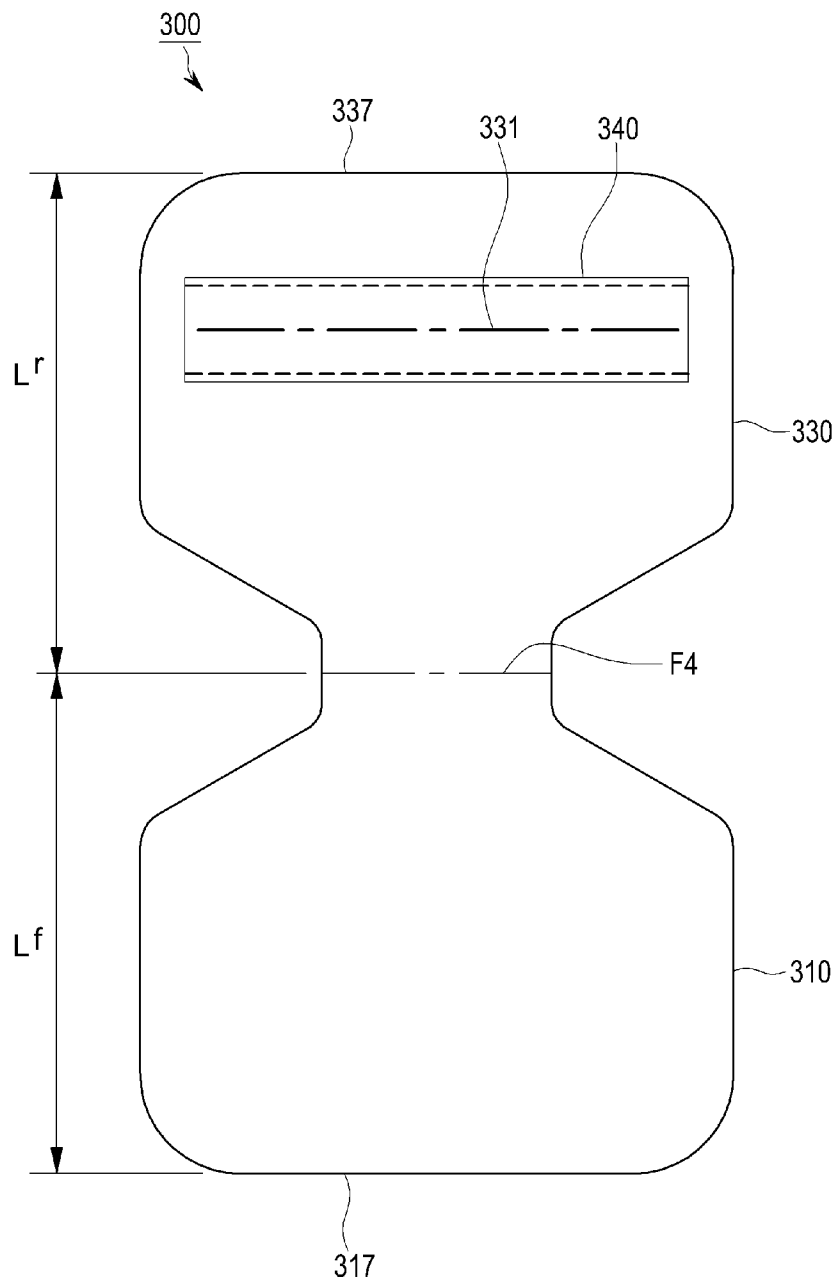
[Fig. 11b]



[Fig. 12]



[Fig. 13]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2014/002685**A. CLASSIFICATION OF SUBJECT MATTER****B60R 21/206(2011.01)i, B60R 21/20(2011.01)i, B60R 21/16(2006.01)i, B60R 21/23(2006.01)i**

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

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
B60R 21/206; B60R 21/20; B60R 21/22; B60R 21/16; B60R 21/23Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: airbag, panel, inflation, housing, fold, and wrinkle**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 7207594 B2 (IGAWA et al.) 24 April 2007 See abstract; column 2, line 32-column 4, line 53; claim 1 and figures 1-4(b).	1, 6-8
A		2-5
A	US 2005-0151351 A1 (ENDERS et al.) 14 July 2005 See abstract; paragraphs [0010]-[0022] and figures 2A-2B.	1-8
A	JP 2007-203937 A (TOYODA GOSEI CO., LTD.) 16 August 2007 See abstract; paragraphs [0005]-[0016] and claim 1.	1-8
A	JP 2003-237525 A (TAKATA CORP.) 27 August 2003 See paragraphs [0005]-[0009] and claim 1.	1-8
A	US 2009-0134611 A1 (WIGGER et al.) 28 May 2009 See abstract; claim 1 and figure 4.	1-8

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

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Date of the actual completion of the international search

08 August 2014 (08.08.2014)

Date of mailing of the international search report

13 August 2014 (13.08.2014)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2014/002685

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