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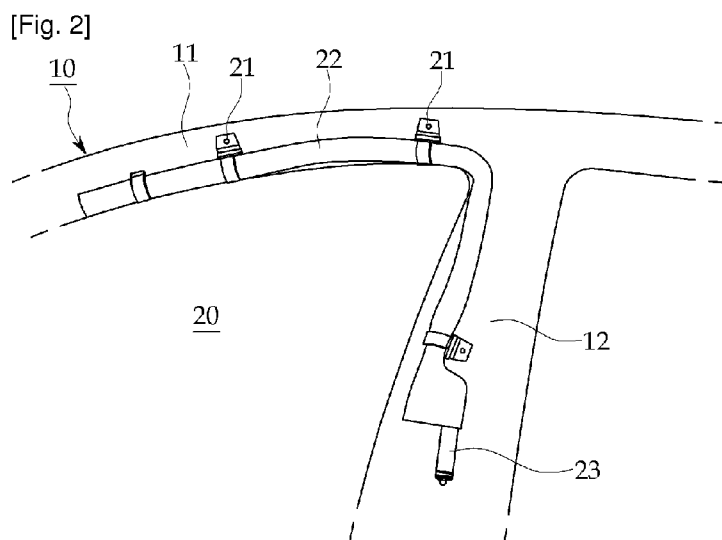
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(54) Title: CURTAIN AIRBAG MODULE



(57) Abstract: Disclosed is a curtain airbag module including an airbag cushion mounted on a roof and a pillar panel of a vehicle through a cushion holder, and an inflator mounted on the pillar panel and exploded upon side collision of the vehicle to transfer gas pressure to the airbag cushion. The airbag cushion includes first and second chambers arranged in parallel and deployed forward from the pillar panel, a coupling portion integrated with the first and second chambers to couple the first and second chambers with each other, and a transfer member coupled with the inflator inside the coupling portion to transfer the gas pressure to the first and second chambers. The gas pressure is transferred into the first and second chambers from the inflator mounted on the pillar panel to simultaneously deploy the first and second chambers, so that the head and chest of the occupant are safely protected.



## Description

### Title of Invention: CURTAIN AIRBAG MODULE

#### Technical Field

- [1] The present invention relates to a curtain airbag module. More particularly, the present invention relates to a curtain airbag module mounted on the roof and a pillar panel of a vehicle and deployed upon vehicle collision, thereby protecting an occupant.

#### Background Art

- [2] In general, curtain and side airbags are representative safety devices to cope with the side collision of a vehicle.
- [3] FIG. 1 is a view showing the mounting state of curtain and side airbags in a vehicle according to the related art.
- [4] A curtain airbag CA according to the related art is mounted on a roof 2 near an upper end of the glass of a vehicle 1 through a cushion holder 3, and coupled with a first inflator 4 mounted on the roof 2, so that the curtain airbag CA is deployed downward upon the side collision of the vehicle 1 to protect an occupant P from the glass and absorb the shock when the occupant P collides with a side door of the vehicle.
- [5] The curtain airbag CA according to the related art has a length enough to cover the glass of the vehicle 1 when the curtain airbag CA is deployed, thereby preventing a head H of the occupant P from colliding with the glass and being injured. Accordingly, the head H of the occupant P can be protected from the fragments of the glass.
- [6] A side airbag SA is coupled with a second inflator 7 installed at a side end portion of a seat 5 of the vehicle 1 or a pillar panel 6. Upon the side collision of the vehicle, the side airbag SA is deployed between the shoulder S and the upper arm of the occupant P and the side door, thereby preventing the body T of the occupant P from being injured due to the collision with the side door.
- [7] Recently, a technology on a cushion airbag having the mixture form of the curtain airbag CA and the side airbag SA has been developed. According to the technology on the cushion airbag, the cushion airbag has the function of the side airbag in which the length of the curtain airbag of the vehicle extends to the chest of the occupant, so that both of the head and the chest of the occupant can be covered by using one curtain airbag.
- [8] However, the curtain airbag having a length extending upward and downward may not protect the chest of the occupant P properly because a great amount of time is spent until the pressure of gas generated from the inflator mounted on the roof is transferred to a lower end portion of the airbag cushion so that the airbag cushion is completely inflated.

- [9] In other words, when the curtain airbag is deployed, an upper end portion of the airbag cushion is first inflated due to the mounting position of the inflator. Accordingly, when considering that the curtain airbag having the function of the side airbag according to the related art protects the occupant in the sequence of the head to the chest of the occupant, a great amount of time is required to inflate the airbag cushion completely, so that a lower end portion of the airbag cushion corresponding to the chest of the occupant may be deployed after impact has been significantly applied to the chest of the occupant. Therefore, in the case of the curtain airbag equipped with the side airbag function according to the related art, the upper and lower end portions of the airbag cushion are not simultaneously inflated, so that the chest of the occupant cannot be properly protected from the impact.

### **Disclosure of Invention**

#### **Technical Problem**

- [10] 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 a curtain airbag module capable of protecting the sides of the head and the chest of an occupant through one airbag cushion.
- [11] Another object of the present invention is to provide a cushion airbag module capable of reducing the deployment time of the curtain airbag corresponding to the sides of the head and the chest of the occupant.
- [12] Still another object of the present invention is to provide a curtain airbag module capable of safely protecting the head and the chest of the occupant by simultaneously inflating the upper and lower end portions of an airbag cushion corresponding to the head and the chest of the occupant.

#### **Solution to Problem**

- [13] In order to accomplish the objects of the present invention, there is provided a curtain airbag module including an airbag cushion mounted on a roof and a pillar panel of a vehicle through a cushion holder, and an inflator mounted on the pillar panel and exploded upon side collision of the vehicle to transfer gas pressure to the airbag cushion. The airbag cushion includes first and second chambers arranged in parallel to each other in a vertical direction and deployed forward from the pillar panel, a coupling portion integrated with the first and second chambers to couple the first and second chambers with each other, and a transfer member coupled with the inflator inside the coupling portion to transfer the gas pressure to the first and second chambers.
- [14] The transfer member includes a three-directional tube having a "└" shape, and extends to internal spaces of the first and second chambers.

[15] The transfer member includes a material identical to materials of the first and second chambers, and has a thickness thicker than thicknesses of the first and second chambers.

[16]

### **Brief Description of Drawings**

[17] FIG. 1 is a sectional view showing the mounting state of curtain and side airbags in a vehicle according to the related art;

[18] FIG. 2 is a sectional view showing the mounting state of a curtain airbag module according to an exemplary embodiment of the present invention;

[19] FIG. 3 is a sectional view showing the deploying state of an airbag cushion of FIG. 2; and

[20] FIG. 4 is a sectional view showing the modification of a transfer member of FIG. 3.

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

[21] Hereinafter, a curtain airbag module according to an exemplary embodiment of the present invention will be described in detail with reference to accompanying drawings.

[22] FIG. 2 is a sectional view showing the mounting state of a curtain airbag module 20 according to an exemplary embodiment of the present invention, and FIG. 3 is a sectional view showing the deploying state of an airbag cushion of FIG. 2.

[23] As shown in FIGS. 2 and 3, the curtain airbag module 20 according to the exemplary embodiment of the present invention includes cushion holders 21 mounted on a roof 11 and a pillar panel 12 of the vehicle 10, an airbag cushion 22 mounted on the roof 11 and the pillar panel 12 of the vehicle 10 through the cushion holders 21, and an inflator 23 mounted on the pillar panel 12 and exploded upon the side collision of the vehicle 10 to transfer gas pressure to the airbag cushion 22.

[24] The cushion holders 21 are arranged at a predetermined interval in the longitudinal direction of the airbag cushion 22.

[25] For example, as shown in FIG. 2, the cushion holders 21 are provided at front and rear ends of the airbag cushion 22, and at least one cushion holder 21 is interposed between the front and rear ends of the airbag cushion 22.

[26] As shown in FIG. 3, the airbag cushion 22 includes first and second chambers 24 and 25 arranged in parallel to each other in a vertical direction and deployed forward from the pillar panel 12, a coupling portion 26 to couple the first and second chambers 24 and 25 with each other, and a first transfer member 27 provided inside the coupling portion 26 to transfer gas pressure from the inflator 23 to the first and second chambers 24 and 25.

[27] In other words, the airbag cushion 22 is extended more downward than the curtain airbag cushion according to the related art to simultaneously protect the head and the

chest of the occupant. In ordinary times, the airbag cushion 22 is curved in a reverse-L shape and fixed onto the roof 11 and the pillar panel 12 by the cushion holders 21 in the state that the airbag cushion 22 is folded so that the volume of the airbag cushion 22 can be minimized.

[28] The first and second chambers 24 and 24 have a rectangular shape.

[29] In this case, the corners of the first and second chambers 24 and 25 are curved. Accordingly, the gas pressure is smoothly transferred throughout the whole space of the first and second chambers 24 and 25 so that the first and second chambers 24 and 25 can be rapidly inflated.

[30] The coupling portion 26 couples an upper end of the rear side of the first chamber 24 with an upper end of the rear side of the second chamber 25. The coupling portion 26 is provided therein with the first transfer member 27.

[31] Preferably, the first and second chambers 24 and 25 and the coupling portion 26 are made of fabric and integrated with each other.

[32] The first transfer member 27 includes fabric having a thickness thicker than that of the first and second chambers 24 and 25 so that the first transfer member 27 has strength higher than that of the first and second chambers 24 and 25. The first transfer chamber 27 includes a three-directional tube having a substantially "└" shape to simultaneously transfer gas pressure from the inflator 23 coupled with one side of the first transfer chamber 27 to the first and second chambers 24 and 25 provided at the upper and lower portions of the first transfer chamber 27.

[33] The first transfer member 27 is fixed inside the coupling portion 26 through sewing or bonding so that the first transfer member 27 does not get out of an original position by the gas pressure.

[34] Therefore, according to the present invention, gas pressure generated due to the explosion of an inflator upon the side collision of a vehicle is simultaneously transferred to the first and second chambers through a transfer member, so that the head and the chest of the occupant can be safely protected.

[35] In addition, the present invention provides a dual structure in which a transfer member having the strength higher than that of the first and second chambers is provided inside a coupling portion to prevent the transfer member from being damaged due to gas pressure in the first stage of the inflator explosion.

[36] Meanwhile, although the present embodiment has been described in that the transfer member is provided inside the coupling portion, the present invention is not limited thereto.

[37] In other words, according to another embodiment of the present invention, the length and the shape of the transfer member may be changed to improve the deployment speed of an airbag cushion.

- [38] FIG. 4 is a sectional view showing the modification of the transfer member 27 of FIG. 3.
- [39] As shown in FIG. 4, upper and lower end portions of a second transfer member 28 can be extended to the inner portion of the first and second chambers 24 and 25 from the coupling portion 26.
- [40] In this case, the extension length and the extension shape of the second transfer member 28 are preferably set to values representing the highest deployment speed of the airbag cushion among experimental data obtained through repeated experiments.
- [41] As described above, according to the present invention, the transfer member is extended to the inner portion of the first and second chambers so that the gas pressure can be easily transferred throughout the whole internal space of the first and second chambers. Accordingly, the deployment speed of the first and second chambers can be enhanced, so that safety can be improved.
- [42] Hereinafter, the coupling relation in the curtain airbag module according to an exemplary embodiment of the present invention will be described in detail.
- [43] The airbag cushion 22 of the curtain airbag module 20 according to the exemplary embodiment of the present invention is fixed onto the roof 11 and the pillar panel 12 of the vehicle 10 in the folded state when the airbag cushion 22 is manufactured, and deployed between an occupant and the side door or the glass of the vehicle upon side collision of the vehicle 10.
- [44] As shown in FIG. 3, the airbag cushion 22 is rolled or folded several times so that the volume of the airbag cushion 22 can be minimized. In this case, the first chamber 24 is fixed onto the roof 11 of the vehicle 10 by the cushion holders 21, and the second chamber 25 and the coupling portion 26 are fixed onto the pillar panel 12 of the vehicle 10.
- [45] The coupling portion 26 and the first transfer member 27 or the second transfer member 28 provided in the airbag cushion 22 are coupled with the inflator mounted on the pillar panel 12.
- [46] Therefore, according to the present invention, gas pressure is transferred into the first chamber corresponding to a conventional curtain airbag cushion and the second chamber corresponding to a conventional side airbag cushion by using one inflator mounted on the pillar panel, so that the first and second chambers can be simultaneously deployed.
- [47] Thus, according to the present invention, when comparing with the case that first and second inflators are separately provided, the number of components can be more reduced, and the fabricating cost can be more reduced. In addition, another device may be installed in a space without an inflator, so that the interior of the vehicle can be designed with an enough room. Accordingly, the work can be smoothly performed, so

that the workability can be improved.

[48] Hereinafter, the operating relation of the curtain airbag module 20 according to the exemplary embodiment of the present invention will be described in detail.

[49] The curtain airbag module 20 according to the exemplary embodiment of the present invention operates by gas pressure generated when the inflator 23 is exploded upon side collision of the vehicle.

[50] The gas pressure generated from the inflator 23 is transferred into the coupling portion 26 through the first transfer member 27 or the second transfer member 28 coupled with the inflator 23, and transferred into the first and second chambers 24 and 25.

[51] As described above, the first and second chambers 24 and 25 are simultaneously inflated by the gas pressure transferred into the first and second chambers 24 and 25 to protect the sides of the head and the chest of the occupant.

[52] Therefore, the gas pressure is transferred into the first and second chambers from the inflator mounted on the pillar panel to simultaneously deploy the first and second chambers, so that the head and the chest of the occupant can be safely protected.

[53] Through the above procedure, according to the present invention, the first and second chambers arranged in parallel to each other in the vertical direction are deployed between the occupant and the side door or the glass by using the inflator mounted on the pillar panel, so that the head and the chest of the occupant can be protected.

[54] Although the exemplary embodiments of the present invention have been described, 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.

[55]

### **Industrial Applicability**

[56] As described above, according to the present invention, gas pressure is transferred into the first and second chambers from the inflator mounted on the pillar panel to simultaneously deploy the first and second chambers, so that the head and the chest of the occupant can be safely protected.

[57] In other words, according to the present invention, gas pressure is transferred into the first chamber corresponding to a conventional curtain airbag cushion and the second chamber corresponding to a conventional side airbag cushion by using one inflator mounted on the pillar panel, so that the first and second chambers can be simul-

taneously deployed.

[58] Thus, according to the present invention, when comparing with the case that first and second inflators are separately provided, the number of components can be more reduced, and the fabricating cost can be more reduced. In addition, another device may be installed in a space without an inflator, so that the interior of the vehicle can be designed with an enough room. Accordingly, the work can be smoothly performed, so that the workability can be improved.

[59] In addition, according to the present invention, there is provided a dual structure in which a transfer member having the strength higher than that of the first and second chambers is provided inside a coupling portion to prevent the transfer member from being damaged due to gas pressure in the first stage of the inflator explosion.

[60] As described above, according to the present invention, the transfer member is extended to the inner portion of the first and second chambers so that the gas pressure can be easily transferred throughout the whole internal space of the first and second chambers. Accordingly, the deployment speed of the first and second chambers can be enhanced, so that safety can be improved.

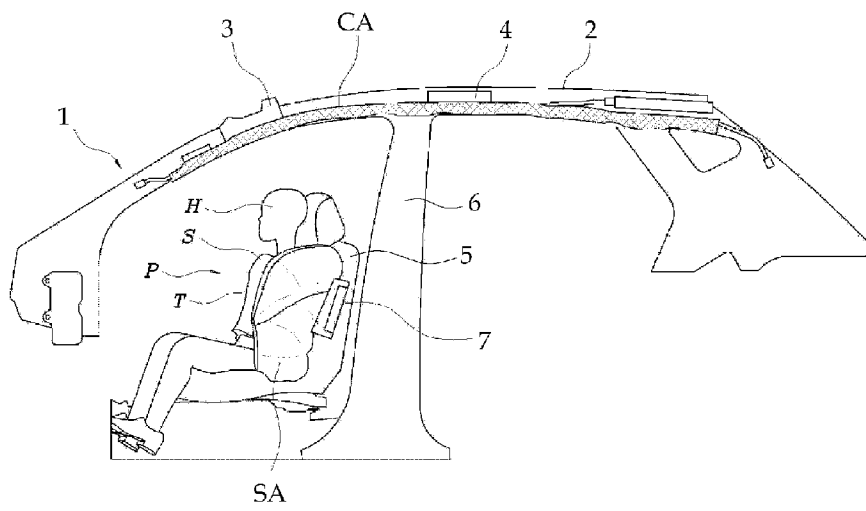
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[62]

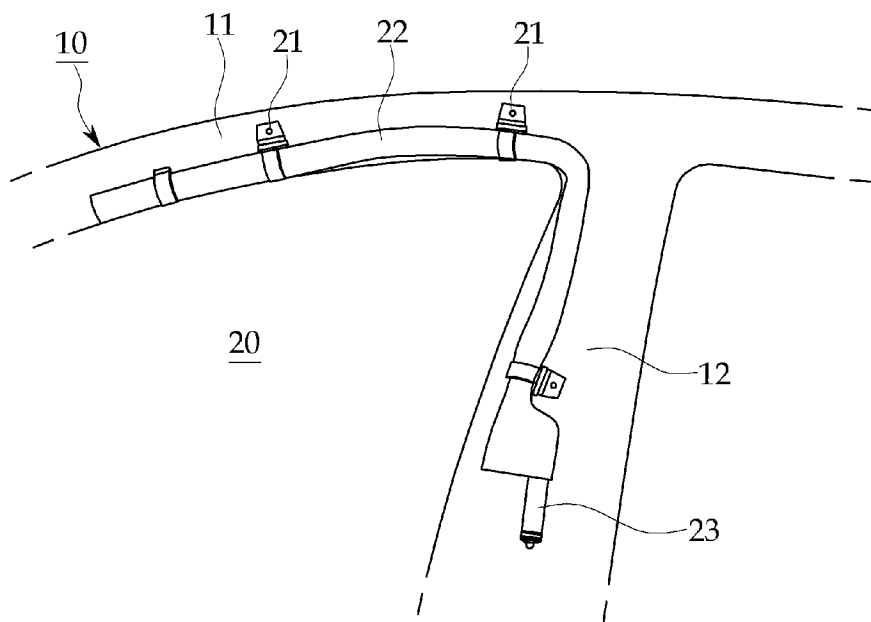
## Claims

- [Claim 1] A curtain airbag module including an airbag cushion mounted on a roof and a pillar panel of a vehicle through a cushion holder, and an inflator mounted on the pillar panel and exploded upon side collision of the vehicle to transfer gas pressure to the airbag cushion, characterized in that the airbag cushion includes:  
first and second chambers arranged in parallel to each other in a vertical direction and deployed forward from the pillar panel,  
a coupling portion integrated with the first and second chambers to couple the first and second chambers with each other, and  
a transfer member coupled with the inflator inside the coupling portion to transfer the gas pressure to the first and second chambers.
- [Claim 2] The curtain airbag module of claim 1, wherein the transfer member includes a three-directional tube having a "└" shape, and extends to internal spaces of the first and second chambers.
- [Claim 3] The curtain airbag module of claim 1 or 2, wherein the transfer member includes a material identical to materials of the first and second chambers, and has a thickness thicker than thicknesses of the first and second chambers.

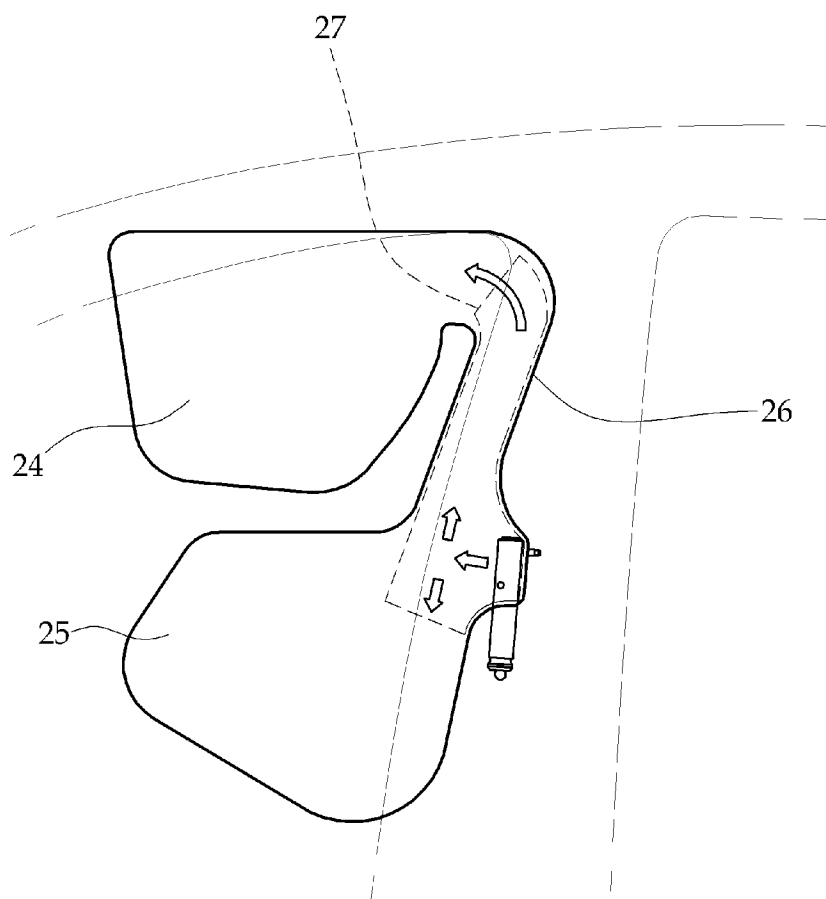
[Fig. 1]



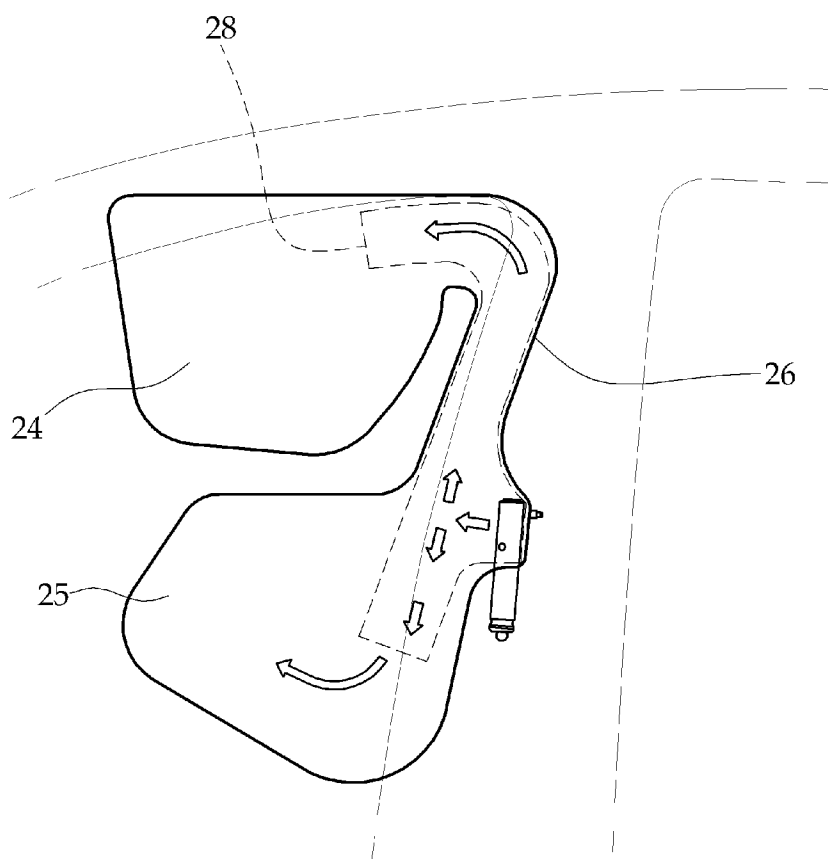
[Fig. 2]



[Fig. 3]



[Fig. 4]



## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/KR2012/000942****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 13/02; B60R 21/20; B60R 21/22

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, pillar, inflator, chamber

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                     | Relevant to claim No. |
|-----------|--------------------------------------------------------------------------------------------------------|-----------------------|
| X         | JP 2004-217213 A (MAZDA MOTOR CORP) 05 August 2004<br>See paragraphs [0022], [0028] and figures 7, 11. | 1-3                   |
| A         | JP 2006-131104 A (TAKATA CORP) 25 May 2006<br>See claim 1 and figure 1.                                | 1-3                   |
| A         | JP 2008-012995 A (TAKATA CORP) 24 January 2008<br>See paragraphs [0023] - [0030] and figure 1.         | 1-3                   |
| A         | JP 2008-120362 A (KIA MOTORS CORP) 29 May 2008<br>See claims 1 - 3 and figure 4.                       | 1-3                   |

☐ 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

29 JUNE 2012 (29.06.2012)

Date of mailing of the international search report

**29 JUNE 2012 (29.06.2012)**

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/KR2012/000942**

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