Airbag, seat belt and the combination

1. Airbag

An airbag, also known as Supplementary Restraint System (SRS), is a flexible membrane which inflates (by being filled with gas) in case of accidents. Airbags are designed for frontal crashes and prevents the driver or passenger to hit the steering wheel or interior of the car. The airbag as known today was invented by John W. Hetrick in 1952. First Ford built an experimental series of cars with airbags in 1971. In 1987 the Porsche 944 turbo was the first car of the world with passenger and driver airbag installed as standard equipment. In the 1980s airbags became standard. Honda introduced the first motorcycle airbag in 2006. An airbag in manufacture costs about 100€. Replacing a used airbag costs the customer about 500€.

1.1. Types

1.1.1. Front airbag

The original type of airbag was the front airbag. This one should protect the head and chest of hitting the steering wheel. Formerly front airbags where only installed on the drivers side, later also passengers had front airbags.

1.1.2. Side airbag

The next step was the introducing of side airbags and front airbags for the passengers of the back seats. The side airbags should prevent the head of the passengers in case of side impact or rollover crashes.

1.1.3. Knee airbag

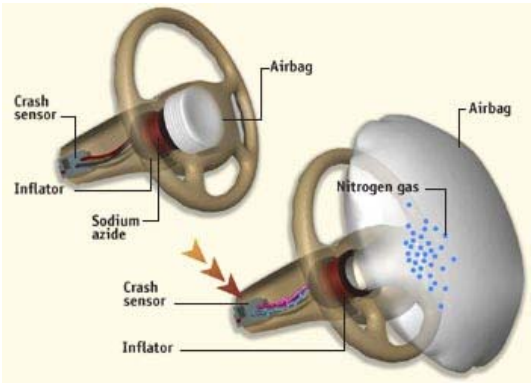
Knee airbags protect the legs and help the driver to slide down und forward during a crash.

1.1.4. Others

As mentioned before Honda developed an airbag for motorcycles. Another experimental version is an airbag for passer-bys which is installed in the hood and should prevent the passer-by of hitting this with his head.

1.2. Mechanism and Design

The mechanism and design is simple. An accelerometer triggers the ignition of a gas generator which inflates a nylon bag. The bag has small holes to allow the gas to pour out slowly from the bag when the occupant pushes against it.



The System contains out of three basic things: the airbag module, a crash sensor and a diagnostic unit. If the crash sensor detects a crash, it ignites the

airbag module, which consists out of the bag itself and a gas module. The diagnostic unit identifies problems at start up and alerts the driver by a warning light. An airbag deploys in 15 milliseconds for high speed crashes and in 25 milliseconds for low speed crashes.

1.3. Risks

- If the distance between the centre of the steering wheel and the driver is below 25,4 cm it is possible that the driver hits the steering wheel before the airbag detonates and the following detonation of the airbag could kill the driver.
- A big problem for rescue workers is that airbags could detonate a long time after the initial crash and could injure or kill the rescue workers which are operating inside the car.
- The detonation of an airbag releases a lot of talcum-powder to the vehicles interior. This could call an asthmatic attack by people with asthma.
- If the passenger airbag could not be manually deactivated and a baby in a baby seat is transported on the passengers seat the airbag would kill it. Also children under ages 12 should not sit in front of the car. It is a fact that most people of the few killed by airbags where infants or children.
- The sound of an airbag deployment is very loud an could result a hearing damage.

2. Seat belt

A seat belt, sometimes called a safety belt, is designed to hold the occupants in place, in case of an accident or a sudden stop. Seat belts should reduce injuries of the wearer which are caused by hitting hard interior elements or being thrown out of the car.

Seat belts were invented by George Cayley in the 1800s. The first two-point seat belt was installed by Ford in its models in the year 1956. Wearing a seat belt reduces the risk of death and injury in many types of car accidents and so it is prescribed by a law in many countries.

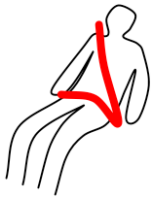
2.1. Types

2.1.1. Two-point

Two-point systems are commonly used in busses or in airplanes. It has two attachment points and is fastened around the lap.

2.1.2. Three-point

Three-point systems have three attachment points. Two points are fixed on the ground of the car frame next to the seat and one on the top of the side B-pillar. This system has the aim to spread out the energy of the moving body over the chest, pelvis and shoulder. It is the primarily used system in modern cars.



2.1.3. Five-point

Five-point systems are typically found in child safety seats or in racing cars. The lap belts are connected to a belt between the legs and these are connected with two shoulder belts, making a total of five attachment points.

2.2. Mechanism

Any seat belt that closes itself automatically is called automatic. For example the seat belt in any car is an automatic one because you only need two put the buckle in the lock and it is fixed. Seat belt systems also have a locking mechanism which blocks the belt when pulled hard but not when pulled slowly. This should prevent that the driver will crash on the steering wheel in case of a crash. A new system but more and more implemented one is called “pretensioner system”. This system additionally tightens the belt in case of an accident to press the driver in his seat. Nearly every new car has warning lights installed, that light when the seat belt is not closed and the car is moved.

3. The Combination

In the beginnings of airbags car manufactures thought that it would replace the seatbelt. But that was not so. Nowadays the security systems seat belt and airbag are designed to work together and so they are doing there jobs only together properly. The combination of airbag and seat belts reduces the risk of serious head injuries by 80 percent.

4. References

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