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International Bureau

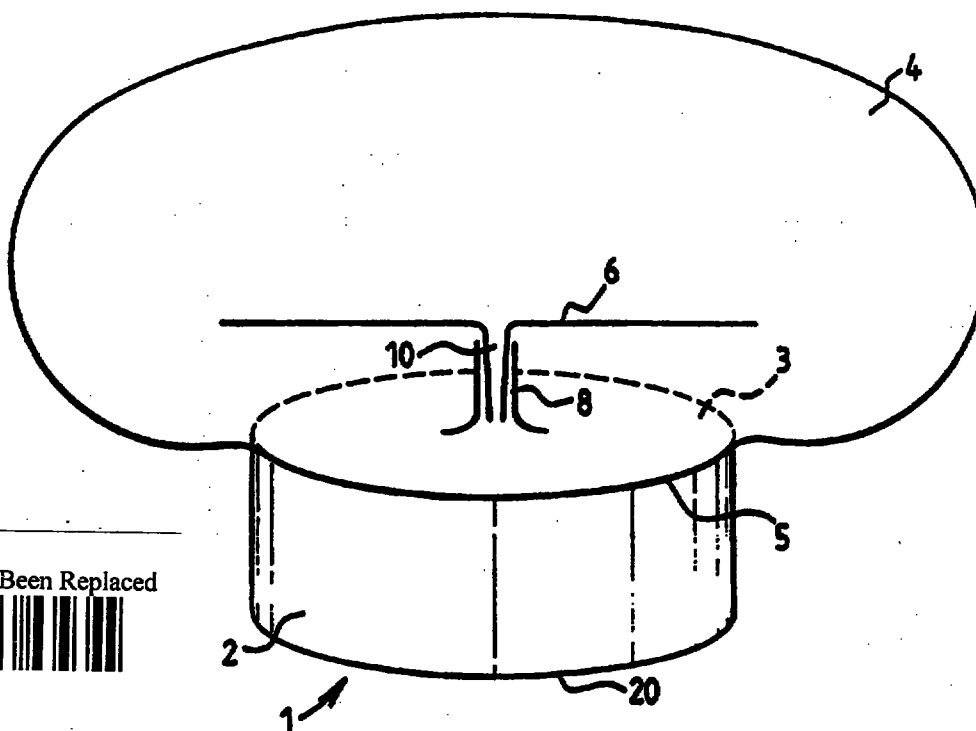


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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B60R 21/26		A1	(11) International Publication Number: WO 96/17753
			(43) International Publication Date: 13 June 1996 (13.06.96)
(21) International Application Number: PCT/SG95/00011		(81) Designated States: AL, AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, <u>SG</u> /SI, SK, TJ, TM, TT, UA, UG, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, LS, MW, SD, SZ, UG).	
(22) International Filing Date: 8 December 1995 (08.12.95)			
(30) Priority Data: 351,939 / 8 December 1994 (08.12.94) / US 9500230.9 / 6 January 1995 (06.01.95) / GB			
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(54) Title: AIR BAG SAFETY DEVICE



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(57) Abstract

A safety device for a body on or in a vehicle comprises an inflatable cushioning means (4) and a trigger device for causing the cushioning means (4) to inflate. The trigger device is activated by proximity of the body to be protected. The trigger device comprises a trigger plate (6) activated by bodily impact. The trigger plate (6) has a hollow needle (10) for puncturing the gas canister.

AIR BAG SAFETY DEVICE

The present invention relates to a device for protecting drivers or passengers of vehicles from injury in the event of an accident.

The most common means for protection against injuries in motor vehicles is a seat-belt. However, during a crash the body concerned undergoes violent movement as it is restrained by the belt. Injuries can still result from the belt itself and from sharp acceleration and deceleration experienced by the human frame. Moreover, the driver is not protected if inward deformation of the car's superstructure is caused by the impact of, for example, another vehicle. Typically, such deformation might be caused by a side impact, or a frontal collision. To exacerbate matters, in the event of a frontal collision, the steering column can be pushed into the cabin with the mass of the engine behind it.

A number of elaborate systems have been proposed for cushioning drivers or passengers against the forces and objects which cause injuries as a result of collisions. However, these are complicated, expensive to manufacture, and in at least one case, preferably should be built into the car when it was manufactured. Often, these devices employ an inertia-activated component which can limit the range of appropriate location for these devices, because different forces will be experienced in different locations in the vehicle.

In particular, there have been proposals for inflatable bags to be activated in the event of an impact. They generally have to be pre-fitted during assembly of the vehicle and normally require the internal structure of the vehicle, such as the facia or steering wheel for example, to be specially designed to accommodate them.

REPLACED SHEETS SG

- ☒ Description : paged1... to paged7.....
☒ Claim(s) : paged8..... to paged9.....
☐ Drawing(s) : paged to paged
☒ Abstract : paged to paged

SUBSTITUTE SHEET (RULE 26)

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The present invention sets out to provide a novel safety device for a vehicle which can afford useful protection during accidents, is relatively inexpensive to manufacture and can easily be installed in all kinds of motor vehicle, even after manufacture of the vehicle.

According to the invention there is provided a safety device for protecting a body on or in a vehicle, the safety device comprising an inflatable cushioning means, and a trigger device for causing the cushioning means to inflate, wherein the trigger device is adapted to be activated by proximity of a body which the safety device is intended to protect.

When a collision occurs, the momentum of the body causes it to move relative to the trigger device, which is secured directly or indirectly to the vehicle, and thus to activate the trigger device, which causes the cushioning means to inflate. Thus, the invention provides a simple means for protecting a body in the event of a collision. Due to its simplicity, the device can be fitted in any appropriate place within a vehicle, because it is not dependent on the inertia of the vehicle itself, but rather on relative movement between the device and the body, and will not fail to operate or be accidentally triggered by installation in an inappropriate position. This means that the device can be fitted in the side of the vehicle to protect against side impacts and in the rear to reduce the possibility of whiplash, for example.

Alternatively, the trigger device may comprise a plate which is adapted to be activated when struck by a body which the safety device is intended to protect.

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Further preferred features of the invention are set out in the appended claims.

In one particularly preferred embodiment, the cushioning means is a gas-tight bag which comprises an opening, the opening being sealed by part of a gas canister; wherein a trigger plate is provided inside the bag and a hollow needle attached to the trigger plate faces a surface of the gas canister which communicates with the interior of the bag; the arrangement being such that impact upon the plate causes the plate to push the needle through the said surface of the gas canister which it faces, thereby releasing a body of pressurised gas from within the gas canister, which body of gas expands to fill the air-bag.

Preferably, the needle extends perpendicularly from a rear face of the trigger plate. Resilient means may be provided between the rear of the plate and a surface of the canister faced by the rear face of the plate. This has the effect of controlling the amount of pressure required to pierce the canister with the needle. In one particularly preferred embodiment, the resilient means is a helical spring, which concentrically encircles the needle. The needle may be located within a cylinder which extends perpendicularly from a surface of the gas canister. The cylinder can provide lateral support for the needle and, if located concentrically within the helical spring, provide lateral support for the helical spring.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:-

Figure 1 is a schematic view of a safety device in accordance with the invention;

Figure 2 is a view of the gas canister of the safety device of Figure 1;





Figure 3 is a detailed view of the connection between the trigger plate of the safety device of Figure 1 and the gas canister of the safety device in Figure 1;

Figures 4, 5 and 6 are a sequence of views of the safety device of Figure 1 in position in a motor vehicle and showing the condition of the safety device at successive stages during the course of a collision;

Figure 7 is a schematic view of a motor vehicle showing alternative positions for a safety device in accordance with the invention; and

Figure 8 is a partially cut-away perspective view of a motor vehicle incorporating two safety devices as shown in figure 7 following a collision.

As shown in Figure 1, an embodiment of the safety device comprises a cylindrical gas canister 2 with an upstanding cylindrical nozzle 8 projecting perpendicularly from one end face 7. Use of a canister of this particular shape is not absolutely required, any other appropriate shape might be used instead. An air-bag 4 comprising an aperture 3 is sealed around one edge 5 of the face 7 of the gas canister 2 by the perimeter of the aperture. The nozzle 8, therefore, extends directly into the air-tight volume of the bag 4.

The canister 2 is charged with compressed gaseous carbon dioxide. However, it could alternatively be charged with a volatile propellant or even a small explosive device, since a large volume of gas is normally released as a result of a chemical explosion.

A trigger plate 6 is located inside the bag 4 and is arranged generally parallel to the face 7 of the canister 2 from which the nozzle 8 projects. The trigger plate 6 comprises a hollow needle 10 which projects generally perpendicularly from the back face of the plate 6 towards the end face 7 of the cylinder. The hollow needle 10 opens



out into the front face of the plate 6, so as to define a flow path from the tip of the needle 10, along the length of the needle 10 and out through the front face of the trigger plate 6. The needle 10 is situated within the nozzle 8 and is capable of reciprocating axial movement within the nozzle 8. The degree of movement is controlled by a co-axial helical spring 12, which surrounds both the nozzle 8 and the needle 10 (see, in particular, Figure 3), and acts against the rear face of the trigger plate 6 and the face 7 of the canister.

Although the nozzle 8 is hollow, the junction between the base of the nozzle 8 and the face of the gas canister is sealed by a seal 9. The seal is, in this case, made from thin metal and is adapted to be punctured by the needle 10. The seal may alternatively be made from a plastics material or be in the form of a solid door, which is pushed open by the needle 10.

During manufacture, the air-bag 4 is evacuated and folded around the sides of the gas canister, so as to form a compact unit.

An adhesive layer 20 is provided on the base end face of the gas canister 2, opposite to the face 7 upon which the nozzle 8 is provided.

In use, the safety device is fixed in position by means of the adhesive 20, with the trigger plate 6 facing towards the body which is to be protected.

In the event of an accident in which a person is thrown towards the safety device, the person strikes the trigger plate 6, compressing the helical spring 12 and forcing the needle 10 to pierce the seal 9. The compressed carbon dioxide is released from inside the gas canister 2 via the hollow core of the needle 10 and evacuates via the front face of the trigger plate 6 into the air-bag 4. The expanding gas rapidly fills the air-bag 4, so as to provide a cushion. Because the air bag is folded around the trigger plate, the

impact of the body upon the trigger plate is cushioned. The cushioning effect is enhanced by the presence of the helical spring 12, which further absorbs the impact of the body.

Actuation of the device will now be described in relation to a front collision. It is to be understood, however, that the device is also effective if installed to offer protection against injury from impact from other directions.

Whenever the driver encounters any risk of collision, he applies the brake. If the braking is severe, the body will be thrown forward. This impact will activate the device, which will then inflate the bag in the manner set out above. When the vehicle actually collides with the object of concern, the body can receive a further impact, which is usually more severe than the first. This impact is, however, cushioned by the air bag which was caused to inflate as a result of the first impact. The air bag will also cushion against any further, subsequent impacts, such as, for example, after the vehicle has crashed and the dashboard connects with the oncoming object. As a result, the person's injuries are limited. This sequence of events is shown in Figures 4, 5 and 6.

The safety device is not intended only for location upon the dashboard of a motor car. It may be located wherever a person or an article is to be protected from an impact. Figures 7 and 8 show examples of alternative positions for the safety device. These are at the rear of a vehicle, to protect against rear impact, and in the side of a vehicle, to protect against side impact. Of course, the safety device is not intended to be used only in motor cars. Any vehicle or vessel in which an impact might occur can employ such a device. In particular, the device can be used in aeroplanes, boats, minibuses, trains or trams etc.

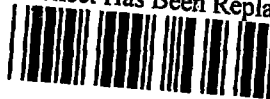
The trigger plate may be replaced by a proximity switch, which activates the gas generation when the body reaches a certain point.

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Many further modifications and variations will suggest themselves to those versed in the art upon making reference to the foregoing illustrative embodiment, which is given by way of example only and which is not intended to limit the scope of the invention, which is determined by the appended claims.

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**CLAIMS**

1. A safety device for protecting a body on or in a vehicle, the safety device comprising an inflatable cushioning means and a trigger device for causing the cushioning means to inflate, wherein the trigger device is adapted to be activated by proximity of a body which the safety device is intended to protect.
2. A safety device for protecting a body on or in a vehicle, the safety device comprising an inflatable cushioning means and a trigger device for causing the cushioning means to inflate, wherein the trigger device comprises a plate which is adapted to be activated when struck by a body which the safety device is intended to protect.
3. A safety device according to claim 1 or 2, wherein the trigger device is provided with means for releasing a body of gas for inflating the cushioning means to cushion the body that the device is intended to protect.
4. A safety device according to claim 3, wherein the trigger device comprises a gas canister and a needle for puncturing the gas canister to release the gas into the cushioning means.
5. A safety device according to claim 4, wherein the needle comprises an axial bore for allowing gas to escape.
6. A safety device according to any preceding claim wherein the cushioning means is a gas-tight bag.
7. A safety device according to claim 6 and claim 4 or 5, wherein the bag comprises an opening, which opening is sealed by a wall of the gas canister.



8. A safety device according to claim 7, wherein the trigger device is located inside the bag and can access the gas canister via the opening.
9. A safety device according to claim 4 or any claim dependent thereon, wherein the canister comprises a nozzle and the needle is located coaxially within the nozzle in such a manner as to be capable of reciprocal movement therein.
10. A safety device according to claim 9, wherein resilient means are provided for resisting axial insertion of the needle into the nozzle.
11. A safety device according to claim 10 wherein the resilient means is a helical spring located coaxially about the needle.
12. A safety device according to claim 4 or any claim dependent thereon, wherein the gas canister is provided with a layer of adhesive on one surface thereof for mounting the safety device in position.

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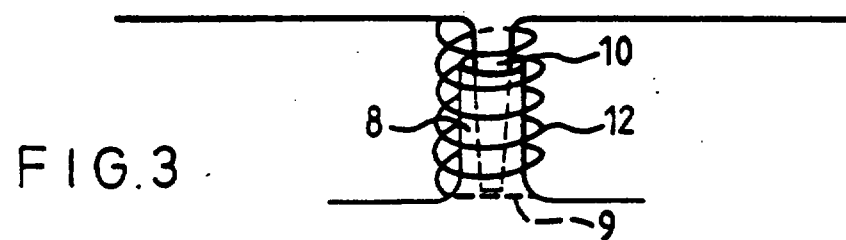
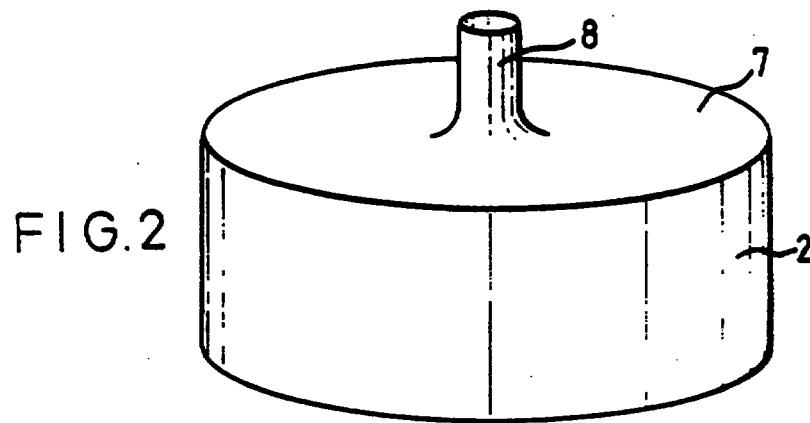
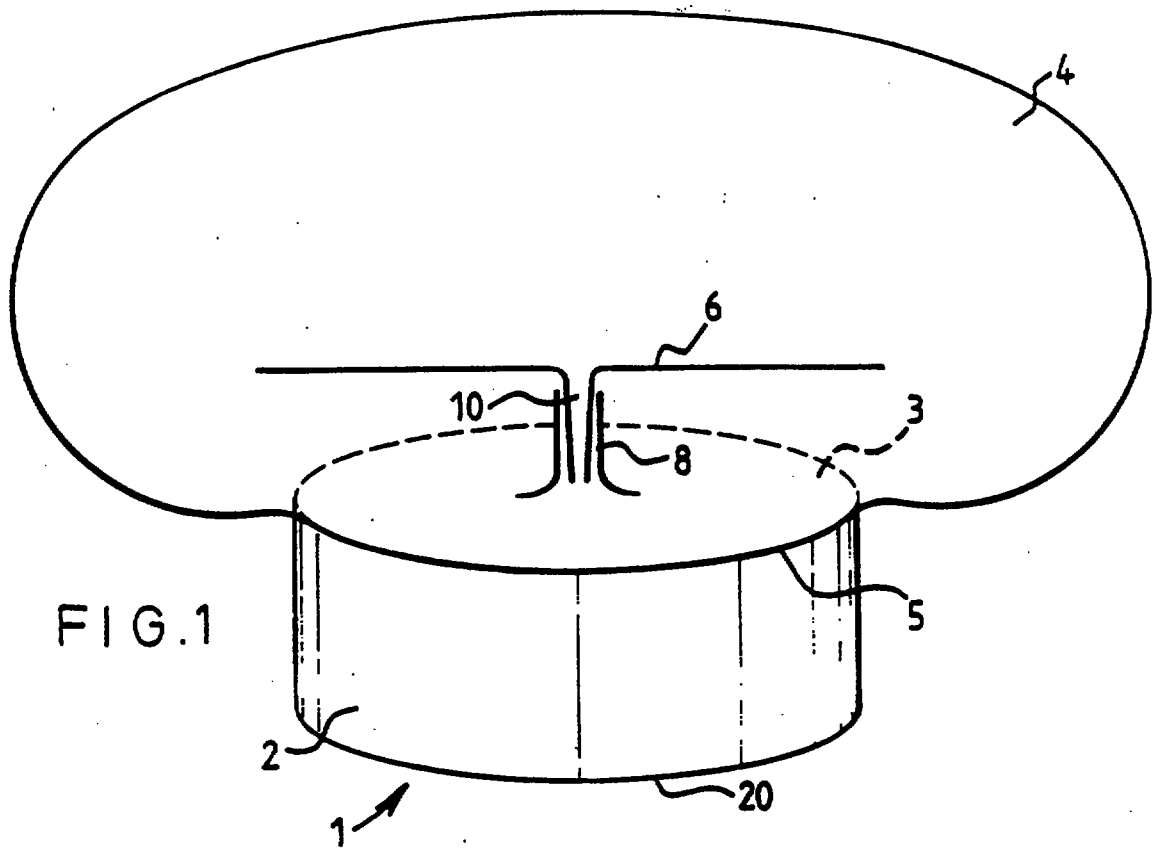


FIG.4

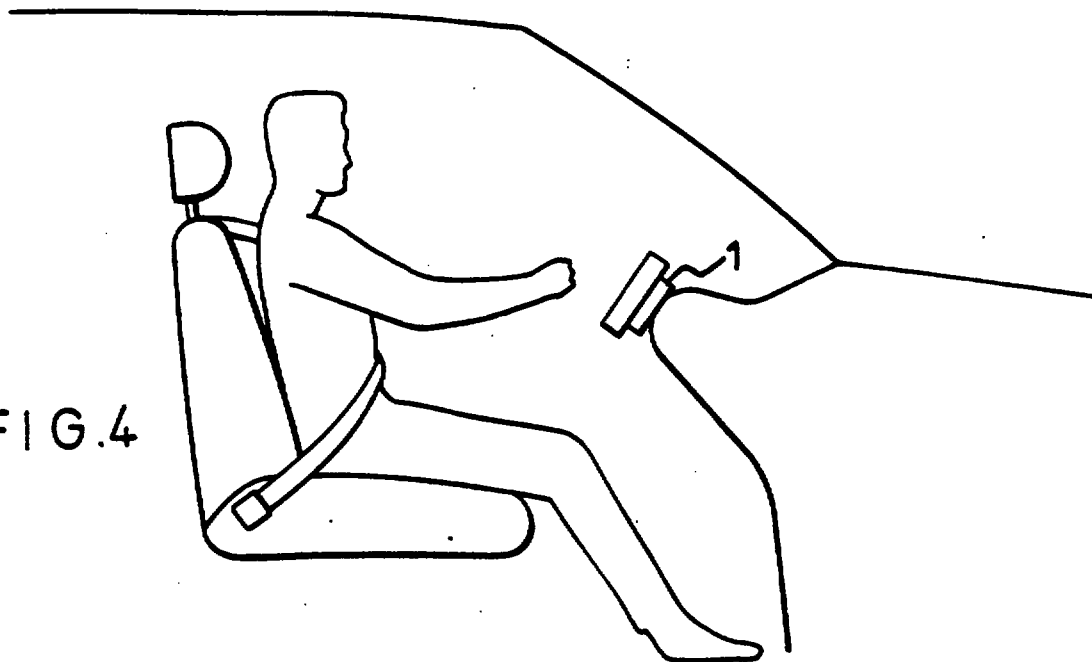
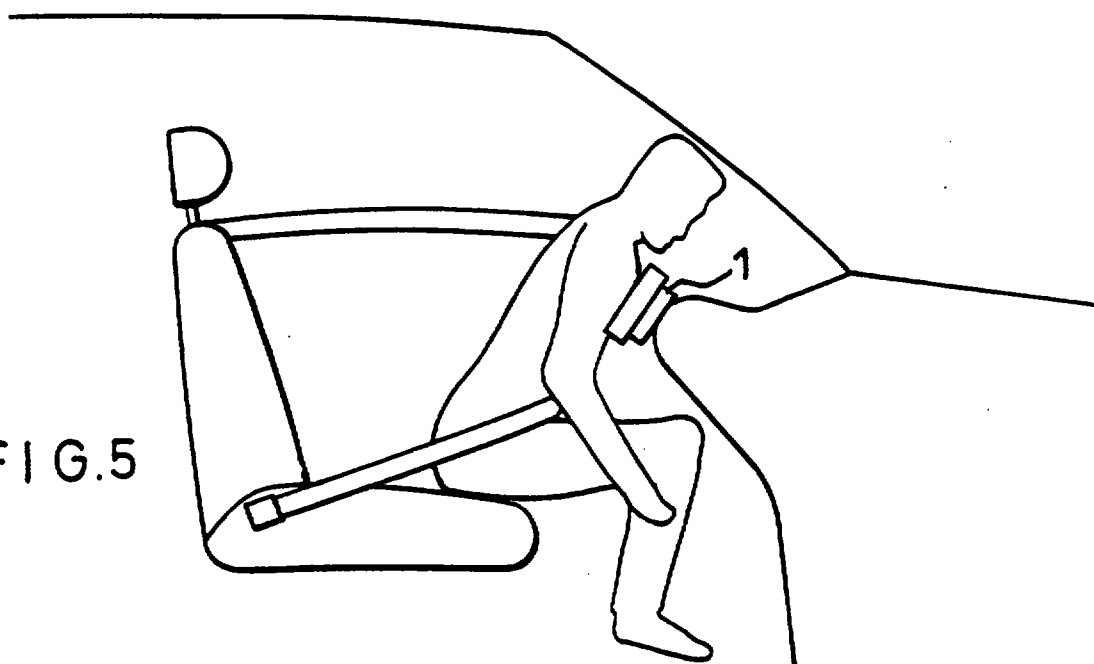


FIG.5



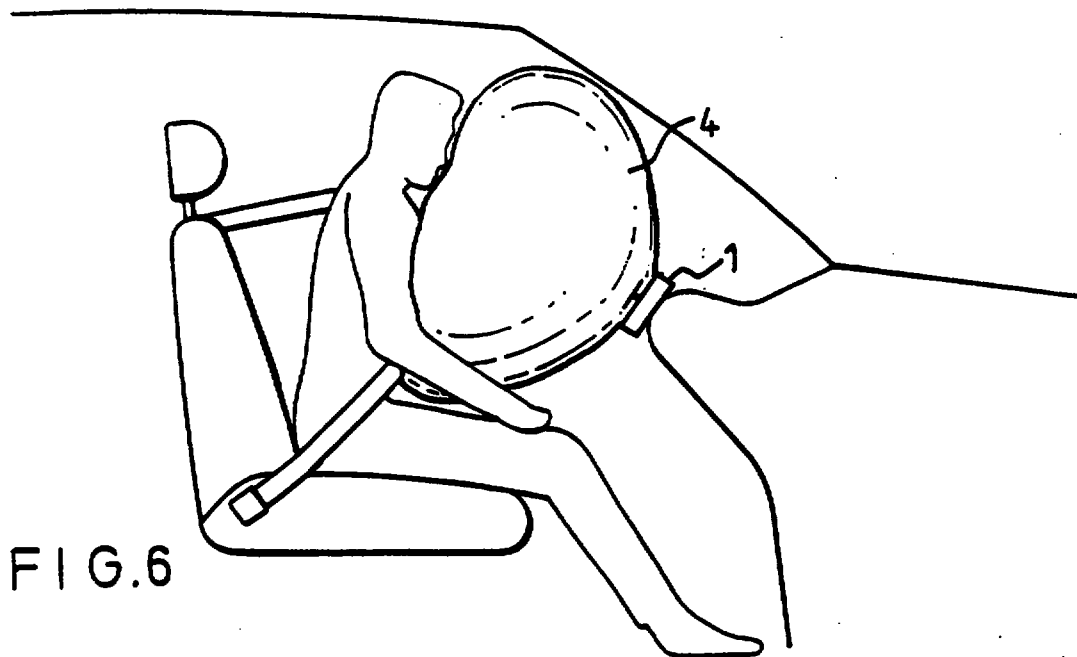


FIG. 6

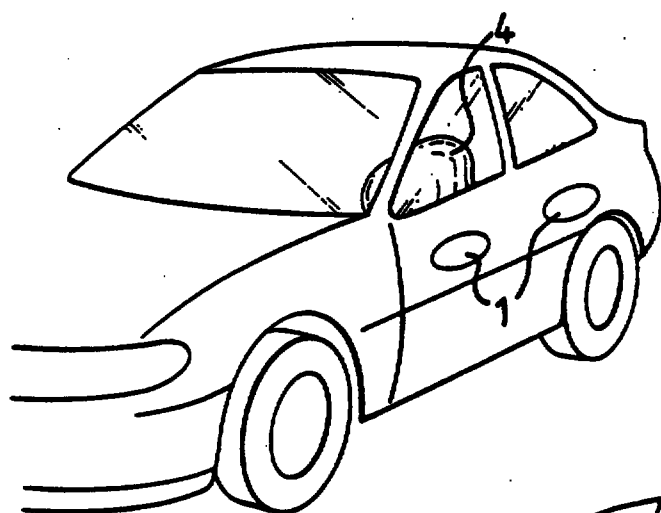


FIG. 7

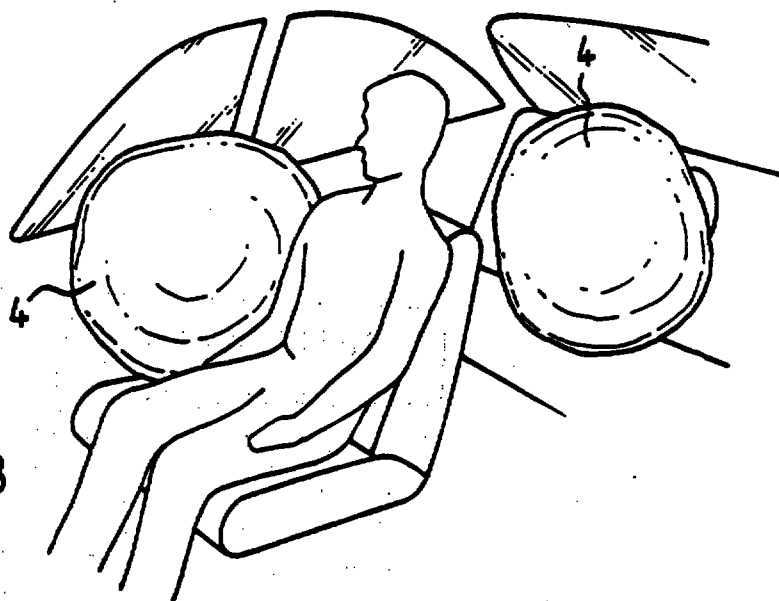


FIG. 8

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Applicant's or agent's file reference LAM/RJS/95-04738-6	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International application No. PCT/SG95/00011 ✓	International filing date 8 December 1995 ✓	Priority Date 8 December 1994 ✓
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁶ B60R 21/26		
Applicant SOH Ah Yew ✓		

1.	This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.																
2.	This REPORT consists of a total of 6 sheets, including this cover sheet. ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of 8 sheet(s).																
3.	This report contains indications relating to the following items: <table border="0"> <tr> <td>I</td> <td>☒ Basis of the report</td> </tr> <tr> <td>II</td> <td>☐ Priority</td> </tr> <tr> <td>III</td> <td>☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td>IV</td> <td>☒ Lack of unity of invention</td> </tr> <tr> <td>V</td> <td>☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td>VI</td> <td>☐ Certain documents cited</td> </tr> <tr> <td>VII</td> <td>☒ Certain defects in the international application</td> </tr> <tr> <td>VIII</td> <td>☒ Certain observations on the international application</td> </tr> </table>	I	☒ Basis of the report	II	☐ Priority	III	☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	IV	☒ Lack of unity of invention	V	☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	VI	☐ Certain documents cited	VII	☒ Certain defects in the international application	VIII	☒ Certain observations on the international application
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VII	☒ Certain defects in the international application																
VIII	☒ Certain observations on the international application																

Date of submission of the demand 3 July 1996	Date of completion of the report 16 April 1997
Name and mailing address of the IPEA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. (06) 285 3929	Authorized Officer JAGDISH BOKIL Telephone No. (06) 283 2371

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

☐ the international application as originally filed.

☒ the description, pages , as originally filed,
 pages , filed with the demand,
 pages 1-6, filed with the letter of 28 February 1997,

☒ the claims, Nos. , as originally filed,
 Nos. , as amended under Article 19,
 Nos. , filed with the demand,
 Nos. 1-14, filed with the letter of 28 February 1997,

☒ the drawings, sheets 1-3, as originally filed,
 sheets/fig , filed with the demand,
 sheets/fig , filed with the letter of ,

2. The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/fig

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☒ complied with.
- ☐ not complied with for the following reasons:

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-13	YES
	Claims	NO
Inventive step (IS)	Claims 1-13	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-13	YES
	Claims	NO

2. Citations and explanations

None of the international search report citations suggests or discloses a safety device comprising an inflatable cushioning means with a trigger device adapted to be activated when struck by a body which is intended to be protected as claimed.

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claim 14 fails to comply with Rule 6.2 (a) of the PCT in that it relies on references to the description and drawings.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 13 lacks clarity in that it is simultaneously appended to more than one claim.

SAFETY DEVICE

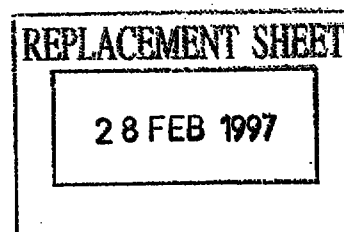
The present invention relates to a device for protecting drivers or passengers of vehicles from injury in the event of an accident.

The most common means for protection against injuries in motor vehicles is a seat-belt. However, during a crash the body concerned undergoes violent movement as it is restrained by the belt. Injuries can still result from the belt itself and from sharp acceleration and deceleration experienced by the human frame. Moreover, the driver is not protected if inward deformation of the car's superstructure is caused by the impact of, for example, another vehicle. Typically, such deformation might be caused by a side impact, or a frontal collision. To exacerbate matters, in the event of a frontal collision, the steering column can be pushed into the cabin with the mass of the engine behind it.

A number of elaborate systems have been proposed for cushioning drivers or passengers against the forces and objects which cause injuries as a result of collisions. However, these are complicated, expensive to manufacture, and in least one case, preferably should be built into the car when it was manufactured. Often, these devices employ an inertia-activated component which can limit the range of appropriate location for these devices, because different forces will be experienced in different locations in the vehicle.

In particular, there have been proposals for inflatable bags to be activated in the event of an impact. They generally have to be pre-fitted during assembly of the vehicle and normally require the internal structure of the vehicle, such as the facia or steering wheel for example, to be specially designed to accommodate them.

AMENDED SHEET
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The present invention sets out to provide a novel safety device for a vehicle which can afford useful protection during accidents, is relatively inexpensive to manufacture and can easily be installed in all kinds of motor vehicle, even after manufacture of the vehicle.

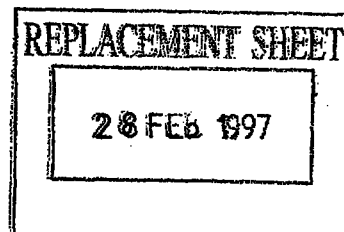
According to the invention there is provided a safety device for protecting a body on or in a vehicle, the safety device comprising an inflatable cushioning means, and a trigger device for causing the cushioning means to inflate, wherein the trigger device is adapted to be activated when struck by a body which the safety device is intended to protect.

When a collision occurs, the momentum of the body causes it to move relative to the trigger device and strike the plate which causes the cushioning means to inflate. Thus, the invention provides a simple means for protecting a body in the event of a collision. Due to its simplicity, the device can be fitted in any appropriate place within a vehicle, because it is not dependent on the inertia of the vehicle itself, but rather on relative movement between the device and the body, and will not fail to operate or be accidentally triggered by installation in an inappropriate position. This means that the device can be fitted in the side of the vehicle to protect against side impacts and in the rear to reduce the possibility of whiplash, for example.

Further preferred features of the invention are set out in the appended claims.

In one particularly preferred embodiment, the cushioning means is a gas-tight bag which comprises an opening, the opening being sealed by part of a gas canister; wherein a trigger plate is provided inside the bag and a hollow needle attached to the trigger plate faces a surface of the gas canister which communicates with the interior of the bag; the arrangement being such that impact upon the plate causes the plate to push the needle through the said surface of the gas canister which it faces, thereby releasing a body of pressurised gas from within the gas canister, which body of gas expands to fill the air-bag.

AMENDED SHEET
IPEA/AU



Preferably, the needle extends perpendicularly from a rear face of the trigger plate. Resilient means may be provided between the rear of the plate and a surface of the canister faced by the rear face of the plate. This has the effect of controlling the amount of pressure required to pierce the canister with the needle. In one particularly preferred embodiment, the resilient means is a helical spring, which concentrically encircles the needle. The needle may be located within a cylinder which extends perpendicularly from a surface of the gas canister. The cylinder can provide lateral support for the needle and, if located concentrically within the helical spring, provide lateral support for the helical spring.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a schematic view of a safety device constructed in accordance with an embodiment of the invention;

Figure 2 is a view of the gas canister of the safety device of Figure 1;

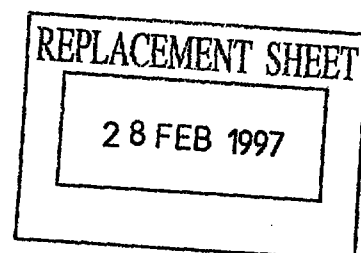
Figure 3 is a detailed view of the connection between the trigger plate of the safety device of Figure 1 and the gas canister of the safety device in Figure 1;

Figures 4, 5 and 6 are a sequence of views of the safety device of Figure 1 in position in a motor vehicle and showing the condition of the safety device at successive stages during the course of a collision;

Figure 7 is a schematic view of a motor vehicle showing alternative positions for a safety device in accordance with the invention; and

Figure 8 is a partially cut-away perspective view of a motor vehicle incorporating two safety devices as shown in Figure 7 following a collision.

AMENDED SHEET
IPEA/AU



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As shown in Figure 1, an embodiment of the safety device comprises a cylindrical gas canister 2 with an upstanding cylindrical nozzle 8 projecting perpendicularly from one end face 7. Use of a canister of this particular shape is not absolutely required. Any other appropriate shape might be used instead. An air-bag 4 comprising an aperture 3 is sealed around one edge 5 of the face 7 of the gas canister 2 by the perimeter of the aperture. The nozzle 8, therefore, extends directly into the air-tight volume of the bag 4.

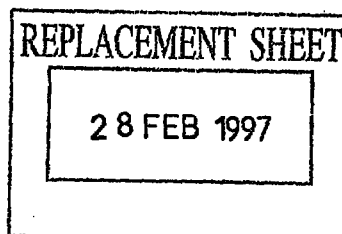
The canister 2 is charged with compressed gaseous carbon dioxide. However, it could alternatively be charged with a volatile propellant or even a small explosive device, since a large volume of gas is normally released as a result of a chemical explosion.

A trigger plate 6 is located inside the bag 4 and is arranged generally parallel to the face 7 of the canister 2 from which the nozzle 8 projects. The trigger plate 6 comprises a hollow needle 10 which projects generally perpendicularly from the back face of the plate 6 towards the end face 7 of the cylinder. The hollow needle 10 opens out into the front face of the plate 6, so as to define a flow path from the tip of the needle 10, along the length of the needle 10 and out through the front face of the trigger plate 6. The needle 10 is situated within the nozzle 8 and is capable of reciprocating axial movement within the nozzle 8. The degree of movement is controlled by a co-axial helical spring 12, which surrounds both the nozzle 8 and the needle 10 (see, in particular, Figure 3), and acts against the rear face of the trigger plate 6 and the face 7 of the canister.

Although the nozzle 8 is hollow, the junction between the base of the nozzle 8 and the face of the gas canister is sealed by a seal 9. The seal is, in this case, made from thin metal and is adapted to be punctured by the needle 10. The seal may alternatively be made from a plastics material or be in the form of a solid door, which is pushed open by the needle 10.

During manufacture, the air-bag 4 is evacuated and folded around the sides of the gas canister, so as to form a compact unit.

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An adhesive layer 20 is provided on the base end face of the gas canister 2, opposite to the face 7 upon which the nozzle 8 is provided.

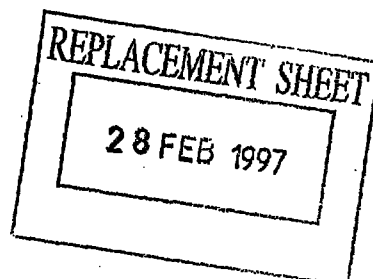
In use, the safety device is fixed in position by means of the adhesive 20, with the trigger plate 6 facing towards the body which is to be protected.

In the event of an accident in which a person is thrown towards the safety device, the person strikes the trigger plate 6, compressing the helical spring 12, and forcing the needle 10 to pierce the seal 9. The compressed carbon dioxide is released from inside the gas canister 2 via the hollow core of the needle 10 and evacuates via the front face of the trigger plate 6 into the air-bag 4. The expanding gas rapidly fills the air-bag 4, so as to provide a cushion. Because the air bag is folded around the trigger plate, the impact of the body upon the trigger plate is cushioned. The cushioning effect is enhanced by the presence of the helical spring 12, which further absorbs the impact of the body.

Actuation of the device will now be described in relation to a front collision. It is to be understood, however, that the device is also effective if installed to offer protection against injury from impact from other directions.

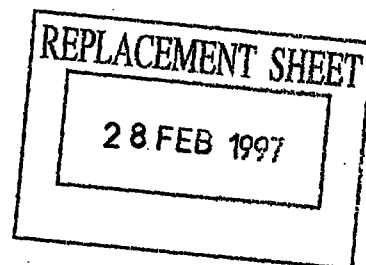
Whenever the driver encounters any risk of collision, he applies the brake. If the braking is severe, the body will be thrown forward. This impact will activate the device, which will then inflate the bag in the manner set out above. When the vehicle actually collides with the object of concern, the body can receive a further impact, which is usually more severe than the first. This impact is, however, cushioned by the air bag which was caused to inflate as a result of the first impact. The air bag will also cushion against any further, subsequent impacts, such as, for example, after the vehicle has crashed and the dashboard connects with the oncoming object. As a result, the person's injuries are limited. This sequence of events is shown in Figures 4, 5 and 6.

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The safety device is not intended only for location upon the dashboard of a motor car. It may be located wherever a person or an article is to be protected from an impact. Figures 7 and 8 show examples of alternative positions for the safety device. These are at the rear of a vehicle, to protect against rear impact, and in the side of a vehicle, to protect against side impact. Of course, the safety device is not intended to be used only in motor cars. Any vehicle or vessel in which an impact might occur can employ such a device. In particular, the device can be used in airplanes, boats, minibuses, trains or trams etc.

Many further modifications and variations will suggest themselves to those versed in the art upon making reference to the foregoing illustrative embodiment, which is given by way of example only and which is not intended to limit the scope of the invention, which is determined by the appended claims.

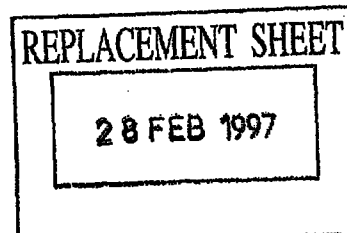




CLAIMS

1. A safety device for protecting a body on or in a vehicle, the safety device comprising an inflatable cushioning means and a trigger device for causing the cushioning means to inflate, wherein the trigger device is adapted to be activated when struck by a body which the safety device is intended to protect.
2. A safety device according to claim 1 wherein the trigger device comprises a plate such that said trigger device is activated when said plate is struck by said body.
3. A safety device according to either claim 1 or 2, wherein the trigger device is provided with means for releasing a body of gas for inflating the cushioning means to cushion the body that the device is intended to protect.
4. A safety device according to claim 3, wherein the trigger device comprises a gas canister and a needle for puncturing the gas canister to release the gas into the cushioning means.
5. A safety device according to claim 4, wherein the needle comprises an axial bore for allowing gas to escape.
6. A safety device according to any preceding claim wherein the cushioning means is a gas-tight bag.
7. A safety device according to claim 6 and claim 4 or 5, wherein the bag comprises an opening, which opening is sealed by a wall of the gas canister.
8. A safety device according to claim 7, wherein the trigger device is located inside the bag and can access the gas canister via the opening.

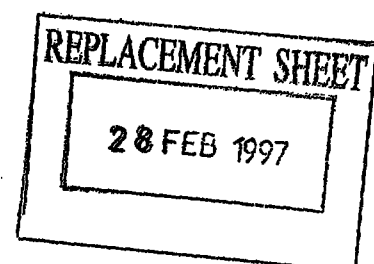
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9. A safety device according to claim 4 or any claim dependent thereon, wherein the canister comprises a nozzle and the needle is located coaxially within the nozzle in such a manner as to be capable of reciprocal movement therein.
10. A safety device according to claim 9, wherein resilient means are provided for resisting axial insertion of the needle into the nozzle.
11. A safety device according to claim 10 wherein the resilient means is a helical spring located coaxially about the needle.
12. A safety device according to claim 4 or any claim dependent thereon, wherein the gas canister is provided with a layer of adhesive on one surface thereof for mounting the safety device in position.
13. A safety device according to claim 2 and 4, or any claim dependent on these two claims, wherein said needle is directly activated by said plate.
14. A safety device substantially as hereinbefore described with reference to figures 1 to 3 of the accompanying drawings.



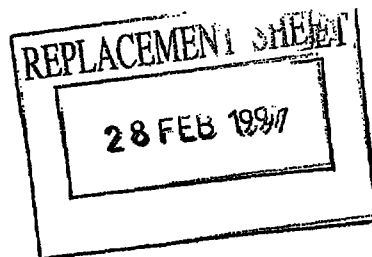
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ABSTRACT**SAFETY DEVICE**

A safety device for a body on or in a vehicle composes an inflatable cushioning means 4 and a trigger device 2, 6, 12 for causing the cushioning means to inflate. The trigger device 2, 6, 12, is activated when struck by the body to be protected. The trigger device comprises means for activation by impact from the body.

Figure 1.



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