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(71) Applicant
Takata Corporation
(Incorporated in Japan)
4-30 Roppongi 1-Chome, Minato-Ku, Tokyo, Japan

(72) Inventor
Yoshikazu Nakayama

(74) Agent and/or Address for Service
Dibb Lupton Broomhead
Carlton House, 18 Albert Square, Manchester, M2 5PG,
United Kingdom

(51) INT CL⁵
B60R 21/16

(52) UK CL (Edition L)
B7B BSB

(56) Documents cited
GB 2244961 A GB 2236082 A GB 2231003 A

(58) Field of search
UK CL (Edition K) B7B BSB
INT CL⁵ B60R

(54) Air bag device

(57) An air bag device has a retainer 10, an air bag 12, a module cover 18 and an inflator 22. The retainer 10 has a flat plate portion 14 and an erected piece 16 projecting from the plate portion 14. The cover 18 has a leg 18a faced and fixed to the erected portion 16. A projection 31 is provided at the leg 18a which is engaged with an opening 32 provided at the erected piece 16 so that the module cover 18 is held at a predetermined position during a process of fixing the leg 18a to the erected piece 16 by means of rivets 20. In another embodiment, the plate 21 is provided with either a projection or an opening which engages with a corresponding opening or projection on the leg 18a of the cover 18.

FIG.1

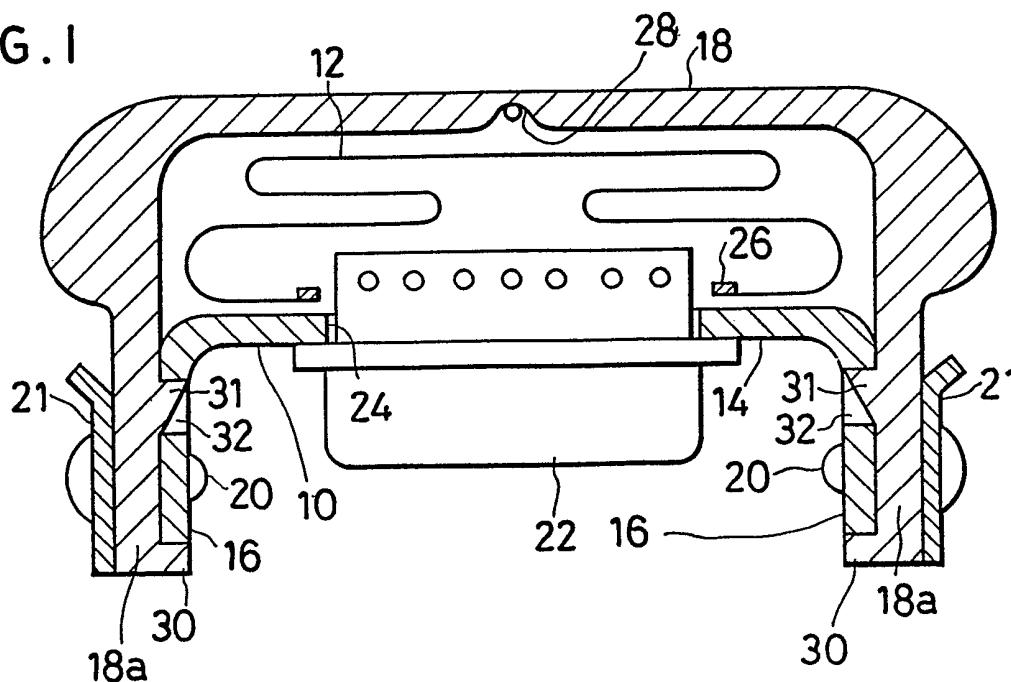


FIG. 2A

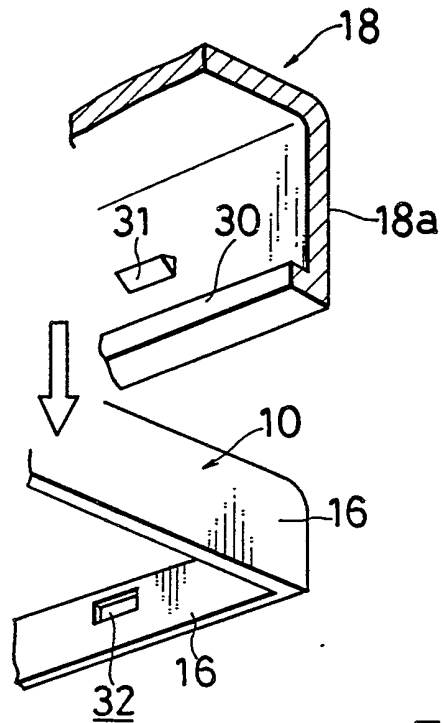


FIG. 2B

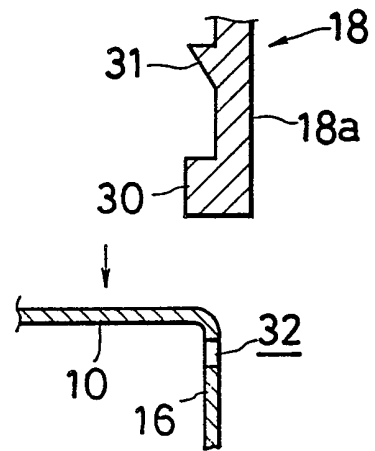


FIG. 2D

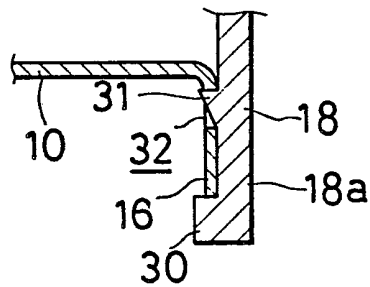


FIG. 2C

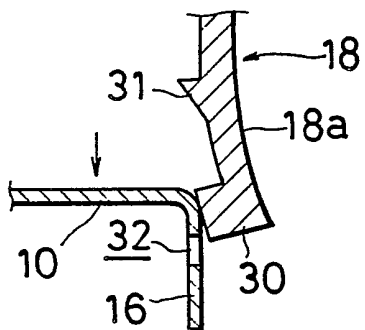


FIG. 3

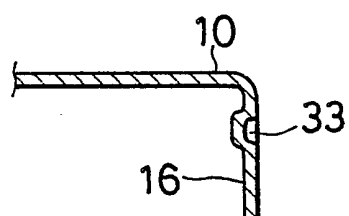


FIG. 4

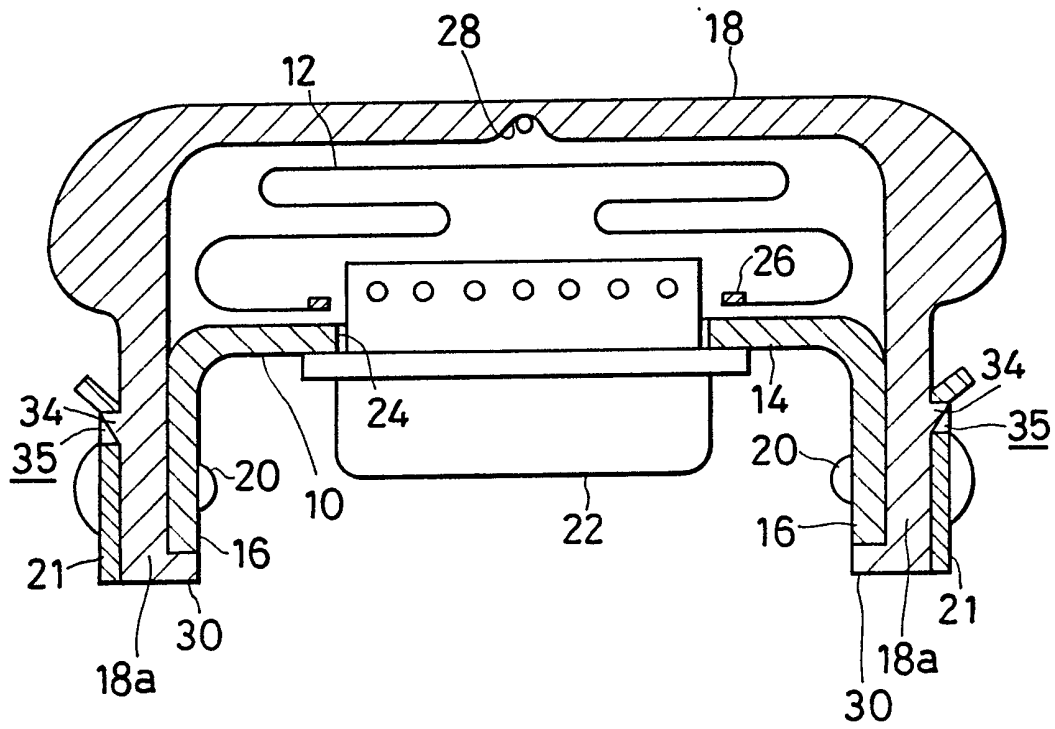


FIG. 5

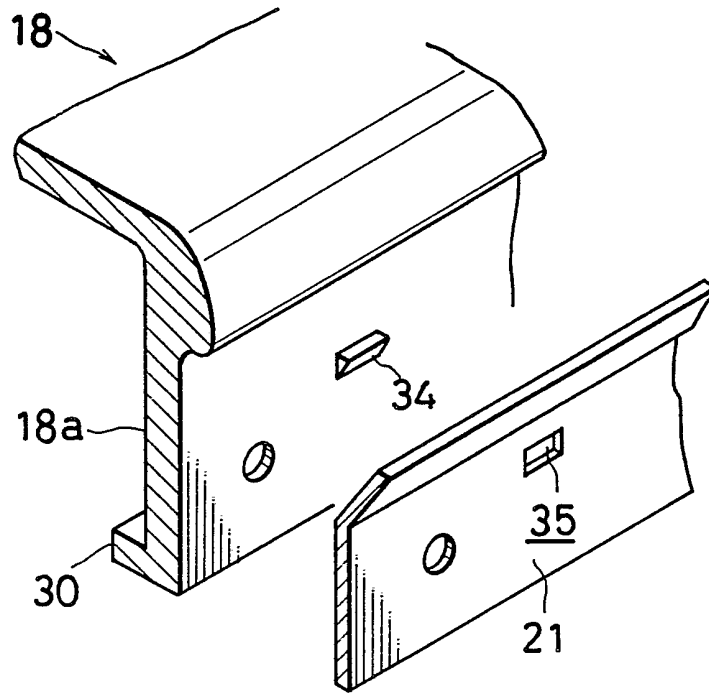


FIG. 6

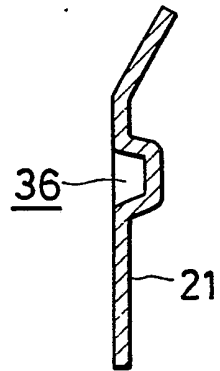


FIG. 8

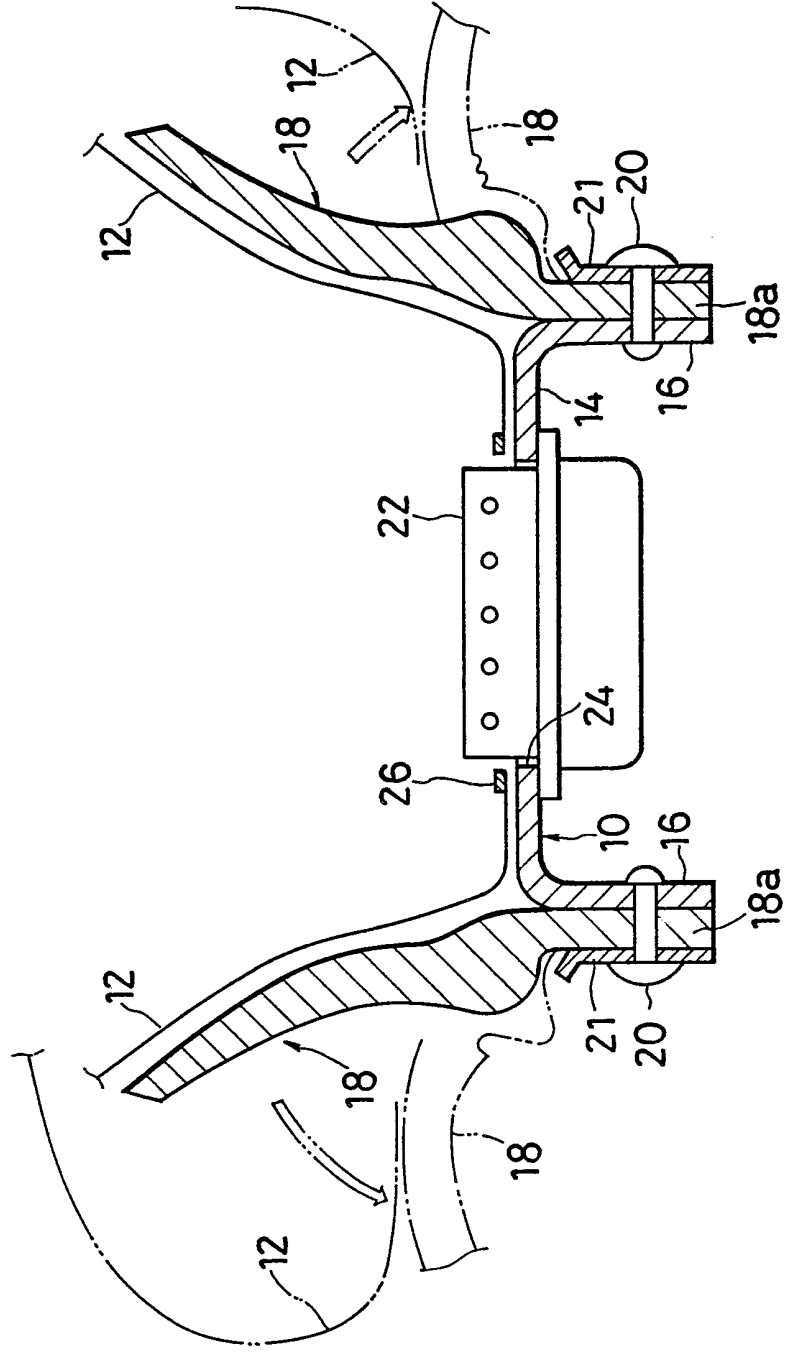


FIG. 9A

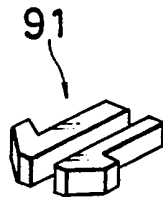


FIG. 9B

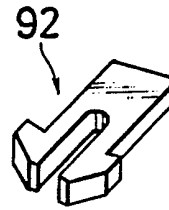


FIG. 10

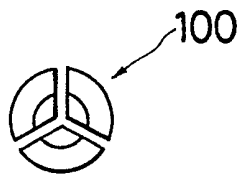


FIG. 11A

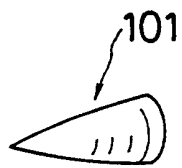


FIG. 11B

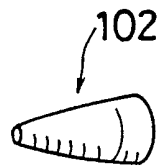


FIG. 12A

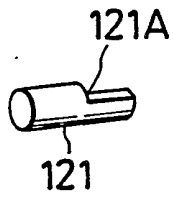


FIG. 12B

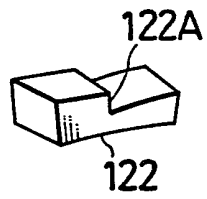


FIG. 12C

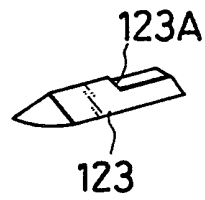


FIG. 12D

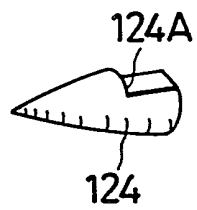


FIG. 12E

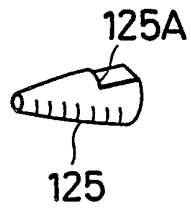


FIG. 12F

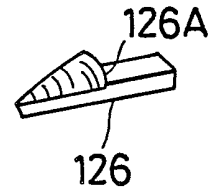


FIG. 13A

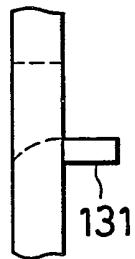


FIG. 13B

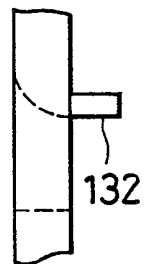


FIG. 13C

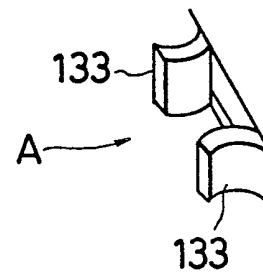


FIG. 14



FIG. 15A

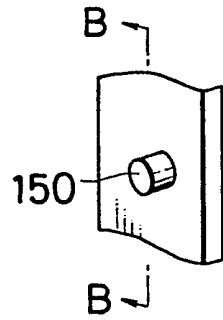
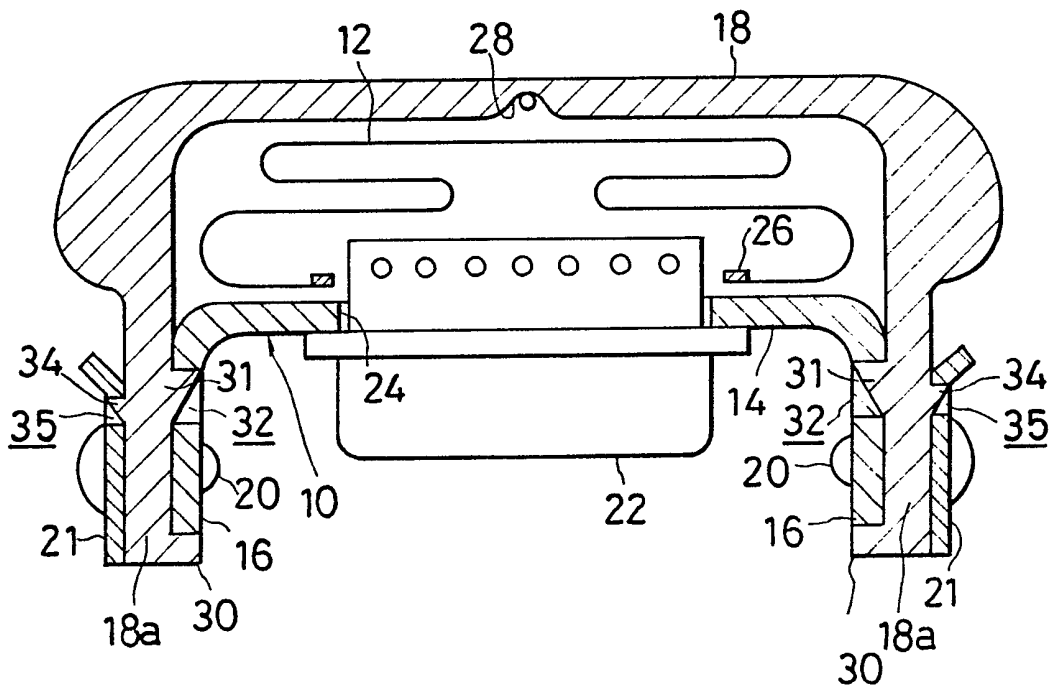


FIG. 15B



FIG. 16



AIR BAG DEVICE

FIELD OF THE INVENTION AND RELATED ART STATEMENT

The present invention relates to an air bag device adapted to develop an air bag at a crash or the like of a vehicle for protecting an occupant, and particularly to an improved air bag device which allows easy assembling of a module cover covering an air bag in an assembly process.

In an air bag device, a folded air bag is attached to a mounting plate called a "retainer", and is covered with a module cover. The module cover is similarly attached to the retainer, and is provided with a tear line (weak linear portion) at which tear starts when the air bag develops.

Further, an inflator is attached directly or through an appropriate mounting member to the retainer. The inflator is adapted to discharge a gas for rapidly developing the air bag at the crash or the like of the vehicle.

Such an air bag in the prior art will be described below with reference to Figures 7 and 8.

In Figure 7, a retainer 10 has a flat plate portion 14 to which an air bag 12 is attached, and a module cover mounting which is formed of an erected piece 16 projected oppositely to an occupant (i.e., oppositely to a mounting side of the air bag 12) from an edge of the flat plate portion 14. The air bag 12 is in a folded condition and is covered with a module cover 18. The module cover 18 has a leg 18a at a proximal side thereof, which is fixed to the above erected piece 16 by rivets 20. A numeral 22

indicates an inflator, which has an upper portion projected through an opening 24 formed in the flat plate portion 14 into the air bag 12, and is fixed to the retainer 10. A numeral 26 indicates an air bag mounting member such as a ring, which cooperates with an edge of the opening 24 in the flat plate portion 14 to pinch an open edge of the air bag 12, so as to fix the air bag 12 to the retainer 10. A numeral 28 indicates a tear line provided in the above module cover 18.

In the air bag device thus constructed, when the inflator 22 is activated due to the crash or the like of the vehicle, a large amount of gas is rapidly injected from the inflator 22 to start the development of the air bag 12. In accordance with the inflation of the air bag 12, the module cover 18 tears along the tear line 28, as shown in Figure 8, and thus, the air bag 12 rapidly develops at the interior of the vehicle to protect an occupant.

In a manufacturing process of the prior art air bag device, the air bag 12 is fixed to the retainer 10, and then is folded to have a small volume so that the folded air bag 12 is laid on the retainer 10. Then, the module cover 18 is assembled from an upper side to accommodate the air bag 12. The module cover 18 is pushed into a position in which the leg 18a of the module cover 18 overlaps the erected piece 16 of the retainer 10. In this condition, a reinforcing member 21 is laid thereon and the module cover 18 is fixed thereto by the rivets 20.

As described above, in this assembling process, after the module cover 18 is put or assembled over the air bag 12, these are sent to a riveting step in which the leg 18a is fixed by the rivets 20 while maintaining the air bag 12 in the compacted condition. However, if one leaves his or her hold of the module cover 18, the module cover 18 is pushed away and spaced from the

retainer 10 due to resiliency of the compacted air bag 12. Therefore, in the riveting step after the placing and covering step of the module cover, an operation for pushing the module cover 18 to cover the retainer 10 is required again, which causes a problem of low operation efficiency.

Further, there are such problems that the module cover may be dislocated and/or a whole volume becomes large during transferring from the folding step of the air bag to the riveting step.

In addition, it is not easy to fix the plate 21, the cover 18 and the retainer 10 with the rivets 20 since the plate 21 often gets out of position during riveting.

OBJECT AND SUMMARY OF THE INVENTION

It is an object of the invention to provide an air bag device allowing extremely easy assembly.

It is another object of the invention to provide an air bag device having a high coupling strength between a module cover and a retainer.

An air bag device of one aspect of the present invention comprises a retainer having a flat plate portion and an erected piece projecting oppositely to an occupant from the flat plate portion, a folded air bag fixed to the flat plate portion of the retainer, an inflator fixed to the flat plate portion for injecting air bag development gas, a module cover covering the air bag and having a leg which is faced and fixed to the erected piece, a fixer for fixing the leg to the erected piece, a projection projecting from the erected piece and an engaging portion provided at the erected piece, whereby the projection is engaged with the engaging portion and the module cover is

held at a predetermined position during a process of fixing the leg to the erected piece.

An air bag device of another aspect of the present invention comprises a retainer having a flat plate portion and an erected piece projecting oppositely to an occupant from the flat plate portion, a folded air bag fixed to the flat plate portion of the retainer, an inflator fixed to the flat plate portion for injecting air bag development gas, a module cover covering the air bag and having a leg which is faced and fixed to the erected piece, a plate covering the leg at an opposite side to the erected piece, a fixer for fixing the plate and the leg to the erected piece, a projection projecting from one of the leg and the plate, and an engaging portion provided at the other of the plate and the leg, whereby the projection is engaged with the engaging portion and the module cover is held at a predetermined position during a process of fixing the leg and the plate to the erected piece.

In the air bag device thus constructed of the invention, when the module cover is placed to cover the air bag after folding, the projection engages with the hollow portion or the opening, so that the module cover will not be dislocated from the retainer even if one releases his or her hold of the module cover.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a longitudinal section illustrating an embodiment of the invention;

Figures 2A, 2B, 2C and 2D are views for illustrating an assembling process thereof;

Figure 3 is a sectional view of a leg according to an another embodiment;

Figure 4 is a sectional view showing still another embodiment;

Figure 5 is a view for illustrating an assembling process of another embodiment;

Figure 6 is a sectional view of a plate according to still another embodiment;

Figure 7 is a cross section illustrating a prior art.

Figure 8 is a cross section of an air bag of a prior art when operating;

Figures 9A and 9B are perspective views of projections 91 and 92;

Figure 10 is a front view of a projection 100;

Figures 11A and 11B are perspective views of projections 101 and 102.

Figures 12A, 12B, 12C, 12D, 12E and 12F are perspective views of projections 121 to 126.

Figures 13A, 13B and 13C are side views of projections 131, 132 and 133;

Figure 14 is a perspective view of a projection 140;

Figure 15A is a perspective view of a projection 150;

Figure 15B is a sectional view taken along a B-B line in Figure 15A.

Figure 16 is a sectional view of an air bag device according to still another embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments will be described below with reference to the drawings.

Figure 1 is a longitudinal section of an air bag device according to an embodiment of the present invention, and Figures 2A, 2B, 2C and 2D are views for illustrating an assembling process thereof. In this embodiment, a module cover 18 has a leg 18a which is provided at its end with a hook 30 forming an engagement portion. This hook 30 protrudes towards an interior of the module cover 18, and is engageable with an end surface of an erected piece 16 of a retainer 10. The leg 18a has projections 31 projecting from a surface thereof which is made to contact with the erected piece 16. The erected piece 16 has openings 32 which the projections 31 are engaged therewith.

As shown in Figures 2A - 2D, when the module cover 18 is put over the retainer 10, the leg 18a elastically deforms outward, as shown in Figure 2C, and slides along the erected piece 16. The hook 30 ultimately engages with the end of the erected piece 16 and each of the projections 31 engages with the each opening 32, as shown in Figure 2D and Figure 1.

After the hook 30 engages with the end of the erected piece 16 and the projection 31 engages with the opening 32, the module cover 18 will not be dislocated from the retainer 10 even if the folded air bag 12 biases the module cover 18 upward. Therefore, in a folding step of the air bag 12, the module cover 18 which is put over the retainer 10 is not dislocated from the retainer 10 even if the module cover 18 is not yet fixed by the rivets 20. Consequently, dislocation of the

module cover 18 can be completely prevented during transfer thereof from the folding step of the air bag 12 to the riveting step, and further, the whole air bag device is transferred to the riveting step while maintaining compact configurations. In the riveting step, it is not necessary to push the module cover 18 again, and it can be set in a riveting apparatus for fastening the rivets 20 as it is, so that the riveting efficiency can be extremely increased.

In the present invention, a hollow portion 33 may be provided at the erected piece 16 as shown in Figure 3 instead of the opening 32.

Figure 4 is a sectional view for illustrating another embodiment of the invention, and Figure 5 is a view for illustrating an assembling process of a main portion of an air bag device according to this embodiment. In this embodiment, the leg 18a has projections 34 projecting from a surface thereof which is made to contact with the plate 21. Openings 35 are provided at the plate 21 which are engaged with the projections.

In this embodiment of Figures 4 and 5, riveting efficiency is extremely increased since the plate 21 is fixed by engaging each of the projection 34 with each opening 35 during riveting. As also in this embodiment, the module cover 18 is prevented to be dislocated from the retainer 10 since the leg 18a has the hook 30.

In the present invention, a hollow portion 36 may be provided at the plate 21 instead of the opening 35, as shown in Figure 6. Furthermore, a projection may be provided at the

plate 21 and an opening or a hollow portion may be provided at the leg 18a as opposed to the embodiment of Figures 4 and 5.

In the present invention, the leg 18a can have both of projections 31 and 34 as shown in Figure 16.

Although the above projections 31 and 34 have triangular pillar shape, they may have another shape such as circular column shape, quadrilateral column shape or cubic.

Figures 9 to 13 show other projections in various shape. Projections 91, 92 shown in Figures 9A to 9D have slits at a top thereof and side portions projecting sideways from the top. The side portions are brought closer each other when they are inserted into an opening, and become separated from each other after they have passed therethrough and engaged with an edge of the opening. The projection 91 has the slit elongated from the top toward the rear end thereof. The projection 92 has the slit which is elongated from the top to the middle portion thereof.

Figure 10 is a front view of a projection 100 which has, at the top thereof, three tips separated each other. Slits between the tips may elongate from the top to a rear portion or a middle portion of the projection.

Figure 11 shows a projection having a shape similar to an artillery shell.

Figure 12 is a perspective view of projections 121, 122, 123, 124, 125, 126 which have step portions 121A, 122A, 123A, 124A, 125A, 126A in a middle position in a longitudinal direction thereof. Each of the projections 121 to 126 is inserted into an opening and prevented from being withdrawn by

engagement of the step portion and an edge of the opening.

In the present invention, a projection may be formed by bending tongues as such projections 131, 132, 133 shown in Figures 13A, 13B and 13C. A projection 140 shown in Figure 14 may be applied, which is bent out through a pair of parallel slits. A projection 150 shown in Figure 15A may also be applied, which is stamped out from a plane leg. Figure 15B is a sectional view taken along a B-B line in Figure 15A.

According to the air bag device of the invention, as described hereinabove, since the module cover is temporarily fixed to the retainer in the assembling process thereof, the assembling work of the air bag device can be extremely facilitated, and thus the assembling work efficiency can be remarkably improved. Further, the engagement of the module cover with the retainer increases the coupling strength between the module cover and the retainer in the tearing operation of the module cover when the air bag device is activated.

WHAT IS CLAIMED IS:

1. An air bag device for protecting an occupant comprising:
a retainer having a flat plate portion and an erected piece projecting oppositely to an occupant from the flat plate portion,
a folded air bag fixed to said flat plate portion of said retainer,
an inflator fixed to said flat plate portion for injecting air bag development gas,
a module cover covering said air bag and having a leg which is faced and fixed to said erected piece,
a fixer for fixing said leg to said erected piece,
a projection projecting from said erected piece; and
an engaging portion provided at said erected piece,
whereby said projection is engaged with said engaging portion and the module cover is held at a predetermined position during a process of fixing said leg to said erected piece.

2. An air bag device for protecting an occupant comprising:
a retainer having a flat plate portion and an erected piece projecting oppositely to an occupant from the flat plate portion,

a folded air bag fixed to said flat plate portion of said retainer,

an inflator fixed to said flat plate portion for injecting air bag development gas,

a module cover covering said air bag and having a leg which is faced and fixed to said erected piece,

a plate covering said leg at an opposite side to said erected piece,

a fixer for fixing said plate and said leg to said erected piece,

a projection projecting from one of said leg and said plate; and

an engaging portion provided at the other of said plate and said leg,

whereby said projection is engaged with said engaging portion and the module cover is held at a predetermined position during a process of fixing said leg and said plate to said erected piece.

3. An air bag device as set forth in claim 1, wherein said device further comprises a hook at an end of said leg, said hook being engaged with an end of said erected piece.

4. An air bag device as set forth in claim 2, wherein said device further comprises a hook at an end of said leg, said hook being engaged with an end of said erected piece.

5. An air bag device as set forth in claim 1, wherein said engaging portion is a hollow portion.

6. An air bag device as set forth in claim 1, wherein said engaging portion is an opening.

7. An air bag device as set forth in claim 2, wherein said engaging portion is a hollow portion.
8. An air bag device as set forth in claim 2, wherein said engaging portion is an opening.
9. An air bag device for protecting an occupant comprising: a retainer having a flat plate portion and an erected piece projecting oppositely to an occupant from the flat plate portion,
a folded air bag fixed to said flat plate portion of said retainer,
an inflator fixed to said flat plate portion for injecting air bag development gas,
a module cover covering said air bag and having a leg which faces and is fixed to said erected piece,
a fixer for fixing said leg to said erected piece,
a projection projecting from at least one of said erected piece or said leg; and an engaging portion provided at the other of said at least one erected piece or said leg, whereby said projection is engaged with said engaging portion and the module cover is held at a predetermined position during a process of fixing said leg to said erected piece.
10. An air bag device substantially as hereinbefore described with reference to the accompanying description and any of Figures 1; 2; 3; 4; 5; 6; 9; 10; 11; 12; 13; 14; 15; or 16.

- 13 -

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number

GB 9222317.1

Relevant Technical fields

(i) UK Cl (Edition K) B7B (BSB)

(ii) Int Cl (Edition 5) B60R

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

PHIL THORPE

Date of Search

15 DECEMBER 1992

Documents considered relevant following a search in respect of claims 1, 3, 5, 6, 9, 10

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
P, X	GB 2244961 A (TAKATA) see page 5 line 12 - page 6 line 4	1, 6, 9
Y	GB 2236082 A (TAKATA) see whole document	1, 3, 5, 6, 9
Y	GB 2231003 A (TAKATA) see particularly Figure 6	1, 3, 5, 6, 9

Category	Identity of document and relevant passages	Relevant to claim(s).

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).