



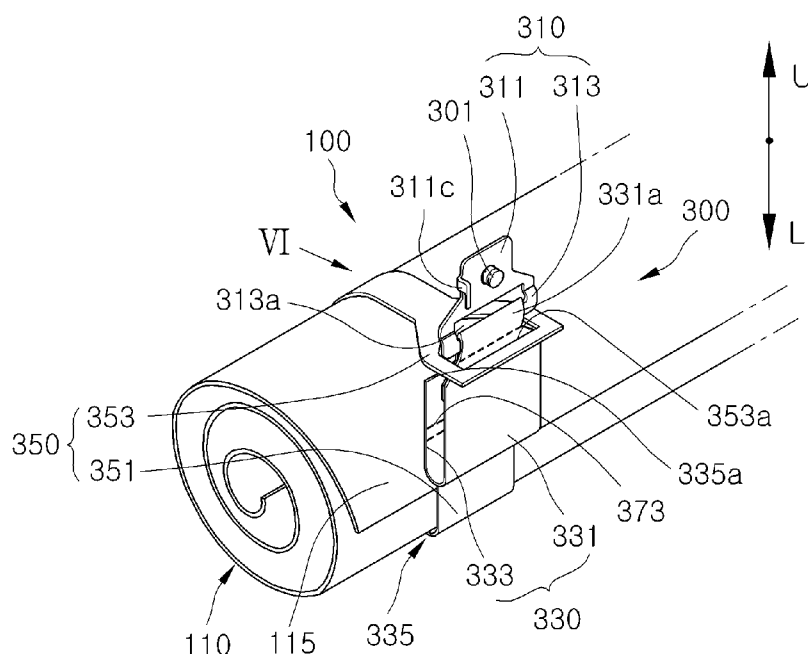
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(54) **Title:** APPARATUS FOR MOUNTING CURTAIN AIRBAG

(57) **Abstract:** Disclosed is an apparatus for mounting a curtain airbag capable of maintaining a desired length of a connection member during deployment of a curtain airbag. The apparatus includes: at least one band type connection member connected to an upper edge of an airbag, and including at least one folding part provided at a middle portion of the band type connection member in a folded state of the airbag to have a reduced installation length; and at least one mounting bracket connected to the connection member to fix the airbag to a vehicle body.

## Description

### Title of Invention: APPARATUS FOR MOUNTING CURTAIN AIRBAG

#### Technical Field

- [1] The present invention relates to a curtain airbag apparatus for protecting a passenger by expanding a curtain airbag upon vehicle collision. More particularly, the present invention relates to an apparatus for mounting a curtain airbag for coupling a curtain airbag to a vehicle.

#### Background Art

- [2] In general, an inner panel covered by a head lining is disposed at an upper side of a side door of a vehicle. A curtain airbag is received in a space defined by the head lining and the inner panel in a folded state.
- [3] When a curtain airbag apparatus is operated, an airbag is deployed due to gas supplied from an inflator and expanded toward an interior of a vehicle while spreading the head lining by pushing a bottom of the head lining.
- [4] The curtain airbag includes an airbag expanded by gas and a plurality of tabs provided at an upper edge of a corresponding airbag and fixed to the inner panel. The tabs are connected to a mounting bracket of a metal material fixed to the inner panel through a coupling member. Accordingly, the tabs allow the airbag to be suspended to the inner panel by cooperating with the mounting bracket.
- [5] In the curtain airbag apparatus having a structure mentioned above, if the tab is short, the airbag is deployed to an interior of the vehicle in an initial step of airbag deployment without being deployed to a lower side of the vehicle along a side window, thereby causing damages to peripheral structural components. In contrast, when the tab is long, the airbag is blown at a mounting location of the airbag apparatus and the deployment direction of the airbag is unstable.
- [6] Accordingly, the tab must have a predetermined length for desirable deployment of the airbag. However, as described above, since the tab has the predetermined length, the tab is idly supported from the folded airbag, so a mounting bracket is drooped from the folded airbag when installing the airbag apparatus. In this case, in order to couple the mounting bracket to the inner panel, there is a complicated operation in that a worker makes the mounting bracket stand and positions the mounting bracket in a predetermined location of the inner panel, and then fixes the mounting bracket to a vehicle body by a coupling member.
- [7] An example of a conventional airbag apparatus has been disclosed in U.S. Patent Application Publication No. 2012-0056409 published on March 8, 2012.

## **Disclosure of Invention**

### **Technical Problem**

- [8] The present invention has been made to solve the problems occurring in the prior art, and an object of the present invention is to provide an apparatus for mounting a curtain airbag for improving installation workability of the curtain airbag by allowing a connection member to have a desired length during deployment of the curtain airbag and to have a short length during the mounting state (non-deployment state) of a curtain airbag apparatus such that the connection member can be maintained in an upright state with respect to a folded airbag.
- [9] Another object of the present invention is to provide an apparatus for mounting a curtain airbag, which facilitates installation work for the curtain airbag in a limited space defined by a head lining and a vehicle body by reducing an installation space for the curtain airbag through the reduction of a length of a tab when the curtain airbag apparatus is in a mounting state.

### **Solution to Problem**

- [10] In order to accomplish the object of the present invention, there is provided an apparatus for mounting a curtain airbag. The apparatus includes: at least one band type connection member connected to an upper edge of an airbag, and including at least one folding part provided at a middle portion of the band type connection member in a folded state of the airbag to have a reduced installation length; and at least one mounting bracket connected to the connection member to fix the airbag to a vehicle body.
- [11] In the apparatus for mounting the curtain airbag, an end of an airbag connection part of the connection member connected to the upper edge of the airbag is directed upward of the vehicle body in the folded state of the airbag, a connection line connected to the airbag is provided in a lower portion of the end, and the folding part is disposed in a lower portion of the connection line, so that a bracket connection part of the connection member connected to the bracket overlaps the airbag connection part.
- [12] In the apparatus for mounting the curtain airbag, the connection member is folded in a "U" shape in the folded state of the airbag and connected to the airbag and the mounting bracket.
- [13] The apparatus for mounting the curtain airbag further includes at least one wrapping member for maintaining the folded state of the connection member and the airbag when the airbag is in a non-deployment state.
- [14] In the apparatus for mounting the curtain airbag, the wrapping member includes a band type member including a support part supported between the connection member and the airbag, and a coupling part wrapping an outer surface of the folded airbag and

coupled to the bracket of the connection member.

- [15] In the apparatus for mounting the curtain airbag, the support part of the wrapping member is connected to the upper edge of the airbag together with the connection member through the connection line, and the coupling part has an opening fitted around an outer portion of the mounting bracket.

### **Advantageous Effects of Invention**

- [16] The curtain airbag apparatus according to an embodiment of the present invention can easily couple a mounting bracket to a vehicle body by maintaining a short length of a connection member such that the mounting bracket can be maintained in an upright state without drooping from a folded airbag.
- [17] In addition, installation work for the curtain airbag can be facilitated in a limited space defined by a head lining and a vehicle body by reducing an installation space for the curtain airbag through the reduction of a length of a tab when the curtain airbag apparatus is in a mounting state.

### **Brief Description of Drawings**

- [18] FIG. 1 is a perspective view showing a folded curtain airbag in a state that a curtain airbag apparatus is coupled to a vehicle body by a mounting apparatus according to an embodiment of the present invention;
- [19] FIG. 2 is a perspective view showing a deployed curtain airbag in a state that a curtain airbag apparatus is coupled to a vehicle body by a mounting apparatus according to an embodiment of the present invention;
- [20] FIG. 3 is an exploded perspective view illustrating a mounting apparatus of a curtain airbag apparatus in a state that a curtain airbag is cut according to the embodiment of the present invention;
- [21] FIG. 4 is an exploded perspective view illustrating a mounting apparatus of a curtain airbag apparatus according to the embodiment of the present invention;
- [22] FIG. 5 is an assembled perspective view illustrating a mounting apparatus of a curtain airbag apparatus in a state that an airbag is not deployed according to the embodiment of the present invention;
- [23] FIG. 6 is a plan view of the mounting apparatus viewed along an arrow VI shown in FIG. 5;
- [24] FIG. 7 is a perspective view illustrating a state that an airbag of a curtain airbag apparatus is partially deployed so that a wrapping member is ruptured and a curtain airbag is cut; and
- [25] FIG. 8 is a sectional view showing an assembled state of a curtain airbag apparatus according to an embodiment of the present invention.

### **Best Mode for Carrying out the Invention**

- [26] 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.
- [27] In drawings, a reference character "U" refers to an upward direction of a vehicle, and a reference character "L" refers to a downward direction of the vehicle.
- [28] FIG. 1 is a perspective view showing a folded curtain airbag in a state that a curtain airbag apparatus is coupled to a vehicle body by a mounting apparatus according to an embodiment of the present invention, and FIG. 2 is a perspective view showing a deployed curtain airbag in a state that a curtain airbag apparatus is coupled to a vehicle body by a mounting apparatus according to an embodiment of the present invention.
- [29] As shown in FIGS. 1 and 2, an inner panel (hereinafter referred to as 'vehicle body') 3 covered by a head lining 1 is disposed above a side window 5 of a vehicle. A curtain airbag apparatus 100 is mounted in the vehicle 3 by at least one mounting apparatus 300.
- [30] The curtain airbag apparatus 100 includes an inflator 101 supplying gas and an airbag 110 coupled to the vehicle 3 in a folded state by the mounting apparatus 300.
- [31] The airbag 110 may be made in the form of a bag by sewing, bonding or fusion-welding two panels, or by weaving a single sheet. The airbag 110 includes a plurality of chambers 111 expanded when the airbag 110 operates and a duct part 113 extending lengthwise along an upper side of each chamber 111 to distribute gas to each chamber 111. The airbag 110 is folded in various forms such as rolling or accordion folding.
- [32] Upon vehicle collision, such as side collision or overturning, a sensor disposed in a vehicle senses an abnormal state and sends an ignition signal to a gas generation unit (not shown) of the inflator 101. The inflator 101 is driven in response to the ignition signal from the sensor and supplies expansion gas to an inside of the airbag 110. When the inside of the airbag 110 is filled with the expansion gas to expand the airbag 110, the head lining 1 is pressed to the downward direction L and is unfolded. The side window 5 is covered by the expanded airbag 110 to protect a passenger in the vehicle.
- [33] Although FIG. 1 shows that one inflator 101 is provided in the center of the airbag 110, one or more inflators 101 may be provided, and the inflator 101 may be installed at various locations such as the front or the rear of the vehicle.
- [34] The mounting apparatus 300 includes a mounting bracket 310, a band type connection member 330, and a wrapping member 350.
- [35] As the airbag 110 is expanded, a tension is applied to the wrapping member 350, so that the wrapping member 350 is ruptured. Thus, the wrapping member 350 ceases

supporting the airbag 110 in the folded state.

[36] The following is a detail description of a mounting apparatus 300 for fixing the airbag 110 to the vehicle body 3.

[37] FIG. 3 is an exploded perspective view illustrating the mounting apparatus of the curtain airbag apparatus in a state that the curtain airbag is cut according to the embodiment of the present invention, and FIG. 4 is an exploded perspective view illustrating the mounting apparatus of the curtain airbag apparatus according to the embodiment of the present invention.

[38] Referring to FIGS. 3 and 4, a mounting apparatus 300 may include a mounting bracket 310, a connection member 330, and a wrapping member 350.

[39] The mounting bracket 310 includes a fixing part 311 and a hanger part 313. The fixing part 311 includes a fixing hole 311a through which coupling means, for instance, a bolt member 301 is inserted to be fixed to a coupling hole 3a of a vehicle body 3. The hanger part 313 includes a through hole 313a and the connection member 330 extends through the through hole 313a. The through hole 313a may include a transverse slot. The mounting bracket 310 may include a metal material.

[40] The mounting bracket 310 may include a coupling protrusion 311c protruding toward the vehicle body 3 and inserted into a hook hole 3b formed in the vehicle body 3. The coupling protrusion 311c prevents the mounting bracket 310 from being rotated when the bolt member 301 fixes the mounting bracket 310 with the vehicle body 3 by allowing the mounting bracket 310 to be situated in a predetermined location of the vehicle body 3.

[41] The connection member 330 may include a non-frangible material, for example, a woven nylon material having a strength capable of sufficiently supporting an airbag 110 expanded due to high pressure gas. The connection member 330 is prepared in the form of a band having a predetermined length. The connection member 330 includes an airbag connection part 331 connected to an upper edge 115 of the airbag 110 and a bracket connection part 333 inserted in the through hole 313a of the mounting bracket 310 to be supported.

[42] The bracket connection part 333 is inserted into the through hole 313a of the mounting bracket 310, and wraps a lower portion of the mounting bracket 310 and then is fixed by a sewing line 371 to form a loop 331a.

[43] An end 335a of the airbag connection part 333 is directed upward, and is connected to an upper edge 115 of the airbag 110 through the sewing line 373 formed below the end 335a.

[44] The connection member 330 includes a folding part, which is formed at the center of the connection member 320, so the connection member 330 may have a "U" shape. That is, the airbag connection part 333 and the bracket connection part 331 overlap

each other. At least one folding part 335 may be provided.

[45] The wrapping member 350 is formed by a band type member, which has a predetermined length, and includes a hanger part 351 and a coupling part 353.

[46] For example, a material of the wrapping member 350 may include a non-woven nylon frangible material and a non-woven polyester frangible material. Alternatively, the material of the wrapping member 350 may include a non-frangible material. In this case, the wrapping member 350 may be configured to have a rupture part 355 such as a tear line such that the wrapping member 350 is ruptured upon the deployment of the airbag 110.

[47] A support part 351 may be interposed between the connection member 330 and an upper edge of the airbag 110 and coupled to the airbag 110 together with the connection member 330.

[48] The present invention is not limited by these examples, and a support structure of the wrapping member 350 may be variously modified. For instance, the wrapping member 350 may be connected to one side of the connection member 330 through the sewing line 371.

[49] The wrapping part 350 has an opening 353a such that the coupling part 353 can be fitted around an outer side of the mounting bracket 310.

[50] FIG. 5 is an assembled perspective view illustrating a mounting apparatus of a curtain airbag apparatus in a state that an airbag is not deployed according to the embodiment of the present invention, and FIG. 6 is a plan view of the mounting apparatus viewed along an arrow VI shown in FIG. 5.

[51] Referring to FIGS. 5 and 6, the airbag is in a rolled state, and a support part 351 of a wrapping member 350 and an airbag connection part 333 of a connection member 330 are coupled to an upper edge 115 of the airbag 110 through the sewing line 373. At least two sewing lines 373 may be provided while being spaced apart from each other by a predetermined distance.

[52] The end 335a of the airbag connection part 333 of the connection member 330 is directed upward so that the sewing line 373 is located below the end 335a.

[53] The connection member 330 includes a folding part 335 formed by folding a lower portion of the sewing line 373 in an upward direction U, and an airbag connection part 335 and a bracket connection part 331 overlap each other.

[54] The wrapping member 350 wraps an outer surface of the airbag 110 in a folded (rolled) state and an opening 353a of the coupling part 353 are fitted around an upper portion of a hanger part 313 of the mounting bracket 310. As a result, the connection member 330 may be maintained in a folded state having a substantially "U" shape to reduce a distance D between a center of the coupling member 301 and a top of a rolled airbag 110.

- [55] Accordingly, the mounting bracket 310 may maintain in an upright state without idly drooping from an outer side of a folded airbag 110, so the mounting bracket 310 may be readily aligned in a coupling location with respect to the vehicle body 3.
- [56] That is, when the mounting bracket 310 is idly drooped downward, a worker needs to uprightly stand the mounting bracket 310 and then move the mounting bracket 310 to a coupling location with respect to the vehicle body 3. However, according to the present invention, the mounting bracket 310 may maintain the upright state, so the above complex work may not be necessary.
- [57] FIG. 7 is a perspective view illustrating a state that an airbag of a curtain airbag apparatus is partially deployed so that a wrapping member is ruptured.
- [58] Referring to FIG. 7, as the airbag 110 is expanded, the tension is applied to the wrapping member 350 so that the wrapping member 350 is ruptured. Thus, the wrapping member 350 may not support the airbag 110 in a folded state.
- [59] Meanwhile, as the wrapping member 350 is ruptured, the connection member 330 is unfolded in the form of a horizontal straight line from the "U" shape. Accordingly, the end 333a of the airbag connection part 333 is located in an upward direction and a sewing line 373 is located above the end 333a.
- [60] As described above, when the airbag 110 is deployed, the wrapping member 350 may extend to an effective length L capable of obtaining a desirable deployment of the airbag 110. Accordingly, in an initial step of the deployment of the airbag 110, the airbag 110 may be deployed to a lower side of the vehicle along a side window.
- [61] FIG. 8 is a cross-sectional view showing an assembled state of a curtain airbag apparatus according to an embodiment of the present invention.
- [62] Referring to FIG. 8, the curtain airbag apparatus 100 is provided in a vehicle body 3 covered by the head lining 1 disposed in an upper edge of a side window in the vehicle.
- [63] The airbag 110 of the curtain airbag apparatus 100 is received in a rolled state, and the airbag connection part 333 of the connection member 330 is connected to the upper edge of the side window. The bracket connection part 331 of the connection member 330 is folded in an upward direction U by the folding part 335 prepared in a lower part of the sewing line 373 and overlaps the airbag connection part 333.
- [64] A support part 351 of the wrapping member 350 is connected to an upper edge 115 of the airbag 110 together with the airbag connection part 333.
- [65] A coupling part 353 of the wrapping member 350 is fixedly coupled with the hanger part 313 of the mounting bracket 310. Accordingly, the connection member 330 maintains the folded state in the form of the "U" shape, and the airbag 110 maintains the folded state.
- [66] An installation length D of the connection member 330 is maintained short so that the mounting bracket 310 is maintained in an upright state in one side of the folding

airbag 110. As a result, a location of a through hole 311a is maintained constant so that the curtain airbag apparatus 100 may be easily coupled to the vehicle body 3.

[67] In addition, because a distance B between a center of the through hole 311a may be reduced, the curtain airbag apparatus 110 may be easily installed in a narrow installation space S between the head lining 1 and the vehicle body 3.

[68] Although the exemplary embodiments of the present invention have been described, it is understood that the exemplary embodiments help one ordinary skilled in the art to easily realize the present invention should not be limited to these exemplary embodiments and accompanying drawings. Therefore, various changes and modifications can be apparently made by the skilled in the art without departing from the technical spirit of the present invention. In addition, it is understood that parts that can be easily changed by the skilled in the art are within the spirit and scope of the present invention as hereinafter claimed.

[69]

[70]

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[72]

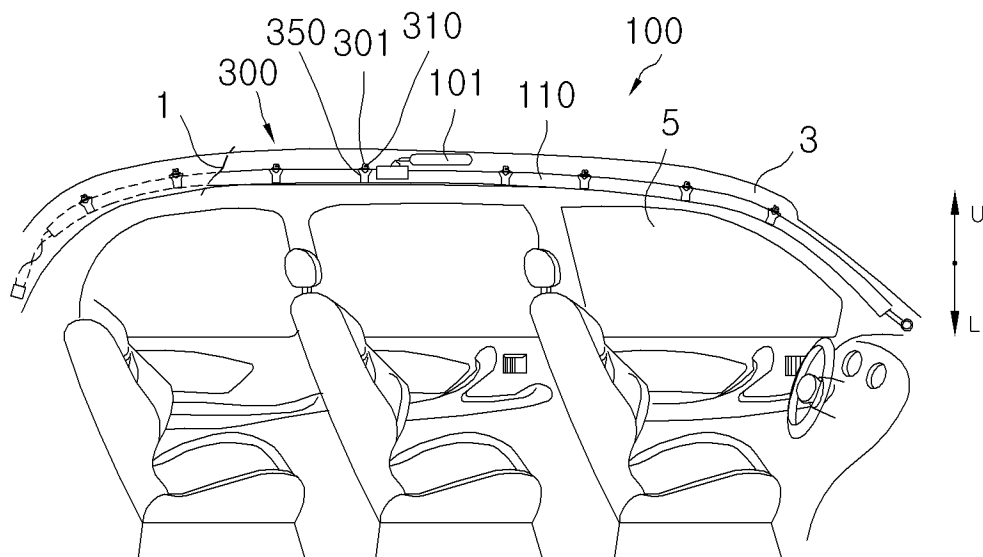
[73]

[74]

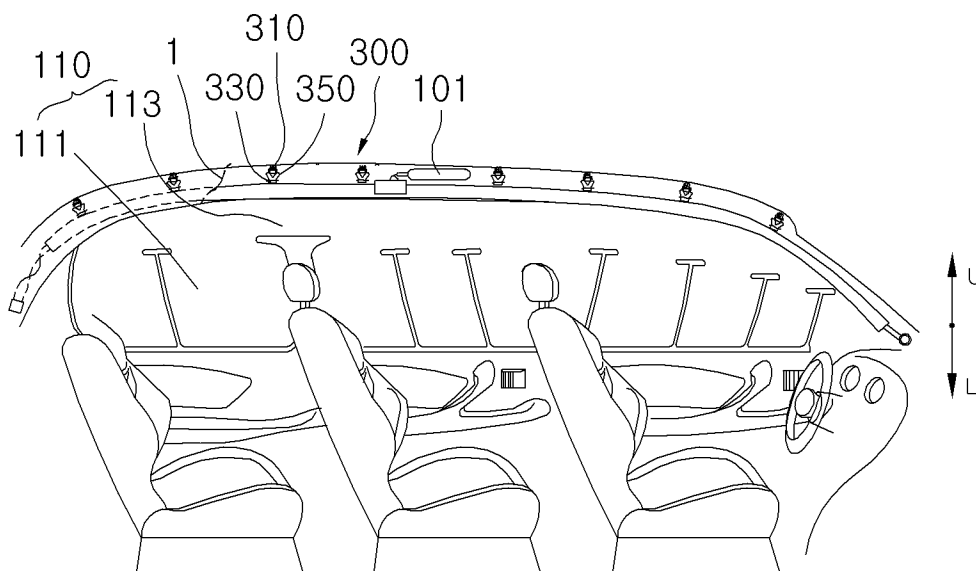
## Claims

- [Claim 1] An apparatus for mounting a curtain airbag, the apparatus comprising:  
at least one band type connection member connected to an upper edge of an airbag, and including at least one folding part provided at a middle portion of the band type connection member in a folded state of the airbag to have a reduced installation length; and  
at least one mounting bracket connected to the connection member to fix the airbag to a vehicle body.
- [Claim 2] The apparatus of claim 1, wherein an end of an airbag connection part of the connection member connected to the upper edge of the airbag is directed upward of the vehicle body in the folded state of the airbag, a connection line connected to the airbag is provided in a lower portion of the end, and  
the folding part is disposed in a lower portion of the connection line, so that a bracket connection part of the connection member connected to the bracket overlaps the airbag connection part.
- [Claim 3] The apparatus of claim 2, wherein the connection member is folded in a "U" shape in the folded state of the airbag and connected to the airbag and the mounting bracket.
- [Claim 4] The apparatus of claim 2, further comprising at least one wrapping member for maintaining the folded state of the connection member and the airbag when the airbag is in a non-deployment state.
- [Claim 5] The apparatus of claim 4, wherein the wrapping member includes a band type member including a support part supported between the connection member and the airbag, and a coupling part wrapping an outer surface of the folded airbag and coupled to the bracket of the connection member.
- [Claim 6] The apparatus of claim 5, wherein the support part of the wrapping member is connected to the upper edge of the airbag together with the connection member through the connection line, and the coupling part has an opening fitted around an outer portion of the mounting bracket.

[Fig. 1]

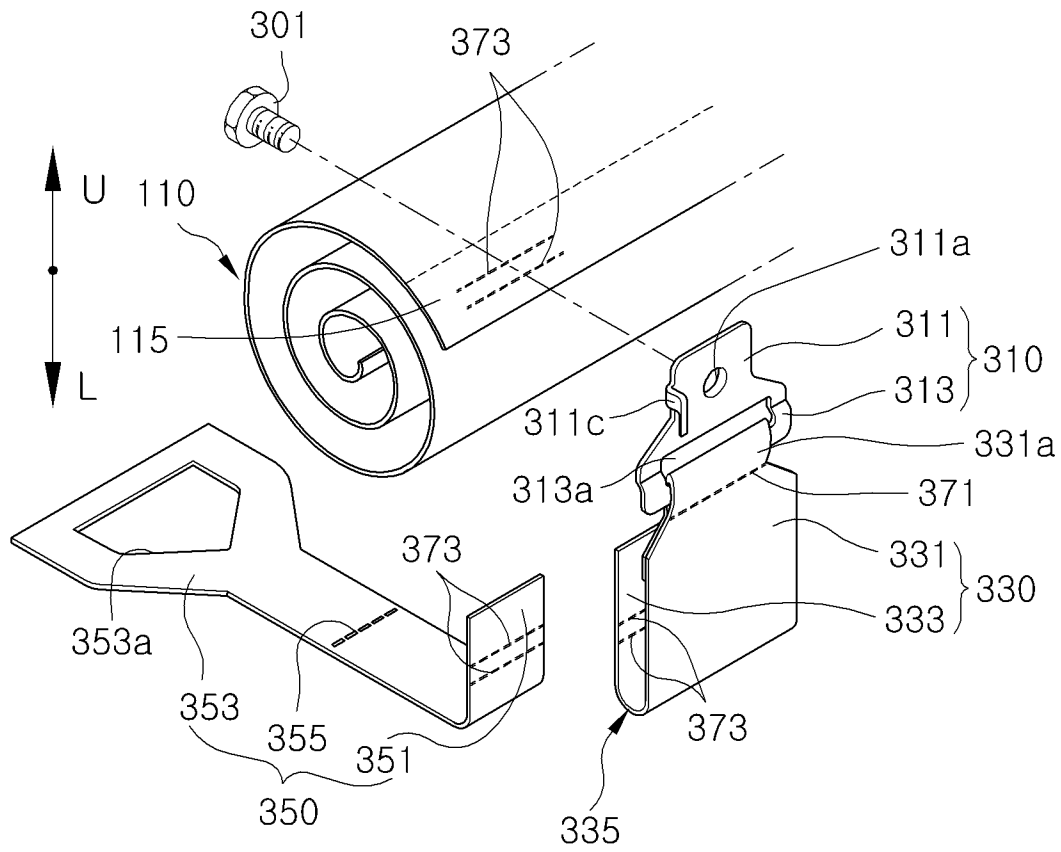


[Fig. 2]

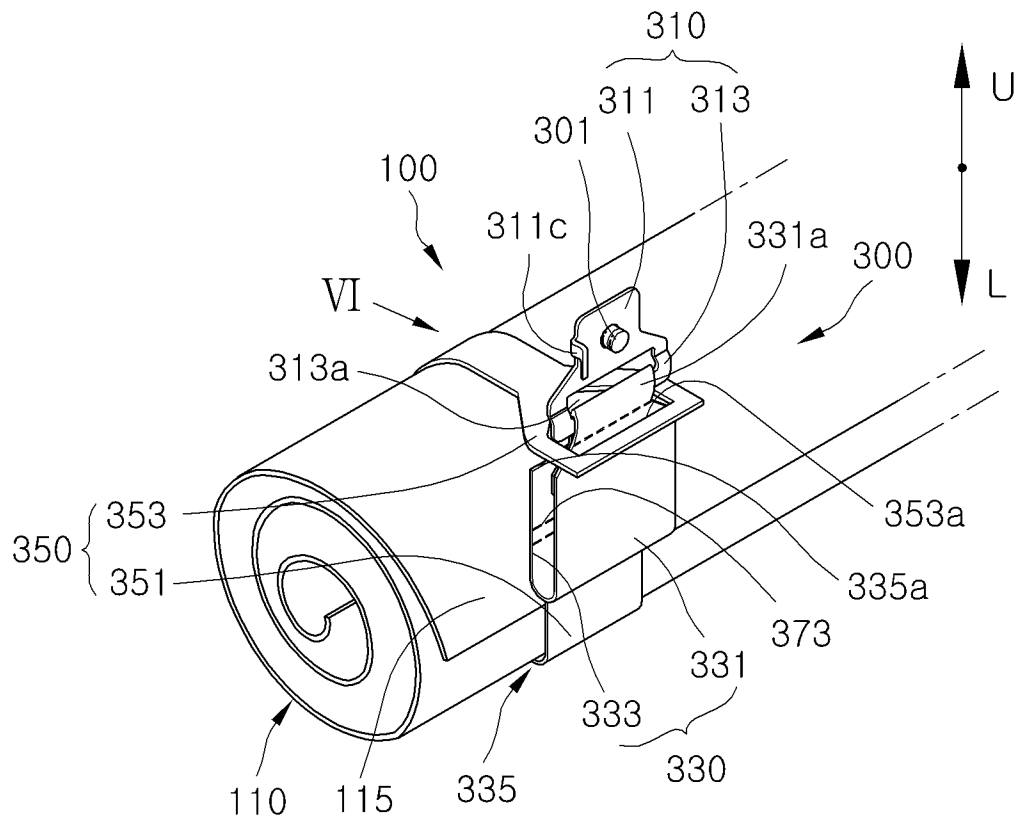




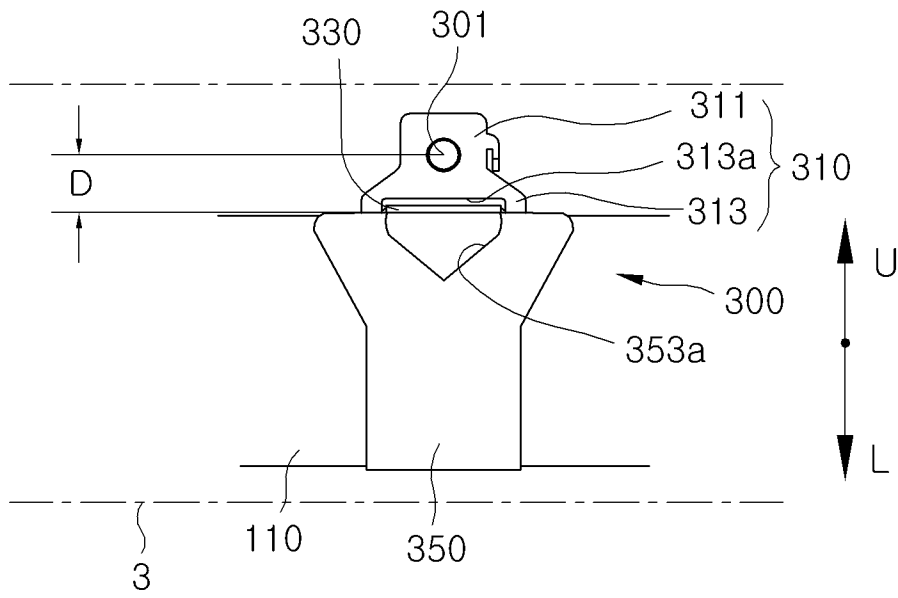
[Fig. 4]



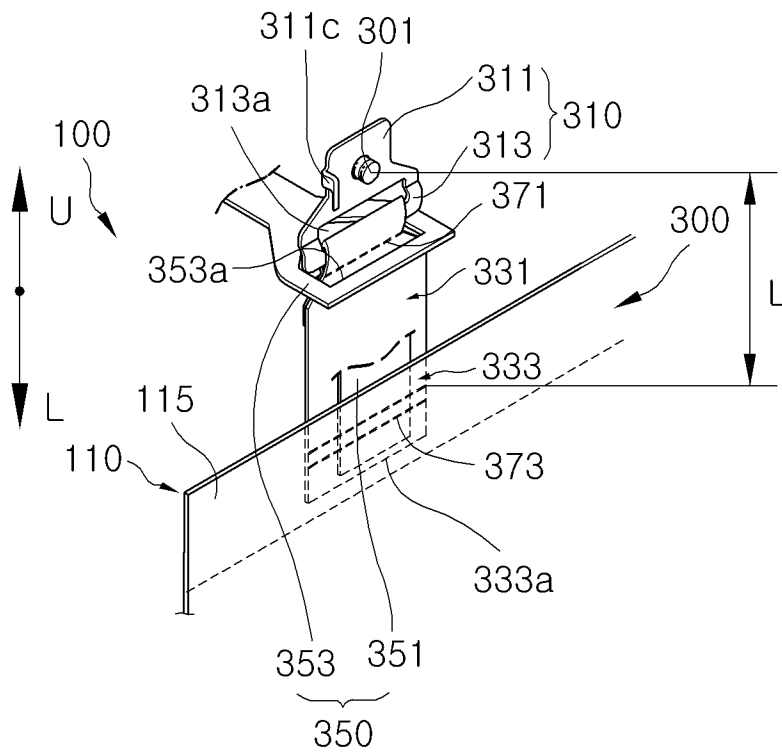
[Fig. 5]



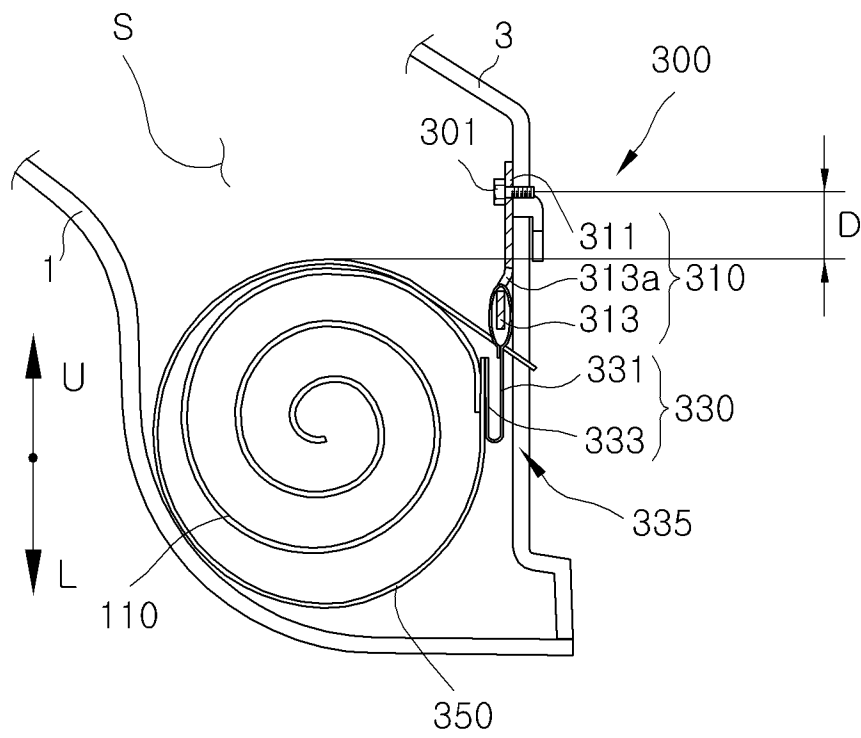
[Fig. 6]



[Fig. 7]



[Fig. 8]



**A. CLASSIFICATION OF SUBJECT MATTER****B60R 21/213(2011.01)i, B60R 21/20(2011.01)i**

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

B60R 21/213; B60R 21/20; B60R 21/16

Documentation 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 models

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

eKOMPASS(KIPO internal) &amp; Keywords: curtain airbag, side airbag, fold, and tuck

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                         | Relevant to claim No. |
|-----------|------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | WO 2011-090994 A1 (AUTOLIV ASP, INC.) 28 July 2011<br>See paragraphs [0039],[0043],[0046], figures 3,5.    | 1-3                   |
| Y         |                                                                                                            | 4-6                   |
| Y         | US 2011-0042923 A1 (HATFIELD et al.) 24 February 2011<br>See paragraphs [0043],[0045],[0046]; figures 4,6. | 4-6                   |
| A         | US 7,357,408 B2 (HALL et al.) 15 April 2008<br>See column 4, lines 27-43; figure 4A.                       | 1-6                   |
| A         | US 2008-0284142 A1 (CHEAL et al.) 20 November 2008<br>See paragraphs [0068]-[0070]; figures 3,4A,4B.       | 1-6                   |
| A         | EP 1764271 A2 (TAKATA CORPORATION) 21 March 2007<br>See paragraphs [0022]-[0024],[0027]; figures 1,3.      | 1-6                   |



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

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Date of the actual completion of the international search

25 July 2013 (25.07.2013)

Date of mailing of the international search report

**26 July 2013 (26.07.2013)**

Name and mailing address of the ISA/KR

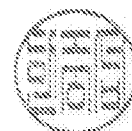
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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/KR2013/003791**

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                                                                                                                        | Publication<br>date                                                                                                        |
|-------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| WO 2011-090994 A1                         | 28/07/2011          | US 2011-0175333 A1<br>US 8091918 B2                                                                                                                               | 21/07/2011<br>10/01/2012                                                                                                   |
| US 2011-0042923 A1                        | 24/02/2011          | US 8056924 B2<br>WO 2011-022614 A1                                                                                                                                | 15/11/2011<br>24/02/2011                                                                                                   |
| US 7357408 B2                             | 15/04/2008          | US 2006-192368 A1                                                                                                                                                 | 31/08/2006                                                                                                                 |
| US 2008-0284142 A1                        | 20/11/2008          | CN 101678807 A<br>CN 101678807 B<br>US 7823914 B2<br>WO 2008-144121 A1                                                                                            | 24/03/2010<br>22/08/2012<br>02/11/2010<br>27/11/2008                                                                       |
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