

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.

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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.

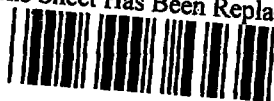
The trigger plate may be replaced by a proximity switch, which activates the gas generation when the body reaches a certain point.

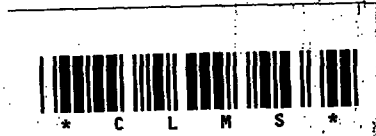
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Many further modifications and variations will suggest themselves to those versed in the art upon making reference to the foregoing illustrative embodiment, which is given by way of example only and which is not intended to limit the scope of the invention,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