

(12) UK Patent Application (19) GB (11) 2481202 (13) A

(43) Date of A Publication

21.12.2011

(21) Application No: 1009885.3

(22) Date of Filing: 14.06.2010

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(51) INT CL:
B60N 2/42 (2006.01) B32B 5/26 (2006.01)
F41H 5/04 (2006.01)

(56) Documents Cited:
WO 2007/060405 A2 DE 010130632 A1
DE 102008049933 A1 US 3581620 A

(58) Field of Search:
INT CL A47C, B32B, B60N, F41H
Other: WPI, EPODOC, TXTE

(54) Title of the Invention: **A blast absorption seat**
Abstract Title: **A blast absorption seat**

(57) The present invention provides a blast absorption seat 10 for use in a vehicle, the seat including a frame 60, the seat including a shell defining a base 30 and a back part 20, the shell having lower 40 and upper 50 portions, the lower portion 40 comprising para-aramid and glass reinforced plastic (GRP), the upper portion 50 comprising carbon fibre and GRP, the seat further including foam members between the upper and lower portions of the shell. Preferably the seat may have at least one attachment position for attaching the seat to a vehicle and the seat may further have shock mountings 100 located at each attachment position. The seat is thought to be useful when an explosive device detonates close to a vehicle.

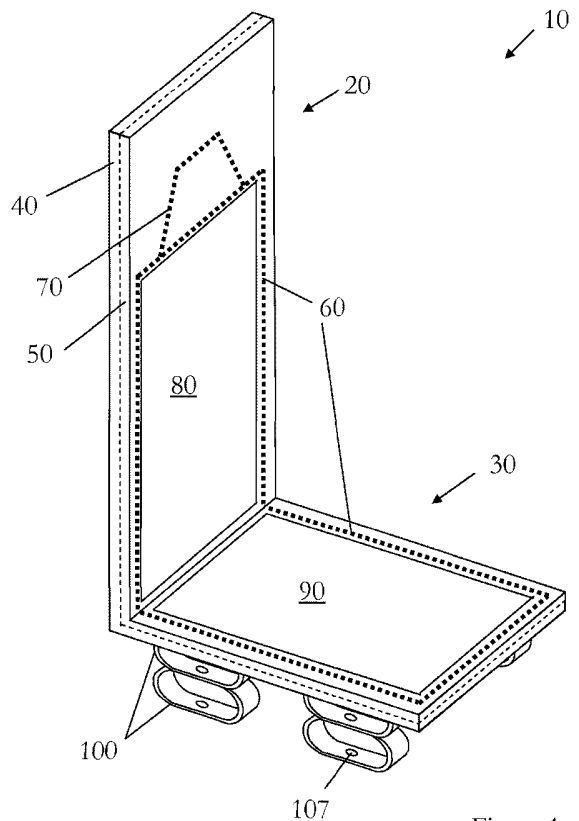


Figure 1

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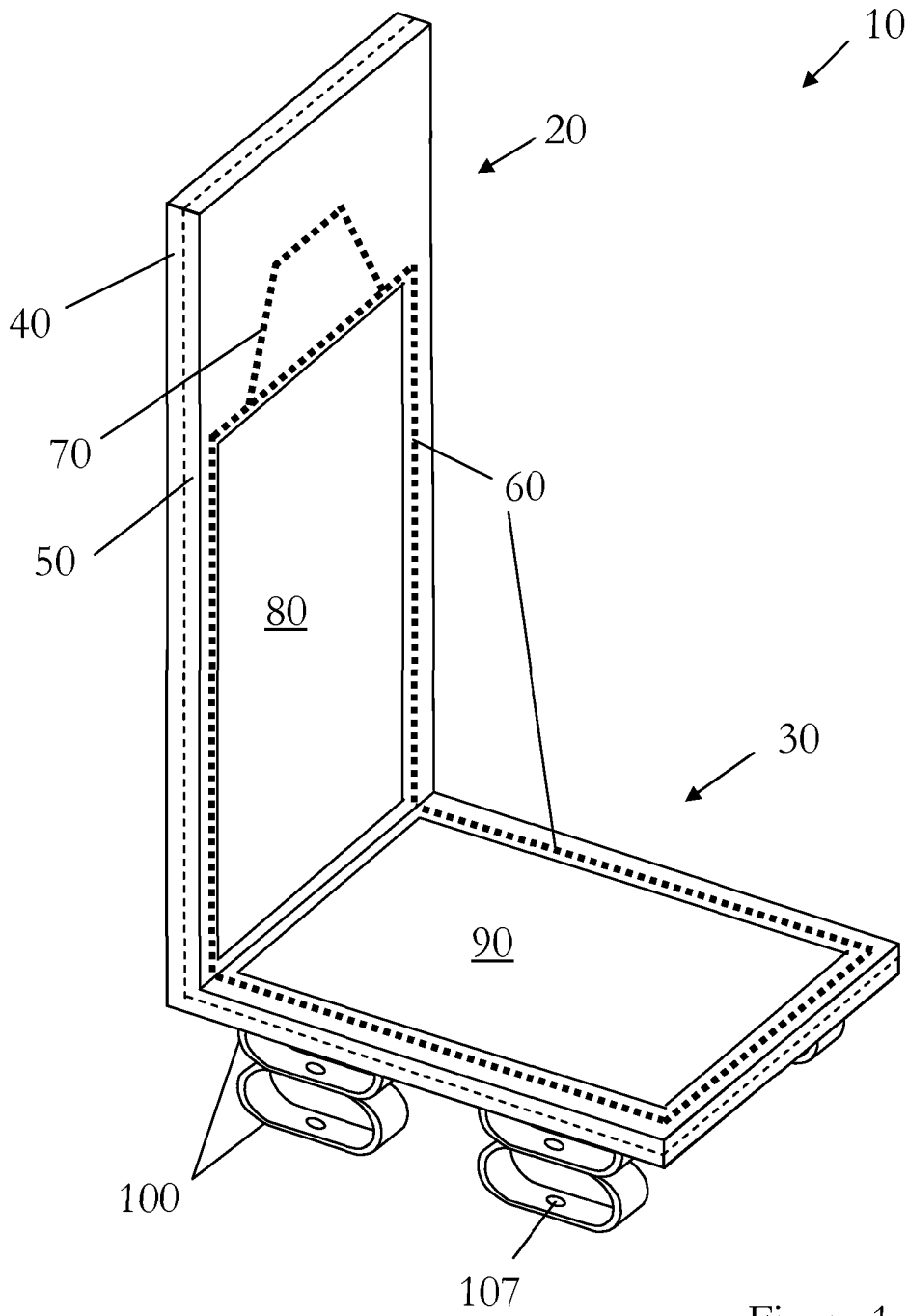


Figure 1

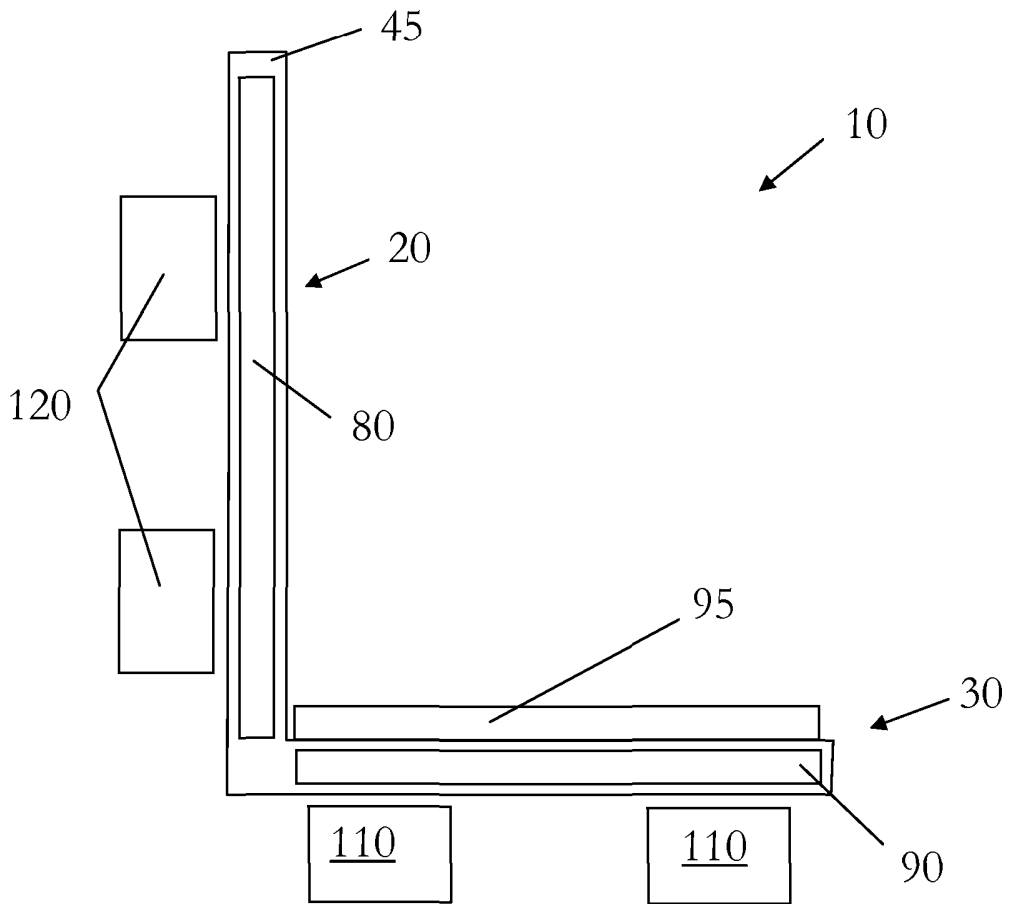


Figure 2

A blast absorption seat

The present invention relates generally to a blast absorption seat and finds particular, although not exclusive, utility in road vehicles.

5 When an explosive device detonates close to a vehicle, and possible under it, the force from the explosion pushes the vehicle seats upwards and/or sideways at a relatively great speed and acceleration. This force often causes severe injuries to the occupants of the seat particularly with regard to their spinal and pelvic areas.

10 It is known to use seats mounted on pistons in an attempt to absorb some or all of this force, however, the pistons tend to be relatively heavy and tall and are not easily fitted to existing vehicles due to height constraints. Another known type of blast absorption seat is one mounted on leaf type springs. However, these are not preferable either because they absorb limited forces or, again, have problems with height

15 The present invention provides a blast absorption seat for use in a vehicle, the seat including a frame, the seat including a shell defining a base and a back part, the shell having lower and upper portions, the lower portion comprising Kevlar (RTM) (RTM) and GRP, the upper portion comprising carbon fibre and GRP, the seat further including foam members between the upper and lower portions of the shell.

20 The type of vehicle may have a weight of between 4 and 25 tonnes, although size vehicles are contemplated. The foam members may be Confor (RTM) foam members.

25 In use, the vertical component of the force is absorbed by the lower and upper portions of the shell compressing together and squeezing the foam members therebetween.

 The seat may further include at least one foam member on top of the upper portion of the shell.

 The foam member on top of the upper portion of the shell may be approximately 50 to 70 mm in thickness.

30 The foam member between the upper and lower portions of the shell in the base part may be approximately 50 to 70 mm in thickness.

 At least part of the frame may be embedded in the upper and/or lower shell portions.

The shell may be formed as one piece or as more than one piece joined together.

5 The frame may include tubular sections. The frame may extend substantially around, and inside, the perimeter of the seat back and base parts. This may be to avoid as many metallic parts being located beneath or behind a person when occupying the seat, as possible.

However, the frame may include sheet sections, such as sheet steel. This may be as well as, or instead of, the tubular sections. In this case, some of the sheet sections may be located directly underneath or behind a person when occupying the seat such that they may provide some protection to the person when encountering an explosion.

10 The seat may have a harness attached to the frame. The harness may be of the type used for restraining movement of the persons occupying the seat.

The seat may have at least one attachment position for attaching the seat to a vehicle, the seat further having shock mountings located at each attachment position.

15 The shock mountings may be substantially elliptical in shape. The shock mountings may be of the type made by Caparo, or Christie & Grey under the trade name "Type X".

20 The seat may have at least two shock mountings, arranged in series, per attachment position. In this regard, the term series means that the mountings are arranged immediately adjacent one another and connected together so that any force has to pass through each mounting in turn. When arranged underneath the seat the mountings may be substantially on top of one another. When arranged behind the back of the seat the mountings may be substantially side by side.

25 The seat may be arranged to at least partially absorb an external force such that an occupant of the seat, in use, experiences only a force of substantially no more than 6kN for more than approximately 6 ms. This force may be as measured in the pelvic region of the occupant.

30 Alternatively, or additionally, the seat may be arranged to at least partially absorb an external force such that an occupant of the seat, in use, experiences only a force of substantially no more than 23G for more than approximately 6 ms. This force may be as measured in the pelvic region of the occupant.

The above and other characteristics, features and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the

principles of the invention. This description is given for the sake of example only, without limiting the scope of the invention. The reference figures quoted below refer to the attached drawings.

5 Figure 1 is a perspective view of a seat; and
 Figure 2 is an elevational view of the seat of Figure 1.

 The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only
10 by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn to scale for illustrative purposes. The dimensions and the relative dimensions do not correspond to actual reductions to practice of the invention.

 Furthermore, the terms first, second, third and the like in the description and in
15 the claims, are used for distinguishing between similar elements and not necessarily for describing a sequence, either temporally, spatially, in ranking or in any other manner. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

20 Moreover, the terms top, bottom, over, under and the like in the description and the claims are used for descriptive purposes and not necessarily for describing relative positions. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other orientations than described or illustrated herein.

25 It is to be noticed that the term “comprising”, used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It is thus to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or
30 groups thereof. Thus, the scope of the expression “a device comprising means A and B” should not be limited to devices consisting only of components A and B. It means that with respect to the present invention, the only relevant components of the device are A and B.

Reference throughout this specification to “one embodiment” or “an embodiment” means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases “in one embodiment” or “in an
5 embodiment” in various places throughout this specification are not necessarily all referring to the same embodiment, but may refer to different embodiments. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments.

10 Similarly it should be appreciated that in the description of exemplary embodiments of the invention, various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted
15 as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the detailed description are hereby expressly incorporated into this detailed description, with each claim standing on its own as a separate embodiment of this
20 invention.

Furthermore, while some embodiments described herein include some features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form yet further embodiments, as will be understood by those skilled in the art. For example, in the following claims, any
25 of the claimed embodiments can be used in any combination.

In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practised without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of
30 this description.

The invention will now be described by a detailed description of several embodiments of the invention. It is clear that other embodiments of the invention can be configured according to the knowledge of persons skilled in the art without departing

from the true spirit or technical teaching of the invention, the invention being limited only by the terms of the appended claims.

A general arrangement of a seat 10 is depicted in Figure 1. It comprises a back part 20 and a base part 30, the base part for being sat on in use. The seat further comprises an upper shell 50 and a lower shell 40. The two shells may be joined together, such as by adhesive, welds, or mechanical fixings, and/or to a common element such as a frame 60. Alternatively, the shell may be formed as one piece. The shells form a space therebetween having a thickness of 50 mm.

The lower shell 40 comprises woven GRP and Kevlar (RTM). It may be rigid. This shell helps protect seat occupants from small arms fire and spall (shrapnel) from explosions. The upper shell 50 comprises carbon fibre and GRP allowing it to flex and compress into the foam pads 80, 90 when absorbing a force due to acceleration.

The back part 20 and base part 30 of the seat 10 are both substantially rectangular, although other shapes are contemplated.

The seat 10 also includes foam pads 80, 90. One pad 80 is located within the back part 20 of the seat 10. One pad 90 is located in the base part 30 of the seat 10. The pads are substantially the same size as the shells 40, 50 such that they fill the void within.

A frame 60 (indicated in the Figure by a broken line within the shells 40, 50) is provided substantially around the perimeter of each of the back 20 and base 30 parts of the seat 10. It includes an upper portion 70 in the region of a seat occupant's neck/head, in use.

The seat 10 is mounted on shock mounts 100. These are substantially elliptical in shape comprising two bands of stainless steel, one inside the other, with a composite material, or cushion, located between them. The bands are fixed to each other and to the vehicle and seat at locations approximately at the mid point 107 of each long side by appropriate fixings such as bolts.

The seat 10 includes two shock mounts 100 at each fixing point, and there are four fixing points, one substantially at each corner of the base part 30.

In Figure 2, an elevational view of the seat 10 is shown. The seat 10 includes a back part 20 and a base part 30. The foam pads 80, 90 are visible within the seat 10. An additional foam pad 95 is included on top of the upper shell 50 forming the base part 30.

The shock mounting are generally indicated at positions referenced 110 underneath the seat 10 and referenced 120 if located behind the back part 20 of the seat 10.

5 In use, with an explosion occurring underneath a vehicle including such a seat 10, the force drives the seat and its occupant upwards. Some of this upwards force will be absorbed by the shock mountings 100. This occurs because the upper and lower long sides of the mountings compress inwardly towards one another.

10 Also, the upper 50 and lower 40 shell portions will compress inwardly towards one another. The foam pad 90 will be compressed by the two shells 40, 50. The foam pads are of the type which when compressed become more solid and less resilient, absorbing the force.

The foam pad 95 on the top of the base part 30 of the seat 10 will also compress between the underside of the occupant and the upper shell portion 50. It also becomes more solid and less resilient when compressed.

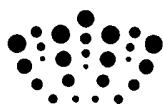
15 Accordingly some of the force that is directed upwardly by the explosion will be absorbed by two shock mountings, two shells and two foam pads before reaching the occupant. This may reduce the force to such an extent that spinal and pelvic injuries are not as life threatening as without the seat 10.

20

Claims

1. A blast absorption seat for use in a vehicle, the seat including a frame, the seat including a shell defining a base and a back part, the shell having lower and upper portions, the lower portion comprising Kevlar (RTM) (RTM) and GRP, the upper portion comprising carbon fibre and GRP, the seat further including foam members between the upper and lower portions of the shell.
5
2. The seat of claim 1, further including at least one foam member on top of the upper portion of the shell.
10
3. The seat of claim 2, wherein the foam member on top of the upper portion of the shell is approximately 50mm in thickness.
4. The seat of any preceding claim, wherein the foam member between the upper and lower portions of the shell in the base part is approximately 50mm in thickness.
15
5. The seat of any preceding claim, wherein at least part of the frame is embedded in the upper and/or lower shell portions.
20
6. The seat of any preceding claim, wherein the frame includes tubular sections.
7. The seat of any preceding claim, wherein the frame includes sheet sections.
25
8. The seat of any preceding claim, further having a harness attached to the frame.
9. The seat of any preceding claim, having at least one attachment position for attaching the seat to a vehicle, the seat further having shock mountings located at each attachment position.
30

10. The seat of claim 9, wherein the shock mountings are substantially elliptical in shape.
- 5 11. The seat of either one of claims 9 and 10, having at least two shock mountings, arranged in series, per attachment position.
- 10 12. The seat of any preceding claim, being arranged to at least partially absorb an external force such that an occupant of the seat, in use, experiences only a force of substantially no more than 6kN for more than approximately 6 ms.
13. A blast absorption seat substantially as hereinbefore described with reference to the accompanying drawings.



Application No: GB1009885.3

Examiner: Melanie Bull

Claims searched: 1-13

Date of search: 28 September 2010

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
A	-	DE102008049933 A1 (WOLFF)
A	-	WO2007/060405 A2 (CONSTANT DEVELOPMENTS LTD)
A	-	DE10130632 A1 (KRAUSS-MAFFEI)
A	-	US3581620 A (NORTON)

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 :

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

A47C; B32B; B60N; F41H

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

WPI, EPODOC, TXTE

International Classification:

Subclass	Subgroup	Valid From
B60N	0002/42	01/01/2006
B32B	0005/26	01/01/2006
F41H	0005/04	01/01/2006