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**Datasheet for the decision
of 23 November 2006**

Case Number: T 0476/05 - 3.2.01

Application Number: 96909412.7

Publication Number: 0819072

IPC: B60R 21/16

Language of the proceedings: EN

Title of invention:

A safety arrangement for a motor vehicle

Patentee:

AUTOLIV DEVELOPMENT AKTIEBOLAG

Opponent:

TRW Occupant Restraint Systems GmbH & Co. KG

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56

Keyword:

"Novelty (yes)"

"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 0476/05 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 23 November 2006

Appellant: TRW Occupant Restraint Systems GmbH & Co. KG
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
2 February 2005 concerning maintenance of
European patent No. 0819072 in amended form.

Composition of the Board:

Chairman: S. Crane
Members: P. L. P. Weber
G. Weiss

Summary of Facts and Submissions

- I. The appeal is directed against the interlocutory decision of the opposition division posted on 2 February 2005 that account being taken of the amendments made by the proprietor during the opposition procedure in its third auxiliary request, the patent EP-B-0819072 and the invention to which it relates meet the requirements of the EPC.

The notice of appeal was filed on the 11 April 2005 and the appeal fee paid on the same day. The grounds of appeal were filed on the 13 June 2005.

- II. The three independent claims according to the main request read as follows:

Claim 1

A safety arrangement comprising an air-bag (1), a gas generator means (40,41) to generate gas to inflate the air-bag in response to a first signal from a sensor (90,95,99,96), the sensor also producing a second predetermined signal in response to a crash of predetermined severity, and/or in response to an occupant of a vehicle not wearing a safety belt, and/or in response to the occupant of a vehicle not leaning forward, an opening (2) formed in the air-bag being connected to the gas generator to receive gas from the gas generator, restricting means (4) comprising straps (13,14,20-25) or the like connecting one or more points on the surface of the airbag to a fixed point (12) to restrict the movement of at least part of the surface of the air-bag away from said opening,

characterised in that
release means (47) are provided adapted to release the
connection to the fixed point (12) in response to the
second predetermined signal from the sensor (90, 95,
99, 96),

the release means comprising a movable knife (61)
adapted to be moved to cut part of the straps
(13,14,20-25) to release the connection to the fixed
point (12).

Claim 2

A safety arrangement comprising an air-bag (1), a gas
generator means (40,41) to generate gas to inflate the
air-bag in response to a first signal from a sensor
(90,95,99,96), the sensor also producing a second
predetermined signal in response to a crash of
predetermined severity, and/or in response to an
occupant of a vehicle not wearing a safety belt, and/or
in response to the occupant of a vehicle not leaning
forward, an opening (2) formed in the air-bag being
connected to the gas generator to receive gas from the
gas generator, restricting means (4) comprising straps
(13,14,20-25) or the like connecting one or more points
on the surface of the airbag to a fixed point (12) to
restrict the movement of at least part of the surface
of the air-bag away from said opening,
characterised in that

release means (47) are provided adapted to release the
connection to the fixed point (12) in response to the
second predetermined signal from the sensor (90, 95,
99, 96),

the release means comprising a bolt (47) which initially retains the strap or straps in position, and a pyrotechnic charge adapted to move the bolt to release the connection to the fixed point (12).

Claim 3

A safety arrangement comprising an air-bag (1), a gas generator means (40,41) to generate gas to inflate the air-bag in response to a first signal from a sensor (90,95,99,96), the sensor also producing a second predetermined signal in response to a crash of predetermined severity, and/or in response to an occupant of a vehicle not wearing a safety belt, and/or in response to the occupant of a vehicle not leaning forward, an opening (2) formed in the air-bag being connected to the gas generator to receive gas from the gas generator, restricting means (4) comprising straps (13,14,20-25) or the like connecting one or more points on the surface of the airbag to a fixed point (12) to restrict the movement of at least part of the surface of the air-bag away from said opening,

characterised in that

release means (47) are provided adapted to release the connection to the fixed point (12) in response to the second predetermined signal from the sensor (90, 95, 99, 96),

the release means comprising means (80) adapted to burn or melt straps (13,14,20-25) to release the connection to the fixed point (12).

III. The following documents played a role in the appeal proceedings:

D6: US-A-5362101

D7: JP-U-533427

D7A: translation of D7

D10: US-A-5180188.

IV. Oral proceedings were held on 23 November 2006.

The appellant requested that the decision under appeal be set aside and the patent revoked.

The respondent requested that the appeal be dismissed or alternatively that the patent be maintained in amended form according to the auxiliary request filed with letter dated 9 October 2006.

V. The arguments of the appellant can be summarised as follows:

The embodiment of the airbag disclosed in D7 is novelty destroying for the subject-matter of Claim 3.

Since it is undisputed that the airbag according to D7 comprises all the features of the first part of the claim it is sufficient to concentrate on the features of the characterising portion.

The characterising portion requires that release means are provided adapted to release the connection to the fixed point in response to the second predetermined signal from the sensor and that the release means

comprise means adapted to burn or melt the straps to release the connection to the fixed point.

It is to be noted that the word strap is not further defined in the claim, in particular it is not mentioned in the claim that when used in the characterising portion of the claim it should have the same meaning as in the first part of the claim. Accordingly the threads 24 which are burned or melted in D7 in order to allow the unfolding of the strap can also be considered to be straps in the sense of the claim and since they are also melted this feature of the claim is anticipated by D7.

Even if the word strap is interpreted in the same way each time it is used in the claim, it must be said that the burning of the threads 24 in D7 will necessarily also burn or melt at least partially the strap so that also in this case the feature would be anticipated.

Concerning the other feature of the characterising portion the exact meaning of the word release has to be considered. According to the Oxford Dictionary it means to set free from restraint. Having this meaning in mind, when the airbag according to D7 is inflated to its first inflation level the straps are under tension until the pyrotechnical means are ignited and the threads 24 burned or melt. At that moment the straps are also released from the connection to the fixed point since they are set free from any restraint, and they can move to their fully extended state.

For this reason both features of the characterising portion of Claim 3 are also disclosed in D7.

If the board considers that in the airbag system according to D7 the connection of the straps to the fixed point is not released, then the subject-matter of Claim 3 is not inventive over a combination of D7 and D6. D6 discloses in its figures 14,15 that a first strap 42 is released from the airbag wall 26A to allow the airbag to expand to its fully inflated state and the skilled man would introduce this feature in the airbag of D7 as an alternative solution.

The subject-matter according to Claim 2 also is not inventive over D7. In the airbag according to D7, the straps are rolled on a pulley which is retained by a slider block 20. When this slider block is moved the pulley is allowed to rotate so that the connection to the fixed point is released. The slider block 20 is moved by an electromagnetic switch in response to a signal from a sensor e.g. determining the position of the occupant or of the belt. It is however self-evident for the skilled man who commonly uses pyrotechnic material in such safety arrangements that this electromagnetic switch could be replaced by a pyrotechnic charge to fulfil the same function.

By doing so, the skilled man would arrive in an obvious way to the subject-matter of Claim 2.

The subject-matter of Claim 1 is not inventive over a combination of D7 with D10.

At the beginning of the inflation of the airbag according to D10 a knife is used to cut a retaining membrane. Although this knife is fixed in D10, the skilled man would realize that when using a sensor to

detect the moment of use of the airbag as in D7 a moving knife would be more appropriate and he would apply it to the airbag of D10 and arrive at the subject-matter of Claim 1 without any inventive step.

VI. The arguments of the respondent can be summarized as follows:

In D7, figure 12 shows an airbag which constitutes prior art for the invention of D7 and which had no release means at all, the straps being there to optimize the shape of the airbag in its inflated condition as is mentioned on page 2 of D7A. This desire to optimize the shape of the airbag is also present in the invention according to D7. There is no disclosure in D7 that the straps should be longer than the maximum length of the airbag, nor is there any disclosure in D7 that the connection of the straps to the fixed point should be released. In order to maintain the advantage of figure 12 there must be a retaining means.

Whatever is melted or burned in D7, it is not to release the connection to the fixed point as in the airbag according to the invention.

D6 cannot suggest the differentiating features of Claim 3 as it does not disclose an adaptative airbag. In the airbag according to D6, the disconnection of the filament always happens in the same way since it is induced by the tensile force acting on it when the airbag is inflated.

On top of that it is explicitly explained in D6 in relation with the figures 14 and 15 that the parts 42 and 44 are filaments of the same strap 41, so that this document cannot suggest releasing a strap.

Concerning the inventive step attack on Claim 2 it is to be noted that in D7 the slider block 20 is actuated by an electromagnetic switch and not a pyrotechnic charge and that in any case the slider block is not used to release the connection of the straps to the fixed point.

Concerning the inventive step attack on Claim 1 it is to be noted that the knife used in the airbag according to D10 is fixed whereas Claim 1 requires a moveable knife.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rule 64 EPC; it is therefore admissible.
2. *Novelty*
 - 2.1 The appellant considered that the airbag described in D7 was novelty destroying for the subject-matter of Claim 3.

The board does not share this opinion.

D7 describes an adaptive airbag the degree of inflation of which depends on the sitting position of the occupant of the vehicle and of the severity of the collision. A vehicle deceleration sensor, a seatbelt sensor and a seat slide position sensor are used to collect the necessary information.

The airbag wall is retained by straps which on one side are fixed to the wall of the airbag and on the other side are wound on a pulley which is fixed at the bottom surface of the gas generator of the airbag. The straps thus connect one or more points on the surface of the airbag to a fixed point. The fixed point although not explicitly mentioned must be on the pulley underneath the gas generator, the existence of such a fixed point also being the logical consequence of the desire to be able to control the lengths of the straps as explained below.

A first possibility of adjusting the length of the straps and thus the size of the inflated airbag is given by the pulley which can be rotated and fixed in three different positions. These three positions are defined by notches on the pulley and a slider block 20 engaging the selected notch.

A second possibility of adjusting the length of the straps is given by two elements of pyrotechnic material 25 which when ignited will burn threads and thereby free folds in the strap. When this second possibility is used the effective length of the strap is increased thus allowing the airbag to be inflated into its maximum size.

The first part of all the three independent Claims 1,2,3 is thus known from D7, which is not disputed by the parties.

The first feature of the characterising portion of all three independent claims requires that release means are provided adapted to release the connection to the fixed point in response to the second predetermined signal from the sensor.

In the board's judgement already this first feature is not disclosed D7. According to the understanding of the board this feature requires that the connection of all straps to the fixed point be released or in other words that the straps be no more connected to their fixing point.

In the airbag according to D7 the straps are lengthened but not disconnected from their fixing point.

Thus for this reason alone the subject-matter of Claim 3 is new.

- 2.2 The appellant alleged that since the verb "to release" means "to set free from restraint" this first feature of the characterising portion would also be anticipated by D7. When inflating the airbag according to D7, a first state of deployment would be achieved when the straps are under tension. When the elements of pyrotechnic material 25 are then ignited and the threads 24 melt, the straps would be set free from restraint since they would then no more retain the airbag wall which would be able to expand to its maximum size.

The board cannot share this opinion since the wording of the claim requires that the release means are adapted to release the connection to the fixed point. By melting the threads 24 in the airbag according to D7 the connection between the points on the surface of the airbag and the fixed point is not released but only temporarily loosened, the points of the surface of the

airbag remaining connected to the fixed point through the straps.

In addition, when a severe collision has been detected by the sensor means of D7, one or both of the heater 26 are actuated and the pyrotechnic material 25 is ignited thus melting the threads 24, while the gas generator is also delivering the necessary gas to inflate the airbag. According to the appellant's interpretation (i.e. the melting of the threads constitutes release of the connection), the melting of the threads should take place while the straps are under tension. However, if the melting of the threads happens before the straps are under tension then there is no releasing taking place even in the sense of the appellant's interpretation. Although it may occur that the threads are melted when the strap is under tension, it seems to the board that this is only likely to happen by mere chance. As soon as the airbag initiation switch is on and the seat belt sensor is off, the heater(s) is/are actuated and gas is generated. Whether or not a tension will be present when the folds in the strap are released cannot be certain. Also for this reason the argument of the appellant cannot be accepted.

- 2.3 Furthermore, if the threads were considered to be other straps as also suggested by the appellant the situation would not be changed since the connection to the fixed point would still not be released.

3. *Inventive step*

3.1 It is undisputed that D7 discloses the closest state of the art safety arrangement.

3.2 Over the safety arrangement according to D7 the differentiating features are the characterising features of the individual claims namely:

For Claim 1

release means (47) are provided adapted to release the connection to the fixed point (12) in response to the second predetermined signal from the sensor (90, 95, 99, 96),

the release means comprising a movable knife (61) adapted to be moved to cut part of the straps (13,14,20-25) to release the connection to the fixed point (12).

For Claim 2

release means (47) are provided adapted to release the connection to the fixed point (12) in response to the second predetermined signal from the sensor (90, 95, 99, 96),

the release means comprising a bolt (47) which initially retains the strap or straps in position, and a pyrotechnic charge adapted to move the bolt to release the connection to the fixed point (12).

For Claim 3

release means (47) are provided adapted to release the connection to the fixed point (12) in response to the second predetermined signal from the sensor (90, 95, 99, 96),

the release means comprising means (80) adapted to burn or melt straps (13,14,20-25) to release the connection to the fixed point (12).

3.3 As is apparent and as discussed above, all three claims have as a first characterising feature the same general feature of release means being present and each independent claim additionally requires a different specific release means.

3.4 The provision of these features in the safety arrangement according to D7 would simplify its construction as the pulley system and the pyrotechnic elements for enabling the unfolding of the straps could be dispensed with.

3.5 The objective problem solved by the above cited differentiating features can thus be seen in the provision of a simpler safety arrangement nevertheless being able to take account of parameters relating to the severity of the impact of the occupant on the airbag.

3.6 In the board's judgement, already the provision of release means adapted to release the connection to the fixed point in response to the second predetermined

signal from the sensor is not obvious with respect to the state of the art.

The aim of the invention disclosed in D7 is to improve the airbag according to figure 12 of D7. The airbag of figure 12 is provided with straps in order to optimise its shape when inflated. These straps are secured at their lower portion to a mounting plate and at their upper portions to the airbag wall. Upon inflation the final shape of the airbag is thus influenced by the length of the straps and the position where they are secured to the airbag wall. The drawback of this airbag resides in the fact that the straps have a fixed length, so that the final shape of the airbag will be the same whatever the position of the occupant of the vehicle, whatever the severity of the collision or more generally whatever the conditions present when the collision occurs.

The aim of the invention in D7 is to improve this situation in order to have a better adaptability of the size and the shape of the airbag to the collision conditions, in particular the position of the driver and the severity of the collision.

In order to solve this problem, D7 proposes to provide the airbag with means for adjusting the length of the straps in response to sensor signals indicative of the severity of the impact or of the position of the occupant of the vehicle. As already mentioned above the means for lengthening the straps are of two kinds. There is a pulley on which the lower ends of the straps are wound and which can be positioned in three different positions allowing three different lengths of

the straps. The straps are also folded in their length to form two S-bends retained by threads which can be melted to free the folds and thus allow a lengthening of the strap.

The teaching of D7 is thus to keep the straps of the prior art to be able to optimise the final shape of the airbag but to provide the airbag with strap length adjusting means.

The provision of release means adapted to release the connection to the fixed point thus goes against the teaching of D7 and consequently cannot be seen as being obvious for the skilled person.

3.7 D6 cannot change this situation. The aim of the invention according to D6 is to improve the state of the art shown in figures 16 and 17 of D6, in which an airbag is shown whose shape is controlled during inflation. A strap fixed at one end at a fixed point at the bottom of the airbag and at the other end to the wall of the airbag avoids inflation of the airbag towards the occupant during the initial phase of inflation until the tensile force applied on the strap exceeds a predetermined value under which the strap breaks and allows the airbag to be inflated to its full extent in the direction of the occupant. The difficulty identified in D6 with such an airbag is that it is difficult to provide a desirable final shape of the airbag.

D6 aims at improving this situation and proposes in the embodiment of figures 14 and 15 to use a strap with two filaments, a shorter one allowing an initial inflation

shape to be guaranteed and a longer one maintaining a desired final shape of the airbag when the shorter one is detached from the airbag wall due to the tensile force applied on it exceeding a predetermined value. The other embodiments described in D6 are constructed with the same principal of having a first length of strap retaining the airbag wall during initial inflation and a second length of strap guaranteeing the desired final shape. The embodiments only differing from each other by the way the two lengths are obtained.

It thus appears to be a clear teaching of D6 to always keep some straps or part of straps maintaining the airbag wall also when it is in its fully deployed condition so as to guarantee a desired final shape of the airbag.

In addition in D6 the part of the strap (filament) is always disconnected from the airbag wall due to the force exerted on it when the airbag is inflated and not in response to a predetermined signal from a sensor, so that this document rather would suggest to abandon the sensor system to come back to a purely mechanical device.

Under these circumstances, and notwithstanding that it would anyway go against the teaching of D7 as explained further above, this document would not suggest to release all the straps as is implicitly required by the wording of the three independent claims according to the main request and to do so in response to a signal from a sensor.

3.8 Since the first feature of the characterising portion of each of the independent claims does not follow in an obvious manner from the state of the art there is no need to examine in detail the contribution to inventive step of the three specific types of releasing means defined in these claims.

Nevertheless, for the sake of completeness the board would like to add the following.

The airbag of D10 functions on a purely mechanical basis like the one of D6 and is inflated in two steps. In a first step the airbag is inflated laterally and when the pressure and thus the force on the wall is large enough the retaining membrane is severed by being forced into the sharp edges of a fixed knife thus allowing the airbag to be inflated towards the occupant into its final shape. The board does not see how D10 could possibly suggest to the skilled man to use a moving knife as required by Claim 1 when the knife of D10 is fixed.

In D7 the slider block 20 is actuated by an electromagnetic switch which must be able to be placed into three different positions in order to be able to retain the pulley 15 in three different rotational positions defined by three radial notches allowing the straps to have three different lengths. It is not clear to the board how such an electromagnetic switch could technically be replaced by a pyrotechnic element as suggested by the appellant as this pyrotechnical element would have to be able to place the slider block into the three different positions. The board does not see how such a replacement could be obvious for the

skilled man in order to arrive at the subject-matter of Claim 2.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Vottner

S. Crane