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(56) Documents Cited:

GB 1373406 A

DE 002523546 A1

JP 020133262 A

US 4518183 A

EP 1088707 A1

JP 090020192 A

US 5810427 A

(58) Field of Search:

UK CL (Edition X) **B7B**

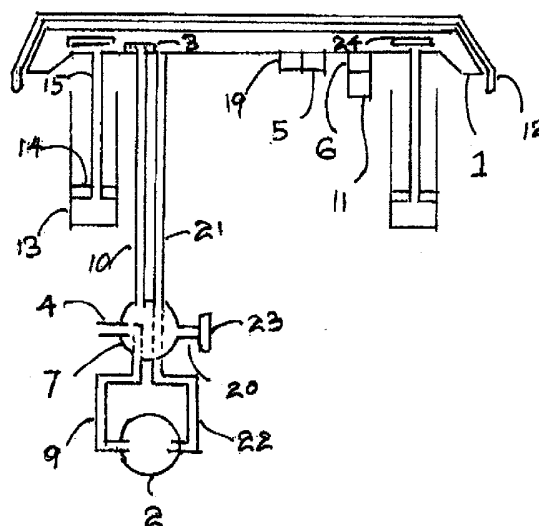
INT CL **B60R**

Other: **WPI, EPODOC**

(54) Abstract Title: **Collision resistance bumper**

(57) The Collision Resistance Bumper comprises of an inflatable tube (1) and an electric air pump (2). When the vehicles gear is on second gear position, the air pump begins to operate and protrudes the tube with an inflation of itself and the movement of the piston, until the pressure inside it reaches the pre determined pressure level. Where a collision happens, the collision valve (6) opens and releases the air from the tube returning it to the original shape, avoiding the collided object bouncing away. The bumper deflates automatically when the gear position is lower than the second gear position. This bumper system can be mounted to any vehicle. The stretchable belt and the cylinder-piston system bold this bumper system on to the vehicle. When the tube deflates, the belt helps the tube to return its original position.

Figure 2



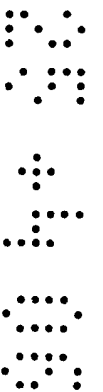
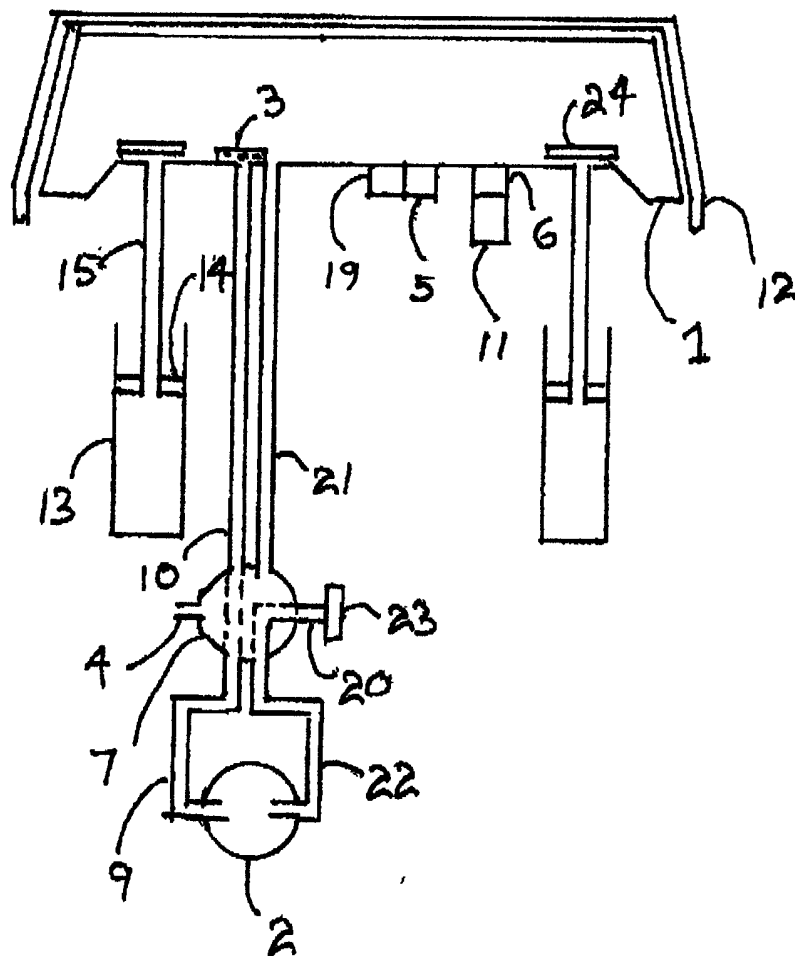
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This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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Figure 1



The diagram illustrates a mechanical assembly with the following labeled parts:

- 1**: A vertical support structure on the right side.
- 2**: A circular component at the bottom center, possibly a piston or a valve seat.
- 3**: A horizontal shaft or pipe at the top center.
- 4**: A side connection or port on the left side of the lower assembly.
- 5**: A component on the right side of the top horizontal shaft.
- 6**: A component on the right side of the top horizontal shaft, adjacent to 5.
- 7**: A component on the left side of the lower assembly.
- 8**: A component on the right side of the lower assembly.
- 9**: A circular component at the bottom center, possibly a piston or a valve seat.
- 10**: A horizontal shaft or pipe at the top center.
- 11**: A component on the right side of the top horizontal shaft.
- 12**: A horizontal support structure at the top.
- 13**: A component on the left side of the lower assembly.
- 14**: A component on the left side of the lower assembly.
- 15**: A handle or lever on the left side of the top horizontal shaft.
- 19**: A component on the right side of the top horizontal shaft.
- 20**: A component on the right side of the lower assembly.
- 21**: A vertical shaft or pipe connecting the top horizontal shaft to the lower assembly.
- 22**: A component on the right side of the lower assembly.
- 23**: A component on the right side of the lower assembly.
- 24**: A component on the right side of the top horizontal shaft.

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Figure 3

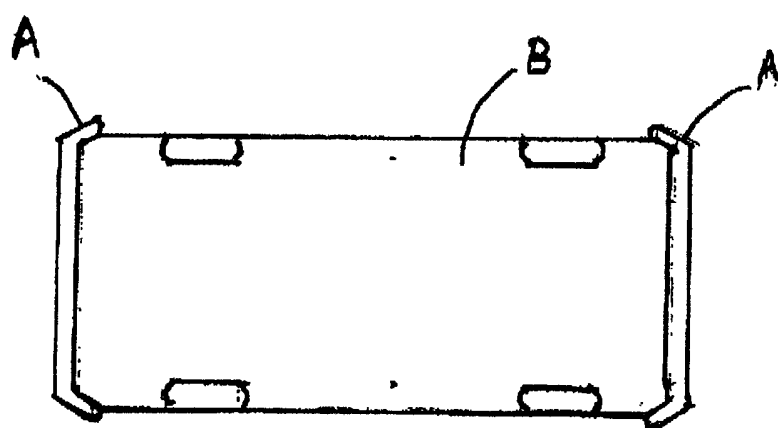
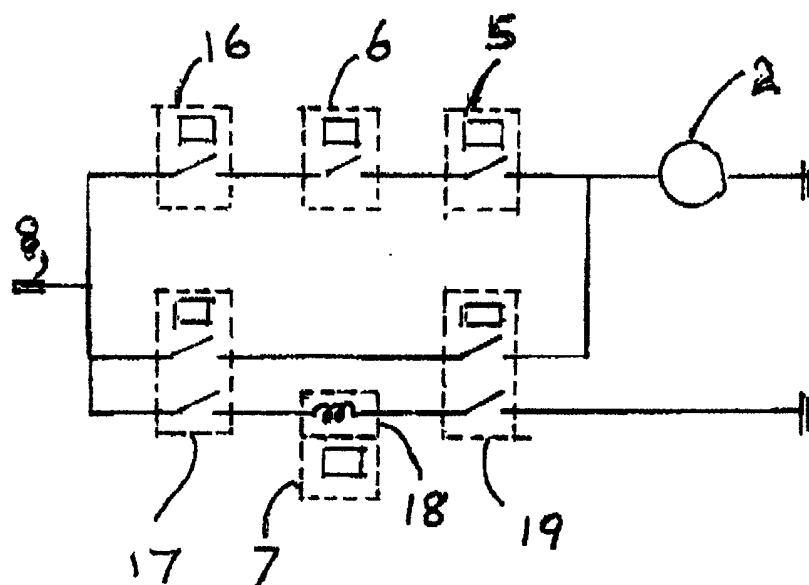
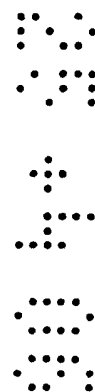


Figure 4



Collision Resistance Bumper

Technical field

This invention relates to a collision resistance bumper.

Background of the invention

Road traffic accidents occur frequently in this world. There are losses of human and animal lives and the damages made to property and vehicles are enormous. Every year insurance companies have to compensate vast sums of money for these damages. To reduce death and injuries of passengers and pedestrians, vehicle manufactures make vehicles with bumpers.

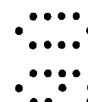
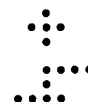
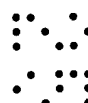
According to definition of the vehicle bumper, any device designed and intended by a manufacturer to prevent the front or rear of the body of a vehicle from coming into contact with any other vehicle, can be made of steel aluminium, rubber or plastic. Modern bumpers use energy absorbers such as foam cushioning materials. When a low speed of collusion occurs, this bumper system absorbs the shock to prevent or reduce damage to the vehicles. These types of bumpers only concern reduction of the hardware damage repair costs. So these are not designed to reduce injuries to the passengers or the pedestrians.

On the other hand modern bumpers are only able to reduce the damages involved with a low speed collusion impact. But, when collusion happens in high speed, damages are unimaginable. Now manufacturers design the vehicles with crash zone in front of the vehicle as a remedy for these drawbacks. Although this zone gives some protection to the passenger of the vehicle, they do not give any protection to the pedestrians, the other vehicle or the vehicle itself at all.

So the deaths and injuries are still enormous. This invention reduces fatal accidents, the serious damages and injuries made to the passengers and pedestrians as well as to the animals, other vehicles and properties.

Previous Invention relation to this invention:

US patent 4970980
US patent 5651569
EP 0987176A2
US 2004/0155473A1
US 2004/0169362A1
WO 2004/050423
US 2004/0080167A1



General Description

According to the present invention there is provided a collision resistance bumper comprising of an inflatable bellow or tube, pistons, cylinders, an electric air pump, a pipe, stretchable belts or clips, electrical switches and valves. This invention can be attached to any vehicle as an integral part of the vehicle as a normal bumper for reducing the damages and injuries to anyone or anything after the collision has happened.

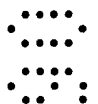
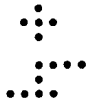
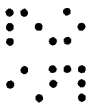
With the engagement of the second gear, the air pump starts to operate. Then the collision resistance bumper begins to inflate and protrudes. Because the tube cavity and the cylinder cavity join together with a hollow piston rod to make a single cavity, inflation as well as protrusion of the tube occurs simultaneously. A protrusion happens in two ways. One is just inflation of the tube. The other one is the movement of the piston. When the air pressure increases the tube bulges, at same time the pistons begins to protrude the tube.

When the inside pressure reaches a pre decided level, the automatic higher pressure gauge switch begins to operate and cuts off the circuit of the air pump. Then the air pump stops pumping air. There is a stretchable belt or clip attached to the tube. Instead of using a stretchable belt, it can be designed with some other means such as metal springs or clips. Because of this stretchable belt, where the tube deflates, the stretchable belt helps the tube to get to its original shape. This process speeds up with the deflated position of the bi-functional valve and the operation of air the pump.

The Bi-functional valve begins to operate with the bi-functional valve solenoid (18). The bi-functional valve solenoid operates with the switch on the position of the lower gear switch. When the bi-functional valve solenoid operates, it causes it to turn the bi-functional valve in to the deflate position. The bi-functional valve has two positions, one is the normal position and the other is the deflated position. The normal position of the bi-functional valve allows air going into the tube, and the other allows air to go out of the tube. The latter operation take place until the air pressure in the cavity reduces to the atmospheric air pressure. In this situation the bi-functional valve solenoid connected to the lower pressure gauge switch cuts off its circuit. Where the lower pressure cut off switch unit detects the atmospheric air pressure level, automatically cuts off the circuit of the solenoid. This causes the bi-functional valve to go in to its normal position.

There are two cut off switches. One is mounted to the lower pressure gauge, and the other one mounts to the higher pressure gauge. The latter one can be designed for variable pressure condition.

When a collision happens, the sudden collision valve opens and progressively deflates the bumper. The function of this valve depends on the excess pressure built up inside the tube due to an impact. Exceeding this pressure causes the collision valve to open. This progressive deflation process avoids the bouncing effect. Not only that, but this process also absorbs the impact force enormously after collision. This reduces the



stiffness of the tube as well as the damping of the tube due to reduced air pressure of the tube's cavity. It will avoid the collided object bouncing back due to less stiffness of the tube and the absorption of the impact force.

Because the protrusion of the bumper increases the overall length of the vehicle, it might affect the parking of the vehicle. But where the gear is below the second gear position, the bumper is always in the original shape. Increased length does not cause parking problems at all. On the other hand comparatively, this invention can be designed to reduce the overall length of the vehicle, due to a deflation.

This whole bumper mounts to the vehicle in a steady and flexible manner. The flexible manner means a movement of one end of the bumper does not affect the other end of the bumper. This mechanism reduces the circling of the vehicle after the collision has happened to a side of the bumper. This invention can be designed with or without a cylinder-piston system. With a cylinder-piston system, this can be designed to extend the bumper according to the speed of the vehicle giving more time to absorb the impact energy.

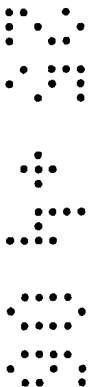
The invention will now be described solely by way of example and with reference to the accompanying drawing in which:

Figure 1 shows a protruded bumper unit, expanded piston-cylinder system, an air pump, the normal position of the bi-functional valve, pipes and switches and valves.

Figure 2 shows a non protruded bumper system, the deflated position of the bi-functional valve, the air pump, pipes and switches and valves.

Figure 3 shows wiring diagram of terminals, switches and component.

Figure 4 shows this invention (A) mounts to the vehicle (B)



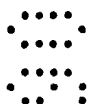
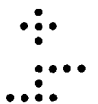
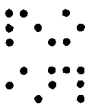
Detail Description of the Preferred Embodiment

When the main switch is on, the terminal (8) attached the main switch supplies power to the second gear switch (16). With an engagement of the second gear or above, the second gear switch completes the circuit of the air pump, because the collision valve switch connects to the air pump circuit by way of a series circuit. In between the second gear switch and the air pump there are two switches (figure 3). The first one is the collision valve switch (6). It mounts to the collision valve (11). This valve and the collision valve switch operate in a combined manner. A closed position of the collision valve makes the air pump circuit complete. The other switch is the high pressure cut off switch (5).

Then the air pump begins to pump air into the inflatable tube (1) and the cylinders (13). Pumped air passes through the pipe (9), bi-functional valve (7), pipe (10) and the one way valve (3) into the inflatable tube (1) and the cylinder (13), making the bumper protrude. The bi-functional valve has two positions. Changing these positions from one to another, the tube can be inflated or deflated. Usually the normal position of the bi-functional valve allows the air to go into the tube and the other allows air go out of the tube. The inlet of the electric pump covers with an air filter (20). This avoids dust or some other dirt going into the air cavity of the tube while the air pump is operating. There is a filter (24) on the inlet position of the piston rod for avoiding the dust and some other dirt going into the piston.

The bi-functional valve has two inlets and two outlets. One inlet connects to the outlet of the air pump with the connecting pipe (9) and the second inlet connects to the tube (1) with the connecting pipe (21). One outlet connects to the tube with the connecting pipe (10) and other connects to outlet of the air pump (2) with the connecting pipe (23). The normal position of the bi-functional valve connects the connecting pipe (9) and the connecting pipe (10) together making pumped air go into the tube via a one way valve. This valve works electromagnetically with the solenoid (18). Where the gear is in lower than the second gear position, the lower gear switch completes the second circuit of the air pump via the lower pressure gauge switch (19) (figure 3). At the same time it completes the circuit of the bi-functional valve solenoid (18). Activating this solenoid causes it to turn the bi-functional valve into the deflating position. This deflating position of the bi-functional valve connects the pipe (21) and the pipe (23) together. Changing the position of the bi-functional valve into the deflating position and starting of the air pump operation make the tube to deflate.

Because the tube cavity and piston cavity join together to make a single cavity with a hollow piston rod (15), the inflation of tube and the movement of the piston (13) take place simultaneously. The one-way valve only allows air to go into the inflatable tube and the cylinder. This inflation of the tube takes place until the pressure inside reaches the pre-determined level. When the pressure increases above the pre decided level, the higher pressure gauge switch (5) cuts off the air pump circuit. This causes it to stop pump's operation, because the higher pressure gauge switch connects to the air pump circuit with the series circuit. In this stage the overall length of the vehicle increased



but it does not affect parking spaces. The reason for this not taking up space is because the bumper begins to protrude while the vehicle is moving. This protruded tube acts as a crash zone. Although vehicles with crash zone give some protection to the passengers of the vehicle, they will not give any protection to the vehicle or to the pedestrians. Because this invention is made of flexible and elastic materials and a shock absorbent cylinder- piston system, it works as a cushion, even touching or knocking the other vehicle does not cause serious damages to others or itself.

When the gear goes to the lower gear or the engine stops running, the outlet valve opens and releases the air from the inflatable tube and the cylinder. Then the inflatable tube returns into its original position (figure 2). The stretchable belt (12), operation of the bi-functional valve and the air pump help the tube to get its original shape.

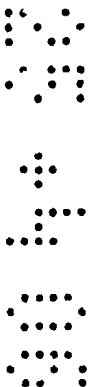
Where a collision happens, the sudden collision valve (6) opens. At the same time it cuts off the circuit of the air pump, because the collision valve (6) and the collision valve switch (11) work together. When the collision valve switch is opened position, it causes the circuit of the air pump to cut off. The closed position of the collision valve switch makes the air pump's circuit complete. This is because the terminal (8), the second gear switch (16) and the collision valve switch (11) are connected by way of series circuit.

After a collision, the opened collision valve causes air to be released progressively from the inflatable tube and the cylinder. This process avoids the collided object bouncing away from the bumper. Then the stretchable belt squeezes the tube to get it back to its original position. This process speeds up with the operation of the bi-function valve and the air pump.

The normal position of the collision valve and collision valve switch is the closed position. This valve is re-adjustable. An opening of the collusion valve depends on an exertion of the pressure inside of the tube. This valve can bore up to certain level of pressure only. An impact of any object squeezes the tube. This causes the pressure inside of the tube to exceed the pre decided level. Exceeding of the pre decided level of pressure causes the valve to open and release the air. This releasing of air collapses the rigidity of the tube. The purpose of this collision valve is, after collision, to avoid the collided object (human or animal) bouncing away from the vehicle. This avoids the collided object facing the second collision.

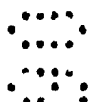
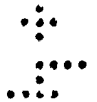
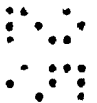
Collision resistance bumper (A) mounts to the vehicle (B) (figure 4).

Figure 3 shows the diagram of the electrical component and the wiring.



Claims

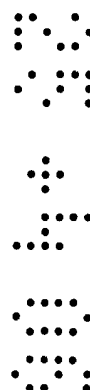
- 1 An inflatable bumper comprising an inflatable tube and a cylinder-piston system attached to any vehicle to operate it automatically with the engagement of the second gear or upwards, where the valves and switches operate according to aforesaid detail description.
- 2 The collision resistance bumper substantially as described herein with reference to figure 1-4 of the accompanying drawing.
- 3 The collision resistance bumper as claimed in claim 1 and 2 wherein the main switch on the power goes to the second gear switch.
- 4 The collision resistance bumper as claimed in claim 1, 2 and 3 wherein the engagement of the second gear or upwards, switches on the second gear switch which causes the electric air pump to operate.
- 5 The collision resistance bumper as claimed in claim 1, 2 and 4 wherein the electric air pump operates, the tube begins to protrude until the inside pressure reaches the pre determined level.
- 6 The collision resistance bumper as claimed in claim 1, 2 and 5 wherein the overall protrusion of the tube happens with the inflation of the tube and the movement of the piston.
- 7 The collision resistance bumper as claimed in claim 1 and 2 wherein the connecting pipe (9) connects the air pump and the bi-functional valve.
- 8 The collision resistance bumper as claimed in claim 1 and 2 wherein the connecting pipe (10) connects bi-functional valve and the one way valve.
- 9 The collision resistance bumper as claimed in claim 1 and 2 wherein the connecting pipe (21) connects the bi-functional valve and the tube.
- 10 The collision resistance bumper as claimed in claim 1 and 2 wherein the connecting pipe (23) connects the air pump and the bi-functional valve.
- 11 The collision resistance bumper as claimed in claim 1 and 2 wherein the one way valve is connected either to the inflatable tube or to the cylinder.
- 12 The collision resistance bumper as claimed in claim 1 and 2 wherein the one way valve allows pressurised air to go into the tube and the cylinder from the air pump.
- 13 The collision resistance bumper as claimed in claim 1 and 2 wherein the bi-functional valve allows air to go into the tube in its inflatable position and where it is in the deflated position allows air to go out of the tube.



- 14 The collision resistance bumper as claimed in claim 1 and 2 wherein The bi-functional valve solenoid operates with the switch on the position of the lower gear switch
- 15 The collision resistance bumper as claimed in claim 1 and 2 wherein the bi-functional valve operates with the solenoid.
- 16 The collision resistance bumper as claimed in claim 1 and 2 wherein the second gear switch is switched on, the bi-functional valve is in the inflated position, and where the lower gear switch is switched on and the bi-functional valve is in deflated position.
- 17 The collision resistance bumper as claimed in claim 1 and 2 wherein the tube protrudes until the pressure reaches a pre decided level.
- 18 The collision resistance bumper as claimed in claim 1 and 2 wherein the bumper deflates automatically, if the second gear is disengaged to a lower gear, if the engine is switched off, or if a collision has occurred, the bumper will return to its original shape.
- 19 The collision resistance bumper as claimed in claim 1 and 2 wherein when the tube protrudes, the stretchable belt holds the tube and allows the tube to protrude.
- 20 The collision resistance bumper as claimed in claim 1 and 2 wherein the stretchable belt squeezes the tube to return it to its original position, when the tube deflates.
- 21 The collision resistance bumper as claimed in claim 1 and 2 wherein that instead of using stretchable belt, it can be designed with some other means such as metal springs or clips.
- 22 The collision resistance bumper as claimed in claim 1 and 2 wherein the air pump operates with the engagement of the second gear or above gears and it stops its operation.
- 23 The collision resistance bumper as claimed in claim 1 and 2 wherein the collision valve has to be in the closed position for the air pump to operate.
- 24 The collision resistance bumper as claimed in claim 1 and 2 wherein the collision valve and the collision valve switch works jointly.
- 25 The collision resistance bumper as claimed in claim 1 and 2 wherein the closed position of the collision valve allows the collision valve switch to be turned on.



- 26 The collision resistance bumper as claimed in claim 1 and 2 wherein the automatic high pressure gauge switch, cuts off the circuit of air pump and stops the operation of the air pump when the pressure inside the tube reaches the pre decided level.
- 27 The collision resistance bumper as claimed in claim 1 and 2 wherein the collision valve can be re-adjusted and in its opened position allows air to be released when a collision has occurred.
- 28 The collision resistance bumper as claimed in claim 1 and 2 wherein air pump operates with the engagement of the second gear or above gears, when the engine is running, the pressure gauge switch and the collision valve switch must all be closed.
- 29 The collision resistance bumper as claimed in claim 1 and 2 wherein the engagement of second gear and above gears allow the second gear switch to be turned on.
- 30 The collision resistance bumper as claimed in claim 1 and 2 wherein the switch attached to the second gear or above gear positions connects to the collision valve switch.
- 31 The collision resistance bumper as claimed in claim 1 and 2 wherein the whole bumper (A) mounts to a vehicle (B) in a flexible manner with the stretchable belt and the cylinder-piston system.
- 32 The collision resistance bumper as claimed in claim 1 and 2 wherein the bumper can be designed with or without the cylinder-piston system.
- 33 The collision resistance bumper as claimed in claim 1 and 2 wherein the bumper with cylinder-piston system can be designed to extend the bumper according to the speed of the vehicle giving more time to absorb the impact energy.
- 34 The collision resistance bumper as claimed in claim 1 and 2 wherein there is a filter in between the piston's cavity and the tube's cavity for avoiding dust or some other dirt going into the piston cavity.
- 35 The collision resistance bumper as claimed in claim 1 and 2 wherein the inlet of the air pump has an air filter to filter the air.
- 36 The collision resistance bumper as claimed in claim 1 and 2 wherein figure 3 shows the connecting diagram of the switches and components of the bumper system.





For Innovation

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Application No: GB0501616.7

Examiner: Peter Gardiner

Claims searched: 1 to 36

Date of search: 11 April 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 at least	GB 1373406 A (RENAULT) See enclosure 3 which is inflated as a result of the vehicle speed.
X	1 at least	DE 2523546 A1 (BASHIR-ELAH) See the abstract and figures, in particular the pressure increasing within the bumper as a result of engine or road speed.
X	1 at least	EP 1088707 A1 (RENAULT) See the abstract and figures, in particular bag 20 being inflated and deflated above and below a set vehicle speed.
A	-	US 4518183 A (LEE) See the whole document, in particular the pistons and air bags in figures 2 to 4.
A	-	US 5810427 A (HARTMANN) See figures 3 and 4 in particular.
A	-	JP 09020192 A (TATSUNO) See the abstract and figures.
A	-	JP 02133262 A (RAIFU) See the abstract and figures.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

B7B

Worldwide search of patent documents classified in the following areas of the IPC



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The following online and other databases have been used in the preparation of this search report

WPI, EPODOC