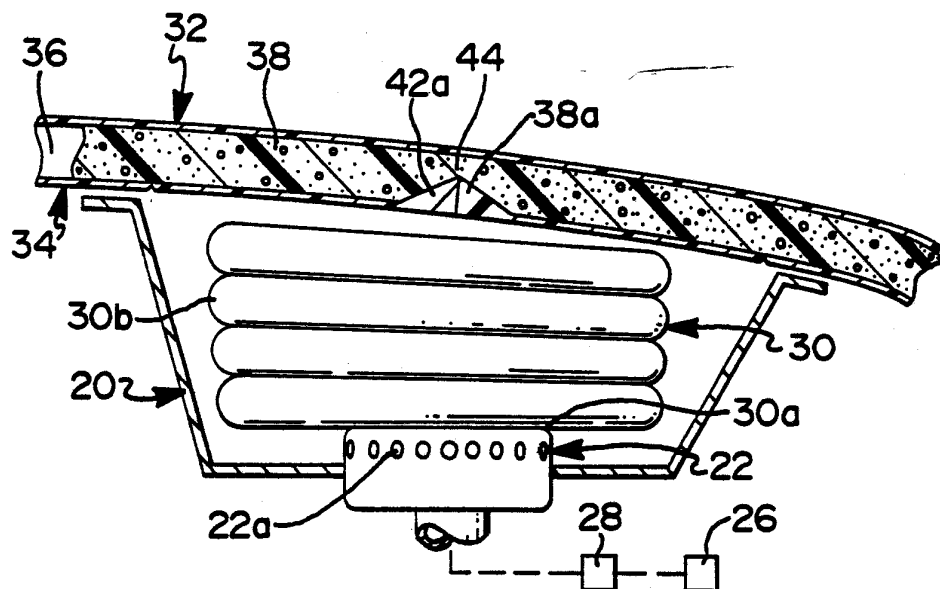




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> : <b>B60R 21/16</b>	<b>A1</b>	(11) International Publication Number: <b>WO 92/17351</b> (43) International Publication Date: 15 October 1992 (15.10.92)
<p>(21) International Application Number: PCT/US92/02289</p> <p>(22) International Filing Date: 20 March 1992 (20.03.92)</p> <p>(30) Priority data: 680,837                      5 April 1991 (05.04.91)                      US</p> <p>(71) Applicant: DAVIDSON TEXTRON, INC. [US/US]; Industrial Park, Dover, NH 03820 (US).</p> <p>(72) Inventor: NELSON, Eric, G. ; Route 153, Box 71 AR, Middleton, NH 03887 (US).</p> <p>(74) Agent: EVANS, John, C.; P.O. Box 4390, Troy, MI 48099-9998 (US).</p>	<p>(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), HU, IT (European patent), KR, LU (European patent), MC (European patent), NL (European patent), PL, RU, SE (European patent).</p> <p><b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: AIR BAG COVER RETAINER WITH CUTTING FLAPS



## (57) Abstract

A cover assembly for an air bag restraint system (20) has a smooth outer skin (32) with a backing layer of foam (38) located between the outer skin (32) cover and a retainer member (34). The retainer member (34) is located above the outlet of an air bag casing (24) and includes a plurality of flaps (36, 38, 40, 42) therein each having a pointed end located in a hidden position beneath the foam (38) and outer skin (32) cover and at a point generally centrally of the outlet of the casing (24). Each of the flaps is connected to the retainer member (34) by integral hinge segments (36b, 38b, 40b, 42b) in the retainer member. When the air bag (30) is inflated, it will cause the segments to pivot outwardly about the hinge segments to pierce both the foam layer and the outer skin and peel them apart so as to form a multi-sided opening through the cover assembly for deployment of the air bag (30).

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AIR BAG COVER RETAINER WITH CUTTING FLAPSField of the Invention

5                   This invention relates to air bag  
restraint systems for motor vehicles and more  
particularly to air bag restraint systems which are  
housed by a cover assembly for providing an  
invisible access door for deployment of the air bag  
10 following inflation thereof.

Background of the Invention

                  Various air bag restraint systems have  
15 been proposed in which an access door is arranged  
behind a continuously formed outer skin or cover.  
In some cases the underside of the outer skin is  
perforated or weakened. In such arrangements as  
shown in United States Patent Nos. 3,622,176 and  
20 4,246,213 the weakened sections represent  
underlying depressions in the outer cover which  
show as an outline of an access door for an  
underlying air bag assembly. Furthermore, such  
systems require that the outer cover be torn apart  
25 at the weakened seams. If the seams are irregular  
in form the opening force will vary and at times  
may tend to impede the release of an air bag.

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In other arrangements, the cover assembly includes a separate cutting device that will pierce the outer skin. Examples of such separate cutting devices are set forth in United States Patent No. 4,097,064 and copending United States Application 5 601,406 filed October 22, 1990.

#### Summary of the Invention

10 The present invention includes an invisible cover for an air bag restraint system which is easily fabricated using standard foam molding apparatus and which has a retainer with integral cutting flaps that pivot in response to  
15 air bag inflation to peel back segments of a foam layer and outer skin to form a deployment opening for passage of the air bag into the passenger compartment of the vehicle.

20 A feature of the present invention is to preform the cutting flaps in a retainer member of a foamed interior trim product of the vehicle of the type having an outer skin of plastic material, an intermediate foam layer for providing a soft  
25 feel and a retainer member for supporting the interior trim product within the vehicle; the flaps are formed as separate segments in the retainer each having a pointed end for piercing the foam and

outer skin and each having an integral hinge section at one end for allowing pivotal movement of the flaps so as to peel the foam layer and outer skin to form an air bag deployment opening.

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Still another feature of the present invention is to provide a cover assembly for concealing an air bag restraint assembly including an air bag, a housing for the air bag, a gas generator located in the housing for supplying gas to the air bag in response to vehicle impact; the cover assembly comprising an outer skin which covers the interior trim product and including a backing layer of foam behind the outer skin for supporting the outer skin; a retainer member underlying the foam backing layer has a portion thereof divided into a plurality of flaps formed therein each having pointed ends thereon located centrally of the outlet from an air bag housing; each of the flaps are integrally connected to the retainer member at a weakened section defining a hinge for pivotal movement to cause the pointed ends to penetrate both the foam layer and the outer skin to pierce and peel back segments of the foam backing layer and outer skin to form an opening therethrough for deployment of an air bag into the passenger compartment of a vehicle when inflated by the gas generator.

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A still further feature of the present invention is to provide a cover assembly for concealing an air bag restraint assembly including an air bag, a housing for the air bag, a gas generator located in the housing for supplying gas to the air bag in response to vehicle impact the cover assembly comprising: an outer skin covering an interior trim product and including a backing layer of foam behind the outer skin for defining a surface configuration on the outer skin; a retainer member underlying the foam backing layer has a portion thereof divided into a plurality of separate triangular flaps having their apexes located centrally of the outlet from an air bag housing; each of the triangular flaps has its base integrally connected to the retainer at a weakened section hinge line that allows pivotal movement of the flaps to cause the apexes to penetrate both the foam layer and the outer skin to pierce and peel back segments of the layer and outer skin to form an opening therethrough for deployment of an air bag into the passenger compartment of a vehicle when inflated by the gas generator.

In the construction of soft foam insert doors a preformed outer skin or shell member formed by casting vinyl particles on a heated mold surface is seated in a female cavity of a foam mold as set-

forth in United States Patent Nos. 4,784,366 and  
4,873,032, which are commonly assigned to the  
assignee in the present application, and are  
incorporated herein by reference. These patents  
5 disclose how a first retainer member is supported  
at construction holes on the lid of the mold which  
closes to form a mold space between the retainer  
and the preload vinyl skin. The retainer on the  
lid can also include a port through which foam  
10 precursors are directed into the mold space for  
reaction therein to form a cellular foam material  
that is soft to the feel. The resultant structure  
is removed from the foam mold and includes a vinyl  
skin which can be colored and grained to match the  
15 aesthetic appearance of the outer vinyl surface of  
an interior trim product such as an instrument  
panel having a upper opening therein for the  
deployment of an air bag. In the past, the  
retainer member has been weakened at a door segment  
20 but has required separate cutters. In the present  
invention, the cutters are formed integral of the  
retainer. Moreover, the integral flaps forming the  
cutters are hidden from view and do not pierce the  
frame until pivoted in a direction to perform a  
25 "peeling" of the backing foam and outer cover.

Brief Description of the Drawings

Other advantages of the present invention will be readily appreciated as the same become better understood by reference to the following detailed description when considered in connection  
5 with the accompanying drawings wherein:

FIG. 1 is a perspective view of an instrument panel or dashboard which is one suitable interior trim product for housing and providing an  
10 opening for deployment of an inflatable restraint into the passenger compartment of a motor vehicle;

FIG. 2 is an enlarged sectional view of one embodiment of the invention taken along the  
15 line 2-2 of FIG. 1; and

FIG. 3 is an enlarged sectional view like FIG. 2 but showing the retainer in an initial peel  
20 back air bag deployment position.

FIG. 4 is a perspective view of the retainer showing the integral cutting flaps in the  
25 embodiment of FIGS. 1-3;

FIG. 5 is a top elevational view of the retainer in FIG. 4;

FIG. 5A is an enlarged sectional view through line 5A-5A of FIG. 5; and

FIGS. 6-8 are perspective views of retainers in other embodiments of the invention.

Description of Preferred  
Embodiments of the Invention

10 Referring now to FIG. 1, a door assembly for an opening through which an inflatable restraint safety device is deployed into a passenger compartment is shown at 10. In this embodiment of the invention the door assembly 10 is shown in a top mount position and forming a hidden opening 12 in the surface 14 of a dashboard or instrument panel 16. The door assembly 10 is in an underlying relationship to a sloped front windshield 18. While shown in the upper surface of the instrument panel, the opening could also be formed in the front surface 16a of the instrument panel 16 in what is known as a mid-mount position. The top mount or mid-mount of the door assembly 10 depends upon the location of an underlying air bag restraint system 20. In the illustrated embodiment of FIG. 1, the air bag restraint system 20 includes a gas generator or canister 22 located in a canister housing or casing 24 mounted on a suitable

vehicle component not shown. The gas generator has a plurality of openings 22a through which a suitable inflatable gas flow when an impact sensor 26 is actuated upon vehicle impact to condition a controller 28 to initiate gas generation all as is well known to those skilled in the art. The inflatable is directed into the interior of an inflatable air bag 30 connected at one end 30a to the casing 24 and having convolutions 30b which expand as the air bag is inflated to impact against the underside of the door assembly 10 to cause it to peel apart for deployment of the air bag 30 through the opening 12.

In accordance with the invention, the door assembly includes a vinyl outer skin or cover 32 which can be formed from cast vinyl material by processes such as those set-forth in United States Patent Nos. 4,664,864 and 4,784,911, all commonly assigned to the same assignee as in the present application. Such outer covers 32 have colors and grain appearances that are accurately matched to the appearance of the surface of an associated interior trim product such as the illustrated instrument panel. The vinyl outer skin or cover 32 has edge portions 32a thereon bent over the peripheral edge 34a of an instrument panel retainer 34 of the type which is mounted on a lid of a foam

mold apparatus such as illustrated and described in United States Patent No. 4,806,094, commonly assigned to the same assignee as the present invention and incorporated herein by reference.

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In accordance with the present invention, the retainer is carried on mold apparatus lids and is located thereon so as to form a sealed connection with respect to the periphery of the outer skin or cover 32 so as to define a space 36 into which foam precursors are directed in a known manner for reaction to form a soft feel foam layer 38 behind the cover 32. The foam layer 38 forms a backing to support the outer cover 32 to produce a finished appearance that matches the styling and appearance of a other associated interior trim components.

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In accordance with one feature of the present invention, the retainer 34 has diagonally arranged cross openings 34a-34d therein forming the sides of four flaps 36, 38, 40 and 42 located in the plane of the remainder of the retainer 34. The retainer 34 is connected to vehicle frame members for supporting the instrument panel 16 within the vehicle. It is located such that the diagonally crossed openings 34a-34d intersect centrally of the outlet opening from the casing 24 for the air bag.

The flaps 36-42, in this embodiment, have a triangular shape and the apexes of each of the flaps have integral pointed cutting portions at 36a-42a to pierce a foam layer 44 located intermediate the retainer member 34 and the outer skin or cover 32 when the flaps 36-42 are pivoted outwardly as shown in FIG. 4. The bases of the triangular flaps 36-42 are connected at integrally formed weakened sections 36b-42b to the remainder of the retainer 34 to form hinges for upward and outward pivotal movement of each of the flaps as shown in FIG. 4.

While triangular flaps are illustrated, other forms of flaps may be formed in the retainer at a point above the outlet of the casing so long as the flaps are integral to the retainer and have a cutting end and a hinged end. For example, the flaps may have a truncated cone shape as shown at 50 in FIG. 6 with a weakened hinge segment 52. Flat end portions 54 have cutting edge 56 which severs a generally square segment from the foam and outer cover as the foam and outer skin are peeled apart to form an opening for deployment of the bag. FIG. 3A shows an H-pattern opening wherein the flaps 60 are rectangular with pointed integral cutting portions 62 with cutting edges 64.

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Openings 66a-66c form the H-pattern. Weakened integral hinges 68 join each flap to the retainer. FIG. 8 shows a scalloped pattern opening wherein the flaps 70 are curvilinear with pointed integral cutting portions 72 having cutting edges 74. Openings 76, 78 form the flaps 70. Integral weakened hinges 79 join the flaps 70 to the retainer.

In all cases, deployment of an air bag causes it to impact the inside surface of the retainer 34 to force the flaps upwardly and outwardly so as to produce a peeling type opening until the overlying cover material is fully peeled back to define an opening more or less congruent with the outline of the weakened segments in the retainer.

The door assembly of the subject invention thereby provides a soft skin door that is easily matched to adjacent interior trim products having foamed in place material and wherein the door assembly can be formed by standard foam molding apparatus without requiring special modifications to retainer components without modification of the lid for carrying such retainers and wherein the retainer has integral cutting flaps therein that are invisible from the exterior of an

interior trim product so that a passenger is  
unaware of the underlying air bag restraint system.  
While the invention is shown in association with a  
dashboard or instrument panel, it is equally  
5 suitable for use with other interior trim products  
such as driver side steering wheel housings. The  
arrangement is manufactured not only with standard  
equipment practicing standard steps, it enables the  
door to be made by less steps and with less  
10 components and in a more cost effective manner than  
cutter assemblies of the prior art.

The invention has been described in an  
illustrative manner, and it is to be understood  
15 that the terminology which has been used is  
intended to be in the nature of words of  
description rather than of limitation.

Obviously, many modifications and  
20 variations of the present invention in light of the  
above teachings may be made. It is therefore, to  
be understood that within the scope of the appended  
claims, the invention may be practiced otherwise  
than as specifically described.

25

What is claimed is:

1. A cover assembly for concealing an air bag restraint assembly including an air bag, a housing for the air bag, a gas generator located in the housing for supplying gas to the air bag in response to vehicle impact the cover assembly comprising:

an outer skin covering an interior trim product within the vehicle and a foam layer behind said outer skin for supporting said outer skin;

a retainer member underlying said foam layer and having a portion thereof divided into a plurality of segments formed integrally therein having cutting portions thereon located centrally of the outlet from an air bag housing;

each of said segments integrally connected by a weakened section hinge line to said retainer member for allowing pivotal movement of said segment to cause said cutting portions to penetrate both said foam layer and said outer skin to pierce and peel back segments of said foam layer and outer skin to form an opening therethrough for deployment of an air bag into the passenger

compartment of a vehicle when inflated by said gas generator.

2. A cover assembly for concealing an  
5 air bag restraint assembly including an air bag, a housing for the air bag, a gas generator located in the housing for supplying gas to the air bag in response to vehicle impact the cover assembly comprising:

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an outer skin covering an interior trim product within the vehicle and a foam layer behind said outer skin for supporting said outer skin;

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a retainer member underlying said backing layer and having crossed openings therein defining a plurality of separate flaps having cutting portions thereon located centrally of the  
20 outlet from an air bag housing;

each of said flaps integrally connected to said retainer member by a weakened section hinge line for allowing outward pivotal  
25 movement of said flaps to cause said cutting portions to penetrate both said foam layer and said outer skin to pierce and peel back segments of said foam layer and outer skin to form an opening

therethrough for deployment of an air bag into the passenger compartment of a vehicle when inflated by said gas generator.

5                   3.    A cover assembly for concealing an air bag restraint assembly including an air bag, a housing for the air bag, a gas generator located in the housing for supplying gas to the air bag in response to vehicle impact the cover assembly  
10 comprising:

                  an outer skin covering an interior trim product within the vehicle and including a foam layer behind said outer skin for supporting  
15 said outer skin;

                  a retainer member underlying said foam layer and having diagonally crossed openings therein dividing said retainer member into a  
20 plurality of segments formed therein having cutting portions thereon located centrally of the outlet from an air bag housing;

                  each of said segments connected at  
25 the base line thereof to said retainer member by a weakened section hinge line for allowing outward pivotal movement to cause said cutting apexes to penetrate both said foam layer and said outer skin

to pierce and peel back segments of said foam layer and outer skin to form an opening therethrough for deployment of an air bag into the passenger compartment of a vehicle when inflated by said gas generator.

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4. A cover assembly for concealing an air bag restraint assembly including an air bag, a housing for the air bag, a gas generator located in the housing for supplying gas to the air bag in response to vehicle impact the cover assembly comprising:

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an outer skin covering an interior trim product within the vehicle and a foam layer behind said outer skin for supporting said outer skin;

20  
a retainer member underlying said foam layer and having crossed straight openings dividing said retainer into a plurality of separate flaps each having cutting portions thereon located centrally of the outlet from an air bag housing;

25  
each of said flaps integrally connected to said retainer member by a weakened section hinge line for allowing outward pivotal movement to cause said cutting portions to

penetrate both said foam layer and said outer skin to pierce and peel back segments of said foam layer and outer skin to form an opening therethrough for deployment of an air bag into the passenger compartment of a vehicle when inflated by said gas generator.

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5. A cover assembly for concealing an air bag restraint assembly including an air bag, a housing for the air bag, a gas generator located in the housing for supplying gas to the air bag in response to vehicle impact the cover assembly comprising:

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an outer skin covering an interior trim product within the vehicle and a foam layer behind said outer skin for supporting said outer skin;

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a retainer member underlying said foam layer and having diagonally crossed, linear openings therethrough dividing said retainer member into a plurality of generally triangularly shaped segments having cutting portions thereon located centrally of the outlet from an air bag housing;

each of said generally triangularly shaped segments connected at the base line thereof

to said retainer member by a weakened section hinge line for allowing pivotal movement to cause said cutting apexes to penetrate both said foam layer and said outer skin to pierce and peel back segments of said foam layer and outer skin to form an opening therethrough for deployment of an air bag into the passenger compartment of a vehicle when inflated by said gas generator.

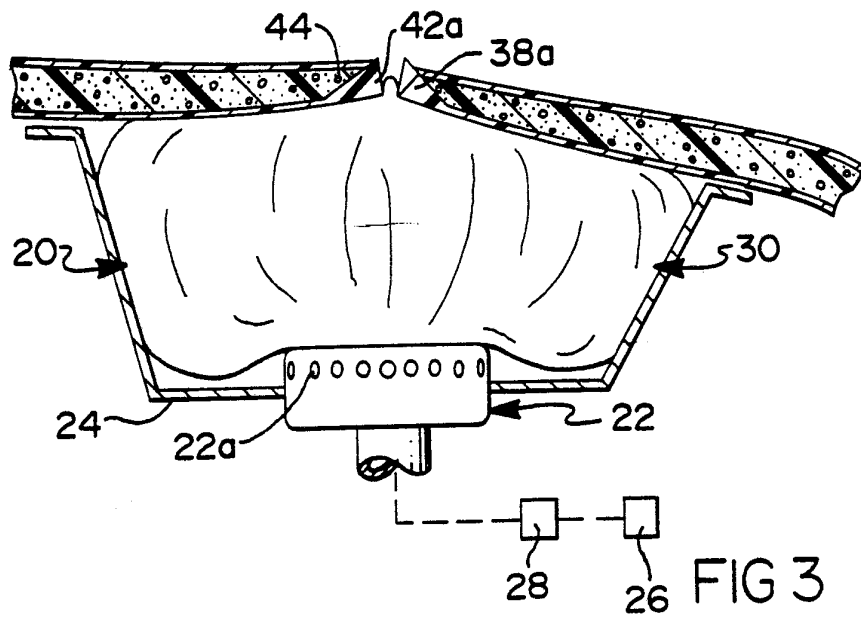
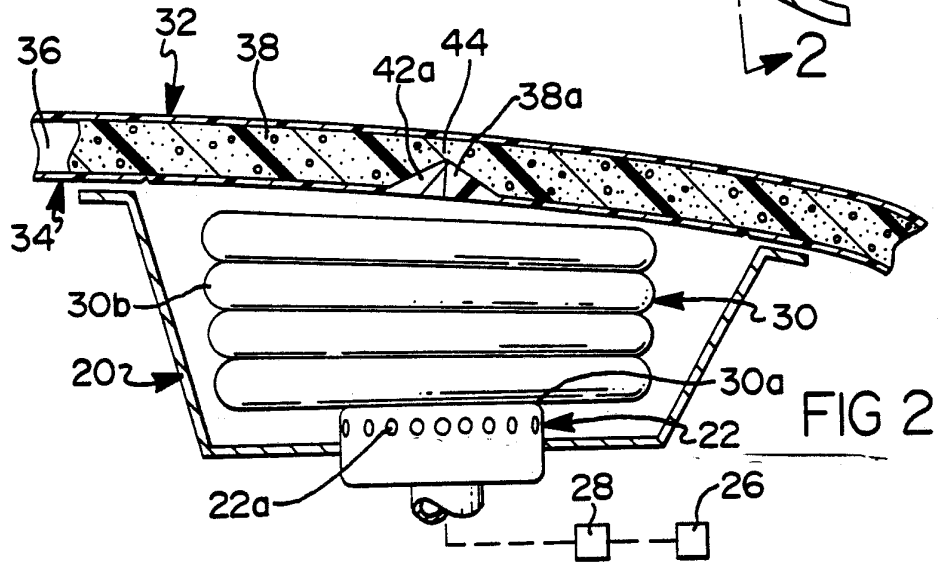
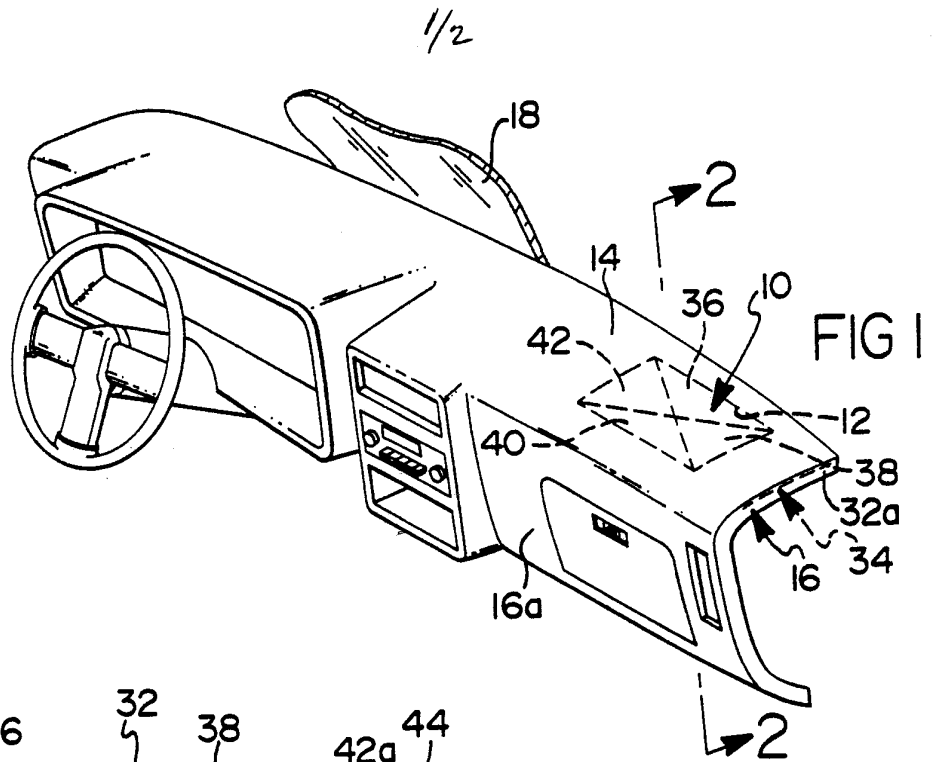
10                   6. A cover assembly for concealing an air bag restraint assembly including an air bag, a housing for the air bag, a gas generator located in the housing for supplying gas to the air bag in response to vehicle impact the cover assembly comprising:

15                   a retainer member underlying said foam layer and having crossed curvilinear openings dividing said retainer into a plurality of separate flaps each having cutting portions thereon located centrally of the outlet from an air bag housing;

25                   a retainer member underlying said backing layer and having crossed curvilinear openings dividing said retainer into a plurality of separate flaps each having cutting portions thereon

located centrally of the outlet from an air bag housing;

5                   each of said flaps integrally  
connected to said retainer member by a weakened  
section hinge line for allowing outward pivotal  
movement to cause said cutting portions to  
penetrate both said foam layer and said outer skin  
to pierce and peel back segments of said foam layer  
10 and outer skin to form an opening therethrough for  
deployment of an air bag into the passenger  
compartment of a vehicle when inflated by said gas  
generator.



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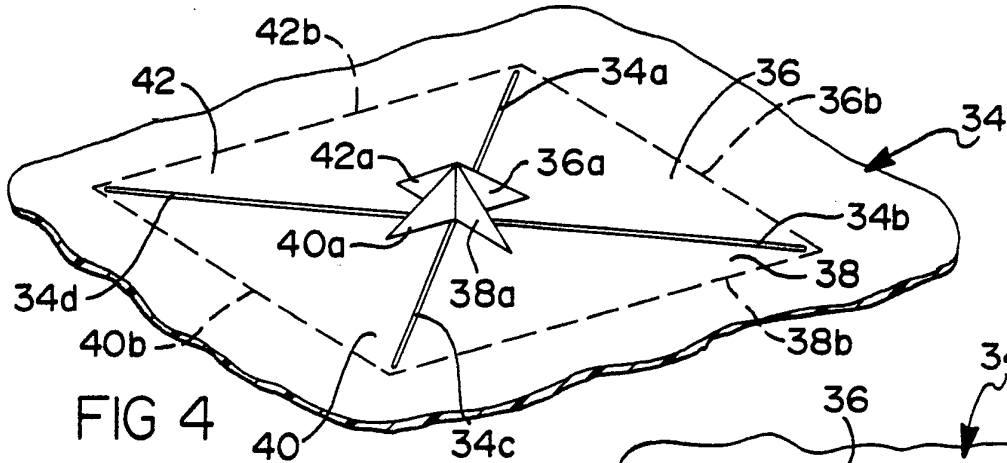


FIG 4



FIG 5A

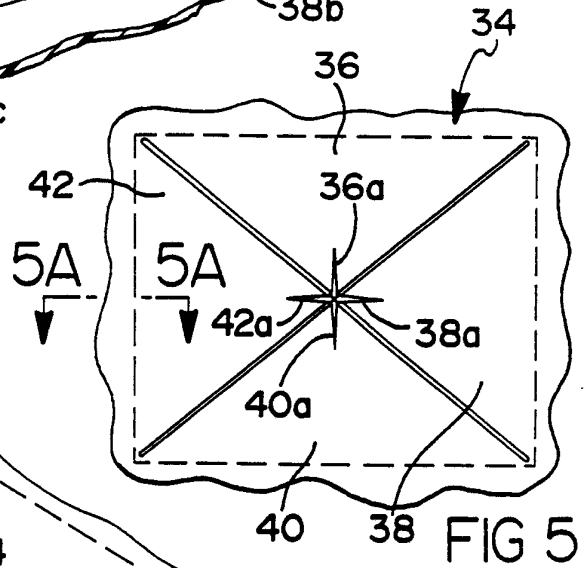


FIG 5

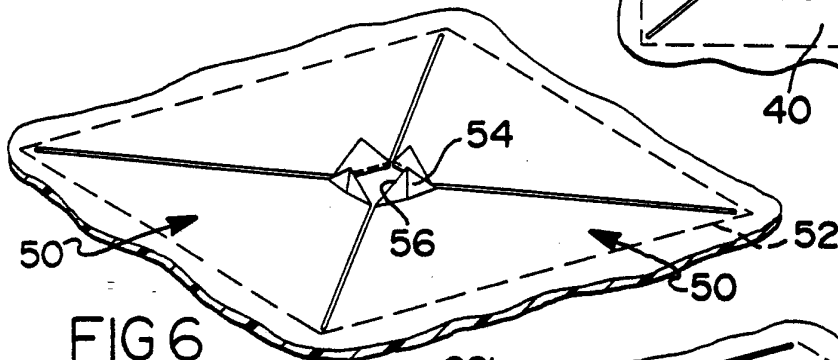


FIG 6

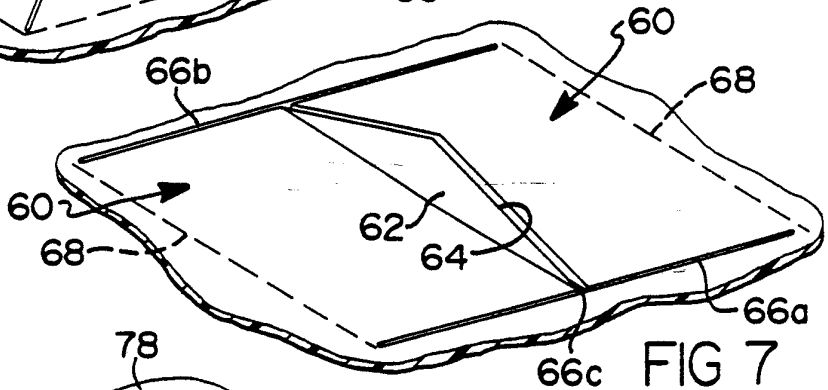


FIG 7

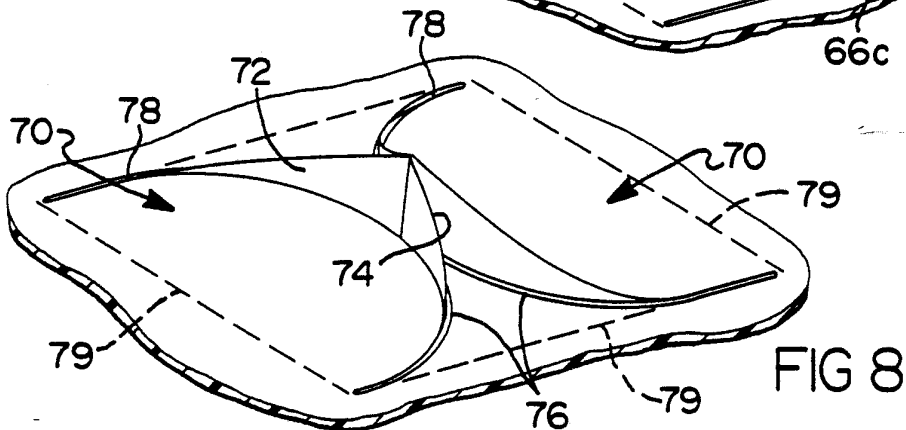


FIG 8

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US92/02289

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC(5) :B60R 21/16  
 US CL :280/732, 729, 743  
 According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**  
 Minimum documentation searched (classification system followed by classification symbols)  
 U.S. : 280/728, 731; 180/90

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

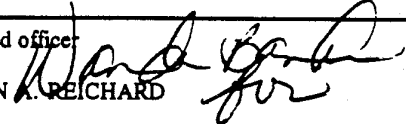
**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X <del>Y</del> ,P Y	EP, A, 0428935 A2 (BAUER) 29 May 1991, See the entire document.	3,4,6 1,2,5
Y,P	US, A, 5,035,444 (CARTER) 30 July 1991, See the entire document.	1,2,5
A,P	US, A, 5,046,758 (RAFFERTY ET AL) 10 September 1991, See the entire document.	
A,P	US, A, 5,009,452 (MILLER) 23 April 1991, See the entire document.	
A	US, A, 3,656,790 (TRUESDELL) 18 April 1972, See the entire document.	

Further documents are listed in the continuation of Box C.       See patent family annex.

<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be part of particular relevance</p> <p>"E" earlier document published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"Z" document member of the same patent family</p>
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Date of the actual completion of the international search 06 JULY 1992	Date of mailing of the international search report 03 AUG 1992
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