

PATENTS EXAMINATION BOARD
PRACTICAL LEGAL PROBLEMS

SUPPLEMENTARY EXAMINATION PAPER: OCTOBER 2016

EXAMINERS: R BAGNALL
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MODERATOR: C.E. PUCKRIN S.C.

DURATION: READING TIME – 60 MIN
 EXAMINATION TIME – 4 HRS
 TOTAL – 5 HRS

NOTES TO CANDIDATES:

1. Attached to the paper are copies of the following documents:
 - (i) A copy of the Patents Act No. 57 of 1978;
 - (ii) A copy of the Patent Regulations 1978; and
 - (iii) A copy of the Uniform Rules of the High Court under the Superior Courts Act 10 of 2013 (Rules 6, 14, 17, 18, 19, 21, 22, 23, 24, 25, 30, 35, 36 and 37).

2. Each candidate is also allowed access to (1) one dictionary during the exam.

3. This paper consists of 25 pages in total and includes the following documents:

- (i) Questions 1 to 3 (100 marks);
 - (ii) Annexure A: South African Patent No. 2006/01111 (7 pages);
 - (iii) Annexure B: Safety Weekly Car Magazine article entitled "Pyrotechnical gas generating systems (3 pages);
 - (iv) Annexure C: South African Patent No. 93/0123 (3 pages);
 - (v) Annexure D: US Patent 6, 347, 123 (4 pages); and
 - (vi) Annexure E: US Patent 4, 361, 781 (4 pages).
4. Prior to the hand out of the answer papers, candidates will have the opportunity to read the above documents and make notes for 60 minutes.
5. Where appropriate reference should be made to case law.

QUESTION 1:

(50 marks)

Your client, Supersave (Pty) Ltd, is interested in expanding its business interests in South Africa into the vehicle airbag safety field. They do not wish to infringe on any patent rights in South Africa and, accordingly, they instruct you to conduct a search through the South African Patent Office records.

*You locate a potentially relevant patent ZA 2006/0111 (which is attached hereto marked **Annexure "A"**). You inspect the official Patent Office records and confirm that the patent is of full force and effect and all of the formalities were complied with during the prosecution of the application.*

Your client is considering manufacturing and selling an airbag module which incorporates each of the features of claims 1 to 3 of ZA 2006/0111 and a gas generator for an airbag module that incorporates each of the features of claims 4 to 5 of ZA 2006/0111.

The South African patent was filed on 28 January 2006 and claims priority from a prior filed South African provisional application, dated 1 February 2005. (You may assume that a valid claim to priority is made). The patent was granted on 28 October 2006.

After you report the findings of the search to your client, your client notifies you that it has been made aware of the following documents:

Annexure "B" – A magazine article from "Safety Weekly car magazine", entitled "Pyrotechnical gas generating systems", published in February 1997;

Annexure "C" – South African Patent No. 93/0123 which was published on 8 June 1994;

Annexure "D" - US Patent 6, 347, 123 which was published on 31 January 2003;

Annexure "E" – US Patent 4, 361, 781 which was published on 3 April 2001.

Please provide your client with a comprehensive opinion on the validity of ZA 2006/0111 taking into consideration the documents provided, as Annexures "B" to "E".

QUESTION 2:

(25 marks)

Your client has now received the opinion and responds by asking for advice on how it should conduct its activities in light of the outcome of the opinion.

Please provide your client with strategic advice. In responding to the question, please provide practical advice and options that will guide your client on how best to proceed.

QUESTION 3:

(25 marks)

Assume that your client instructs you to apply for revocation of South African Patent No. 2006/0111.

Please prepare a statement of particulars that shall accompany the prescribed form P20.

TOTAL: 100 marks

[0001] The present invention relates to an airbag module for protecting a vehicle occupant upon frontal impact.

[0002] Airbag modules known in the art consist of a control unit, a gas generator and a cushion, i.e. an inflatable bag. In a situation of imminent impact, the control unit activates the gas generator, which delivers an appropriate quantity of gas that fills the cushion to a certain pressure in milliseconds. The pressurized cushion expands between the occupant and an object, for example the dashboard or the steering-wheel, thereby providing a decelerating and cushioning effect that will protect the occupant upon impact.

[0003] During the collision, the occupant is forced against the cushion, thereby compressing the cushion. As a result, the pressure inside the gas-filled cushion is increased. In the prior art, during major impacts (for example, when an occupant is not wearing a seat belt) the pressure may rise in the cushion to such an extent that the cushion becomes so hard that it can cause injuries to the occupant.

[0004] The aim of the present invention is to avoid impact injuries.

[0005] Figure 1 shows the deployment of an airbag according to the invention.

[0006] Figures 2 (a) - (c) show a fully deployed airbag and a valve according to the invention.

[0007] Figures 3 (a) - (c) show the airbag according to the invention when the occupant strikes against it and the valve according to the invention.

[0008] Figure 4 shows a gas generator according to the invention.

[0009] The airbag module of the invention comprises a control unit (not shown) to control its activation, a gas generator 1 and a fabric cushion 2. Prior to being placed inside the module, the fabric cushion 2 is rolled up in such a way that when the airbag is activated, the fabric rolls out along a deployment surface, for example the
5 windscreen 13, as seen in Figure 1. If the airbag is stored in this way, the windscreen 13 is covered rapidly at a very early inflation stage. The deployment time is reduced, thereby increasing occupant safety.

[0010] As seen in Figures 2 (a) - (c) the fabric cushion 2 comprises a pressure
10 regulating valve 3, i.e. a device that regulates the pressure inside the fabric cushion 2 by regulating the flow of gas exiting the fabric cushion. This adapts the hardness of the cushion 2 according to the situation. According to a preferred embodiment, the valve may be an elastic membrane, i.e. an expandable and pliable barrier that changes shape when exposed to an outside force or pressure. The elastic membrane may be an elastic
15 strip 10 made of silicone attached to the cushion 2 by a rubber-based adhesive 9, which creates a bond with increased strength compared to other attachment means such as stitches. The strip 10 covers a vent-hole 5 provided in the wall of the fabric cushion 2. The vent-hole 5 is an opening through which gas can exit the chamber defined by the
20 cushion 2. As seen in Figure 2, during the expansion of the cushion, and before the occupant hits the cushion, the strip 10 closes the vent-hole 5, because the pressure inside the cushion chamber is not enough to deform the strip. Therefore, no gas is vented, which allows a rapid expansion of the airbag.

[0011] As seen in Figure 3, when the occupant of the vehicle is thrown forward against the cushion 2 due to a rapid deceleration of the vehicle, the cushion 2 will be compressed with a large force, creating a rise in pressure. If, due to the magnitude of the impact, the pressure surpasses a certain threshold, the elastic strip 10 will then bow outwards and open the vent-hole 5. This allows gas 11 from inside the cushion to be liberated and relieves the pressure in the cushion during its compression. This prevents the airbag from becoming excessively hard during high impact collisions, and reduces the risk of the occupant being injured. The cushioning effect is therefore improved.

10 **[0012]** The fabric cushion of the airbag may be made of polyester and coated with a polyamide resin. This coating gives the fabric a better heat resistance when compared to uncoated fabrics, but does not compromise the flexibility of the fabric, since it does not make it heavy and stiff like other coatings known in the art.

15 **[0013]** As seen in Figure 4, the gas generator 1 for the airbag module of the invention comprises a housing 20 made of cuzinal and filled with a gas generating composition. Cuzinal is a copper-zinc alloy that maintains a good structural resistance at high temperatures, when compared to stainless steel and aluminium. This reduces the risk of fracture of the housing 20. An igniter 21 comprising zirconium and potassium
20 perchlorate is located inside the housing 20 with the gas generating composition (not shown). Upon ignition the gas generating composition turns into gas and is expelled out of the housing and into the fabric cushion 2 through the outlets 22. The igniter 21 is activated by induction through a magnetic field from outside the generator 1 and is not electrically connected to the outside of the generator 1. These igniters are more reliable,
25 because they are less exposed to moisture from the outside and cannot be set off by static discharge as in the case of other types of electrical igniters.

[0014] The gas generating composition used comprises guanidine nitrate and ammonium perchlorate. Within the same amount of time, this combination produces a larger amount of gas than other combinations. The composition may additionally comprise sodium nitrate, which results in the generated gas also having a lower temperature. Gas having a high temperature should be avoided since it might heat the fabric and burn the occupant.

[0015] Like most compositions, the composition with sodium nitrate produces a flame. As an alternative to sodium nitrate, potassium sulphate can be added to the composition. The composition with potassium sulphate not only produces large amounts of gas, but also prevents the formation of flames during the gas generating reaction so that the fabric of the cushion does not catch fire.

[0016] The weight ratio of guanidine nitrate to ammonium perchlorate determines the speed at which gas is generated. The fastest gas generating levels were obtained with weight ratios between 2:1 and 5:1. The amount of sodium nitrate or potassium sulphate does not change the speed at which the reaction occurs.

[0017] Moreover, it was observed that a weight ratio of 3:1 produced the cleanest combustion and created the smallest amount of toxic residual gas.

Claims:

1. An airbag module for protecting a vehicle occupant in a frontal collision comprising:
 - 5 -a control unit;
 - a gas generator comprising a housing made of cuzinal; and
 - a fabric cushion comprising a pressure regulating valve.
- 10 2. An airbag module according to claim 1 wherein the valve comprises: an elastic membrane at least partially covering a vent-hole provided in the fabric cushion, the membrane being attached to the cushion by means of a rubber-based adhesive.
- 15 3. An airbag module according to claim 1, wherein the fabric cushion is made of polyester and is coated with a polyamide resin.
4. A gas generator for an airbag module comprising:
 - 20 - a housing made of cuzinal and having outlets;
 - an inductively-activated igniter comprising zirconium and potassium perchlorate; and
 - a gas generating composition inside the housing, the composition comprising guanidine nitrate, ammonium perchlorate, and either sodium nitrate or potassium sulphate.
- 25 5. A gas generator according to claim 4, wherein the composition comprises a weight ratio of guanidine nitrate to ammonium perchlorate of 3: 1.

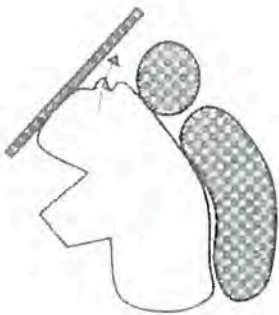
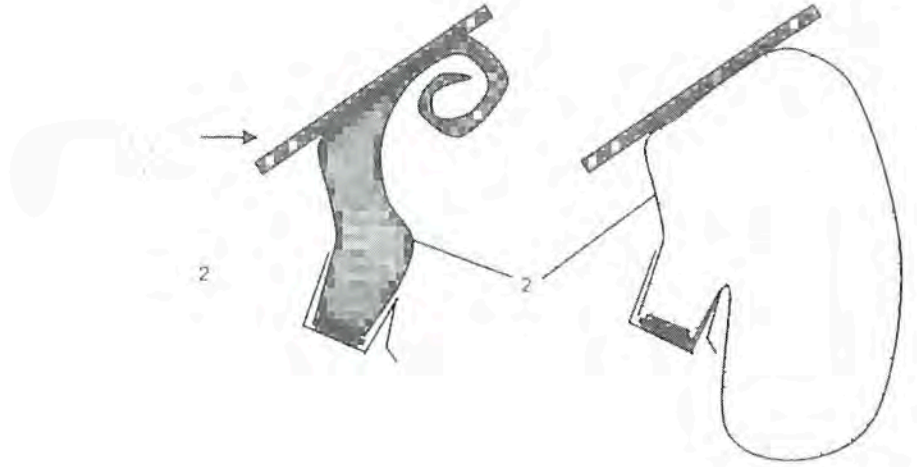
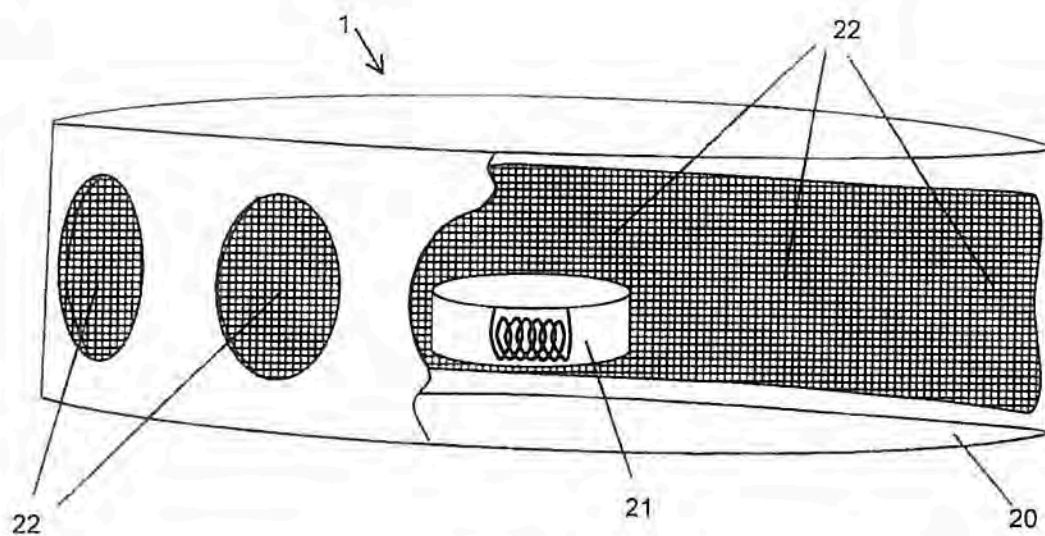


Figure 4



Safety Weekly Car Magazine
"Pyrotechnical gas generating systems"

Author: John Smith

5 Published: February 1997

[0001] Passive restraint systems such as airbags and seatbelts make use of gas generating means to activate their security systems. Pyrotechnical systems, which rapidly create large quantities of gas, have had great success.

10 **[0002]** Pyrotechnical systems usually comprise a gas generator housing, which can be made as a die cast container of stainless steel, nickel-plated steel, carbon steel, aluminium or cuzinal, which is a copper-zinc alloy. The container may comprise exhaust openings to channel the gas into another component of the restraint system, such as an inflatable polyester cushion bag or a cylinder-piston system.

15 **[0003]** Surprisingly, cuzinal maintains an almost constant resistance to breaking even at high temperatures (above 200°C). In contrast, the resistance of steel and aluminium alloys decreases progressively above 200°C.

20 **[0004]** The container contains a powder composition for generating gas, and an initiator. The powder composition can be ignited by the initiator. The initiator comprises a coil and highly combustible material (for example, zirconium and potassium perchlorate) that may be lit by an induced current in the coil to initiate the ignition of the powder composition. These initiators have the advantage that they are placed inside the
25 container and activated at a distance without being wired to the outside. The isolation from the outside protects the initiator from humidity, and the absence of an electrical connection removes the danger of static electricity discharges or short circuits which could accidentally trigger the initiator.

[0005] The choice of the materials which form the powder composition is of major importance. A large amount of gas has to be generated within a few milliseconds. Moreover, this gas should not be toxic since it is going to be released into the passenger compartment. When used to inflate airbags the generated gas should also not be too hot. Airbags are made of fabric which may be damaged by high temperatures. Also, if the heat is passed to the vehicle occupant when coming into contact with the airbag, it could cause burn injuries.

[0006] Powder compositions comprising a fuel agent, an oxidizer to accelerate combustion and at least one additive are considered the most effective.

[0007] The following substances have been found to give the best results:

Fuel agent	Oxidizer	Additives
cellulose	potassium chlorate	magnesium carbonate
starch	potassium perchlorate	zinc carbonate
sucrose	sodium chlorate	potassium bicarbonate
cellulose acetate	sodium perchlorate	sodium nitrate
guanidine nitrate	lithium nitrate	barium carbonate
nitroguanidine	lithium perchlorate	potassium nitrate
	ammonium perchlorate	lithium carbonate
		potassium sulphate

[0008] When there is a flame generated during the combustion process, the flame ensures that no residual glowing particles of powder composition are left and that the powder composition is completely converted into gas as quickly as possible. When the flame-producing powder compositions are used in airbag systems, airbag cushions
5 made of polyester are usually coated with nylon resin, which ensures good heat resistance to avoid problems with the flame produced. Nylon-coated polyester also maintains a high degree of flexibility, so that the time needed for deploying the airbag cushion is not adversely affected. This is crucial in airbags having a large volume or placed close to the passenger such as in the dashboard.

ANNEXURE "C"

South African Patent No. 93/0123 published 8 June 1994

Steering wheel airbags

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[0001] Various types of impact protection systems are common in the art to protect a vehicle occupant. Airbags are commonly mounted in the steering wheel and dashboard to protect the driver and a front seat passenger.

20

[0002] This invention concerns steering wheel airbags. These are relatively small airbags that are installed in steering wheels to protect the driver during frontal collision.

25

[0003] As shown in Figures 1 and 2, the invention concerns an airbag unit mounted in a steering wheel 1 comprising a pyrotechnical gas generator activated by a command unit to quickly supply gas to a nylon cushion. The generator is made of aluminium or die-cast steel. The cushion comprises two equal-sized round sheets 2a and 2b of a non-stretchable nylon fabric sewn together around their edges (represented by a dotted line in the Figures) that form an air-tight chamber for the supplied gas. The fabric sheet 2a facing the steering wheel 1 is attached to the generator to let the gas from the generator

30

flow in.

[0004] The cushion is tucked inside the steering wheel after having been folded. The cushion is firstly folded like an accordion, i.e. it is divided in equally sized sections, which are folded together back and forth. Subsequently the side portions are folded together in order to fit in the middle of the steering wheel, where the airbag module is mounted.

5 When the airbag is deployed, it expands away from the steering wheel towards the driver.

[0005] The cushion has a synthetic rubber (e.g. silicone) membrane 3 with a small vent-hole 4 that usually allows only a very limited amount of gas to be vented, as can be
10 seen in Figure 1. When the driver hits the cushion, the pressure inside the cushion will rise. If the driver hits the cushion with excessive force, the additional pressure will trigger deformation of the elastic rubber membrane 3 (see Figure 2) so that it protrudes outwardly from the cushion, thereby enlarging the diameter of the hole 4 and allowing more gas to be vented.

15

[0006] This increased gas venting creates a temporary pressure drop that makes the cushion less hard. The rubber membrane 3 is attached over an opening 5 in the cushion, by means of a silicone-based adhesive, which creates an air-tight bond between the rubber and the fabric. Silicone adhesives adhere well to nylon fabrics.

20 Polyester fabrics such as PET, on the other hand, would require a resin coating if used with silicone adhesives. Such coatings would make the fabric stiffer and more bulky, hence more difficult to fold and place inside limited spaces.

Claim:

25

Airbag for a steering wheel comprising a gas generator to supply gas to a fabric cushion, the fabric cushion having an outlet valve.

Figure 1

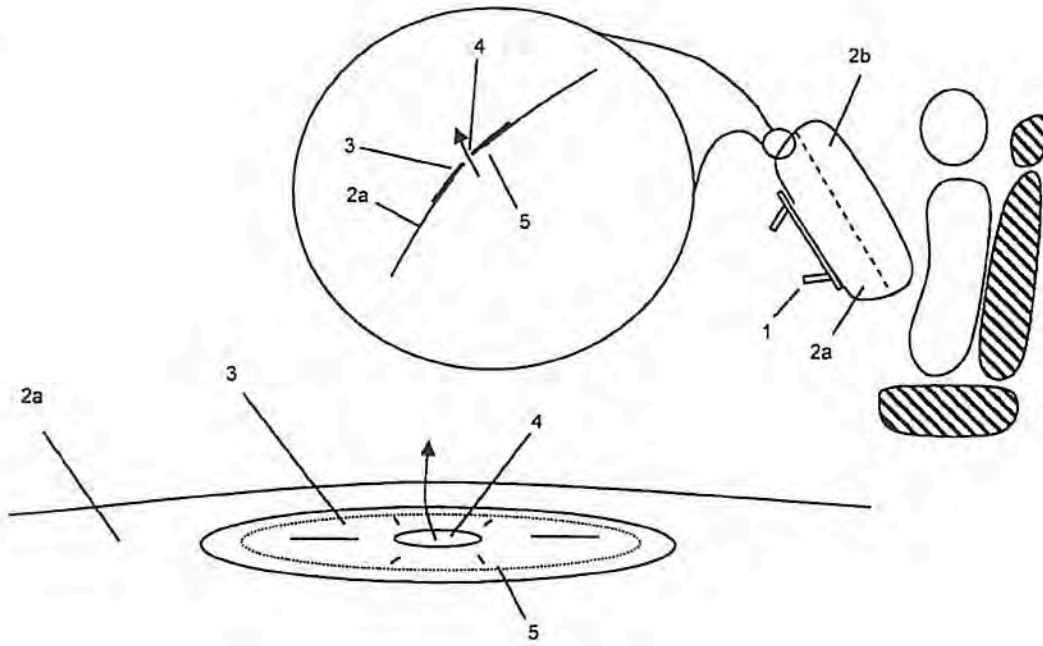
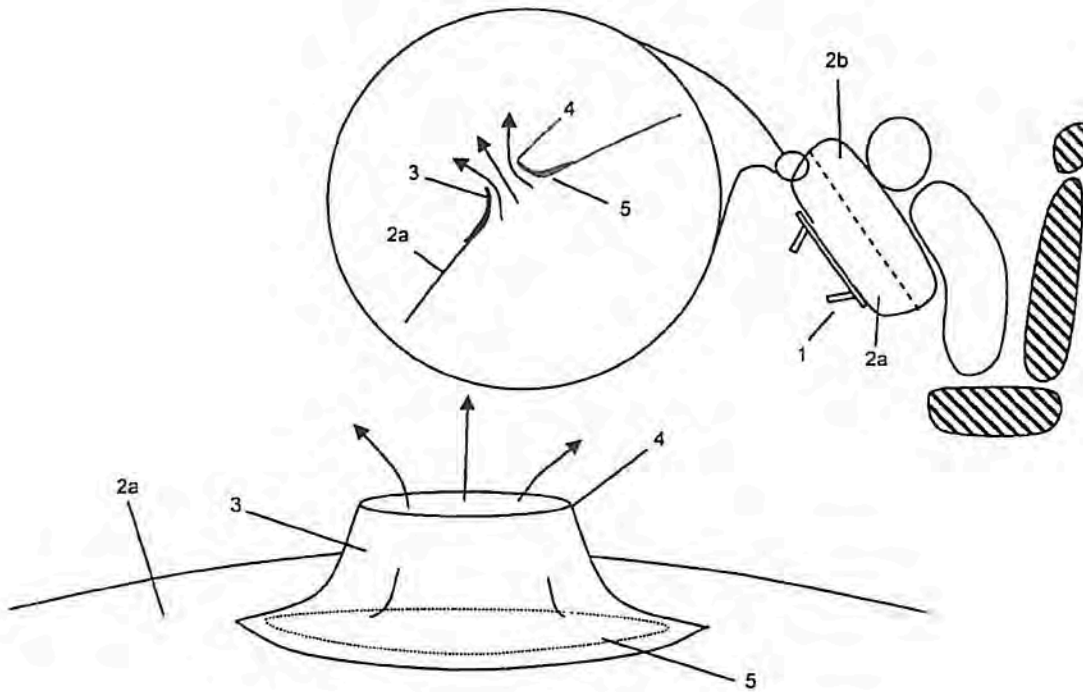


Figure 2



ANNEXURE "D"

US Patent No. 6,347, 123 published 31 January 2003

Improvements in vehicle occupant restraint systems

15 [0001] The present invention relates to safety improvements for vehicle occupant restraint systems that protect the occupants involved in frontal impact vehicle crash situations.

20 [0002] During a frontal impact, the vehicle decelerates suddenly, while the occupant tends to continue moving due to inertia. Systems to counter this effect, such as seat-belts and airbags, are already known in the art. In order to avoid injury, the occupant should not be stopped too abruptly. At the same time, the restraint system must be deployed swiftly.

25 [0003] Seat-belt systems usually include a belt made of a polyamide such as nylon, a seat-belt tensioner comprising a cylinder-piston assembly and a seat-belt buckle rigidly connected to the piston. The system is triggered in emergency situations and pulls the seat-belt very rapidly to hold the occupant firmly in position. The cylinder-piston assembly is usually activated by releasing pressurized gas into the piston chamber. The
30 gas has to be stored under a very high pressure in a gas container for the restraint system to react quickly and effectively. However, this may create a safety problem in case of rupture of the gas container.

[0004] The present invention overcomes this drawback by providing an occupant restraint system that comprises a pyrotechnical charge and an igniter to supply gas in a safe way.

5 **[0005]** Figures 1 and 2 show a safety system according to the invention before and after deployment (front and sideview).

[0006] The safety system includes a seat-belt tensioner and an airbag module comprising a curtain airbag 5.

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[0007] The seat-belt tensioner comprises a cylinder-piston assembly 1, a buckle 2, a pyrotechnical charge 3 and an igniter 4. The charge 3 and the igniter 4 are placed inside the cylinder chamber 1b. By igniting the pyrotechnical charge 3, a greater quantity of gas can be created almost instantly and the cylinder-piston assembly 1 may be activated
15 faster than by releasing pressurized gas.

[0008] When these assemblies are provided close to seat cushions, a pyrotechnical charge composed of guanidine nitrate, ammonium perchlorate and sodium nitrate is advantageous. Such a charge produces large quantities of gas per unit of reactant within
20 the first milliseconds of reaction. Although a flame is still produced, the generated gas has a lower temperature, because the sodium nitrate works as a catalyst and a coolant. This is important, because the cylinder-piston assembly is usually built into or close to a seat covered with a fabric such as polyester, and so the generated gas will not heat the seat cover and cause further discomfort to the occupant.

5 [0009] In principle, all pyrotechnical charges comprising a fuel agent and an oxidizer produce a flame. If a flame is undesirable, potassium sulphate may be used instead of sodium nitrate in the charge. The resulting charge does not create a flame but still produces large quantities of gas. However the use of potassium sulphate does not have an effect on the temperature of the generated gas. In this case, the pyrotechnical charge is not completely consumed and some residual glowing particles are left. Nevertheless, due to the absence of a flame, the overall risk of igniting the fabric of the seat, is still significantly reduced, even in the event that the assembly ruptures in a severe crash.

10 [0010] The use of a composition of 72% by weight guanidine nitrate, 24% by weight ammonium perchlorate and 4% by weight sodium nitrate can be advantageous, since it produces the most gas per unit of composition used.

15 [0011] Other occupant restraint systems, such as airbags, which are also susceptible to rupture, may also benefit from using such compositions, because an airbag requires a large quantity of gas to be produced very rapidly. Care also has to be taken when choosing the material of the igniter, because some materials, such as azides, react with compositions based on guanidine nitrate to produce extremely toxic gases and may not be used in rupture-sensitive systems.

20

Claim:

Vehicle occupant restraint system comprising a gas source, characterized in that the gas source comprises a pyrotechnical powder and an igniter.

Figure 1

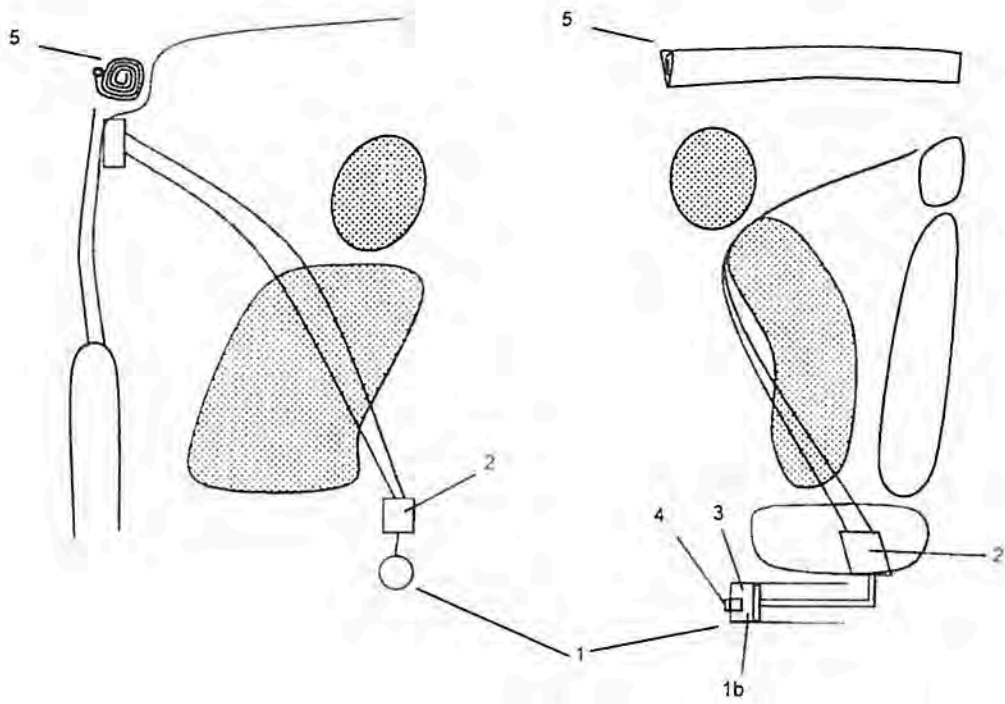
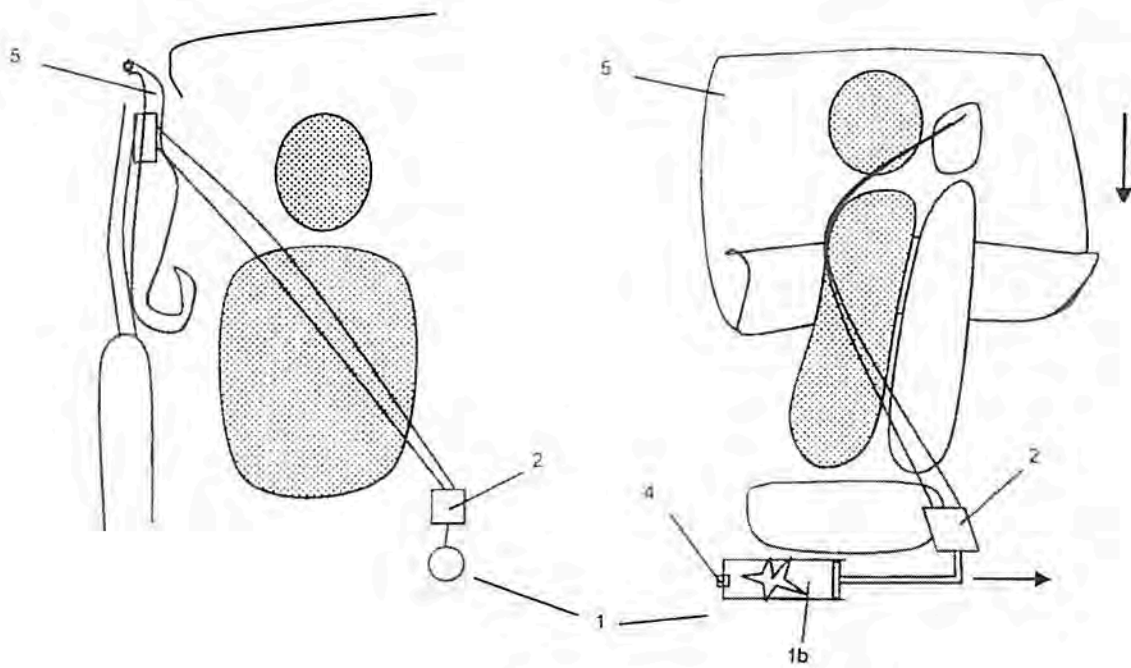


Figure 2



ANNEXURE "E"

US Patent No. 4, 361, 781 published 3 April 2001

Airbag module to be mounted in a dashboard

15 **[0001]** The present invention relates to an inflatable airbag to be mounted in the dashboard of a vehicle. Such airbags are intended to protect the passenger during head-on collisions. According to the passenger's size and position, it is advantageous to fill the airbag with different amounts of gas in order to achieve different pressures.

20 **[0002]** The purpose of the invention is to provide a system to control the internal pressure of an airbag and adapt it to each passenger and situation in a simple manner, and hence to safeguard the passenger in impact situations.

25 **[0003]** Figure 1 shows the airbag module of the present invention comprising a deployed fabric airbag 10 and a gas generator 2. The generator 2 comprises a housing that is made of any suitable metal for die-cast containers referred to in the article "Pyrotechnical gas generating systems" of the magazine "Automotive Safety", ed. 2/1997.

[0004] When a safety processing unit 1 in the vehicle senses that impact has occurred or is imminent, it sends an electric pulse through a cable connected to an electric match 3 to activate the latter. The electric match 3 is an electrical conductor wrapped in lead azide, which is a highly combustible, fast reacting material. The activation of the electric match 3 ignites a gas-generating composition which is inside the generator 2, thus producing large quantities of gas that will be channelled into a restraint system to be activated.

[0005] The fabric bag 10 is made of a non-stretchable PET material and provided with a vent-hole 11 in the fabric. The vent-hole 11 is covered with a ribbon 12 made of the same fabric as the bag 10. As seen in Figure 1, the ribbon 12 is stitched to the fabric bag 10 on two opposed edges. The ribbon 12 has a loop 13 of excess fabric stitched to form a tearable seam 14 close to one of the edges such that the vent-hole is covered by a portion of the ribbon in an air-tight manner.

[0006] During impact a pressure spike is created inside the bag 10, thus generating a force towards the outside on the non-stretchable ribbon 12 through vent-hole 11. As shown in Figure 2, if this force exceeds a certain value, the tearable seam 14 will tear and the excess fabric of the loop will be released, thereby creating an arch and uncovering the vent-hole 11. Gas is then expelled, thus relieving the pressure and making the airbag less hard.

[0007] The generator 2 needs to generate enough gas to fill a large frontal airbag to the required pressure. Large volumes of gas are therefore necessary. Pyrotechnical powder compositions are preferred because they generate the maximum quantity of gas per volume of ingredients.

[0008] In order to avoid any small glowing particles of non-consumed pyrotechnical powder rupturing the airbag 10 or the ribbon 12, a mesh is placed at the gas outlets of the gas generator 2 to trap the particles, but allowing the generated gas to flow into the airbag 10. If necessary, this mesh may also contain the combustion flame inside the
5 generator 2 to prevent the fabric from igniting.

[0009] The ribbon 12 also has the purpose of diverting the gas to the sides. The generated gas may reach a very high temperature and may injure the occupant. Therefore, care has to be taken when choosing the location of the vent-hole 11.
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Claim:

15 An occupant restraint system to be mounted in the dashboard of a vehicle, comprising a gas generator and an inflatable airbag, said airbag comprising a vent-hole and a ribbon over said vent-hole defining an outlet flow path for the gas exiting through the vent-hole.

Figure 1

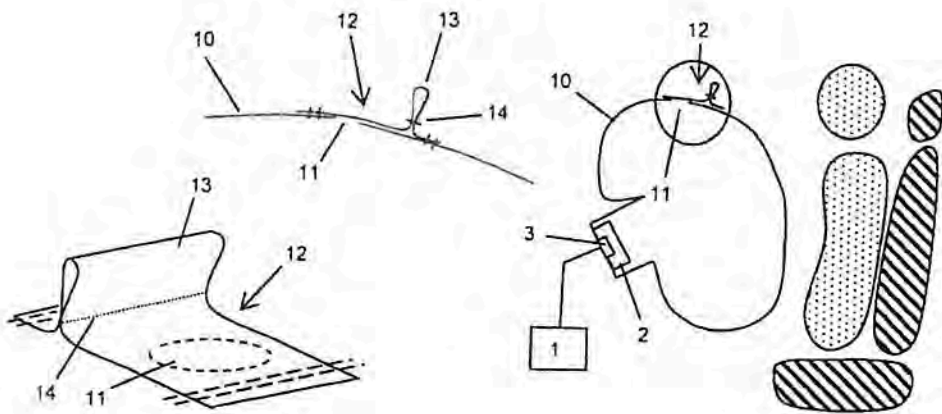


Figure 2

