Title: SAFETY ARRANGEMENT FOR A BED IN A VEHICLE

Abstract: The invention relates to a safety arrangement (1) for a bed (2) in a vehicle, comprising at least one device (5) which catches a person lying in the bed (2) and which can be arranged at least partially around the bed (2). The catching device is arranged so that it can be pushed partially along a longitudinal side (6) of the bed (2) in order, in a pushed-closed position, to allow the person to get in and out of the bed (2).
IT, LU, MC, NL, PT, SE, TR), OAPI patent (BE, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
Safety arrangement for a bed in a vehicle

The present invention relates to a safety arrangement for a bed in a vehicle, comprising at least one device which catches a person lying in the bed and which can be arranged at least partially around the bed.

The cabs of lorries and trucks can include a sleeping area behind the driver and passenger seats. The sleeping area is provided with one or more beds so that the driver or the passenger can sleep or rest in said area. If a person is lying in the bed during travel, it is desirable, and in some countries even a requirement, that the bed be provided with a safety arrangement to prevent the person from being injured in the event of a violent impact on the vehicle, for example in a collision or if the vehicle rolls over. It also happens that objects such as items of luggage or the like are kept on the bed. It is therefore important that the driver or a passenger sitting alongside the driver is not struck and injured by these objects if the vehicle is in a collision or brakes sharply.

It is already known to arrange a safety net in front of and above a bed located in a vehicle cab. The net is connected to the bed and to the walls of the vehicle cab. In a collision, the net is intended to catch the person lying in the bed. The net is connected in a releasable manner to the floor and walls of the vehicle cab via a number of fastening devices so that the person can get in and out of the bed.

However, it has been found to be time-consuming and laborious to handle these fastening devices each time the safety net is to be used and when the person using the safety net wants to get in and out of the bed. The laborious handling of the known safety net can also mean that, for reasons of convenience, the net is not used.
In order to simplify the handling of such a safety net, US-A-5,375,879 proposes a safety net which, in the inactive position, can be stored rolled-up on a number of pre-tensioned rollers. However, this safety net has a plurality of fastening devices which have to be handled when getting in and out of the bed. Said net also provides a relatively small area of protection since its width is considerably smaller than the length of the bed, which means that the head and feet of the person lying in the bed are not well protected. If objects are placed on the bed, it is possible for these to be flung forwards past the net at the ends of the bed and thus strike the driver or a passenger sitting alongside the driver.

It is therefore an object of the present invention to make available a safety arrangement which is arranged on a bed in a vehicle and which is easy to handle and at the same time provides a large area of protection.

This is achieved by means of a safety arrangement of the type indicated in the introduction, where the catching device is arranged so that it can be pushed partially along a longitudinal side of the bed in order, in a pushed-closed position, to give protection to the person lying in the bed and, in a pushed-open position, to allow the person to get in and out of the bed.

Such a safety arrangement means that it is easy for a person to get in and out of the bed since the catching device only needs to be displaced along a longitudinal side between a pushed-closed position and a pushed-open position. Since the catching device is easy to handle, this encourages a person lying in the bed to actually use the safety arrangement.

The invention will be explained in more detail with reference to illustrative embodiments shown in the attached figures, in which

Fig. 1 shows a first illustrative embodiment of a safety arrangement according to the present invention in a pushed-closed position,
Fig. 2 shows the safety arrangement according to Fig. 1 in a pushed-open position.

Fig. 3 shows a partial view of a safety arrangement according to a second illustrative embodiment of the invention,

Fig. 4 shows a partial view of a displaceable securing device according to the invention,

Fig. 5 shows a locking-element according to the invention,

Fig. 6 shows a tensioning arrangement according to the invention,

Fig. 7 shows how the tensioning arrangement cooperates with a safety arrangement according to a third illustrative embodiment of the invention,

Fig. 8 shows how the tensioning arrangement cooperates with a safety arrangement according to a fourth illustrative embodiment of the invention,

Fig. 9 shows how the tensioning device cooperates with a safety arrangement according to a fifth illustrative embodiment of the invention,

Fig. 10 shows a safety arrangement according to a sixth illustrative embodiment,

Fig. 11 shows a safety arrangement according to a seventh illustrative embodiment,

Fig. 12 shows a safety arrangement according to an eighth illustrative embodiment, and
Fig. 13 shows a safety arrangement according to a ninth illustrative embodiment,

A first illustrative embodiment of a safety arrangement 1 according to the invention is shown in Fig. 1. The safety arrangement 1 is arranged on a bed 2 in a vehicle, for example in the vehicle cab 3 of a lorry or truck, and comprises at least one device for catching a person lying in the bed 2. According to the illustrative embodiment shown, the catching device consists of a net 5 which is made up of belts 4 and which can be arranged at least partially around and over the bed 2. The net 5 is at least partially displaceable along a longitudinal side 6 of the bed 2 in order, in a pushed-closed position, to provide protection to the person lying in the bed 2 and, in a pushed-open position, to allow the person to get in and out of the bed 2. By arranging the net 5 so that it can be pushed sideways, i.e. in a horizontal direction along a longitudinal side 6 of the bed 2, the net 5 is made easier to use.

As is shown in Fig. 1, two nets 5 are preferably arranged alongside each other and can be displaced along the longitudinal side 6 of the bed 2 in such a way that, in a pushed-closed position, they together have a width which corresponds substantially to the length of the longitudinal side 6 of the bed 2. The bed 2 is preferably oriented in the vehicle cab 3 in such a way that the longitudinal side 6 of the bed 2 is substantially directed towards, and extends substantially at right angles to, the direction of travel of the vehicle.

The nets 5 are connected to a vehicle cab 3 surrounding the bed 2. In the illustrative embodiment shown, each net 5 converges towards a respective central attachment point 7 on the wall 8 of the vehicle cab 3. This wall 8 is a rear wall of the vehicle cab 3. The nets 5 can be securely anchored in or releasably connected to the wall 8 of the vehicle cab 3. At least one of the belts 4 in each net 5 comprises a stiffening element 9 which supports at least
a portion 10 of the respective net 5. Only one stiffening element 9 is indicated by broken lines in Fig. 1. The stiffening elements 9 preferably extend from the area where the belts 4 are attached to the bed 2 and further upwards towards the common attachment point 7 on the wall 8 of the vehicle cab 3. Alternatively, the stiffening elements 9 extend from the attachment point 7 on the wall 8 and onwards towards the areas of attachment of the belts 4 on the bed 2. The stiffening elements 9 are designed such that the nets 5 come to have an arc shape, which means that the space created under the nets 5 is sufficiently large to allow a person lying in the bed 2 to sit up in the bed 2. Alternatively, the belts 4 can extend in a plane which coincides with the attachment points 7 and the longitudinal side 6 of the bed 2. According to this alternative, no stiffening elements 9 are required. It is also conceivable to connect the upper end of the nets 5 to the roof of the vehicle cab 3 instead of to the attachment points 7.

Fig. 2 shows the safety arrangement 1 in a pushed-open position. The nets 5 can be connected to the longitudinal side 6 of the bed 2 in different ways. The left-hand net 5 in Fig. 2 is arranged displaceably with its belts 4 in a rail 11 provided with a track 12 which is common to all the belts 4 and which means that the width of the net 5 in the pushed-open position will correspond to the combined width of the respective belts 4. The right-hand net 5 in Fig. 2 has each belt 4 displaceably arranged in a track 12 which is provided separately for each belt 4 and which means that the width of the net 5 in the pushed-open position will correspond to the width of one belt 4.

Fig. 3 shows in detail how a rail 11 with a plurality of tracks 12 is arranged on the longitudinal side 6 of the bed 2. The tracks 12 extend parallel to each other and a belt 4 is arranged displaceably in each track 12. As is shown in Fig. 2, a fixing eyelet 13 or the like can be arranged on the side wall 14 of the vehicle cab 3 in order to fix each net 5 in the pushed-open position.
Fig. 4 shows how a rail 11, which is provided with a track 12 common to all the belts 4, cooperates with each belt 4. In the track 12 there is a slide piece 15 which is connected to the belt 4. The slide piece 15 is preferably made of such a material and adapted to the track 12 in such a way that no jarring noises, such as rattling or squeaking, are caused by the vibrations which are generated by the vehicle during travel. The rail 11 can be made of an aluminium profile which extends along the whole of the longitudinal side 6 of the bed 2. If a plurality of tracks are arranged in parallel in the rail 11, the tracks 12 and the nets 5 can be arranged in such a way that the two nets 5, in a pushed-closed position, partially overlap.

Fig. 5 shows how a locking mechanism 16 can be arranged on the rail 11 so that the nets 5 can be locked and fixed in the pushed-open position. The locking mechanism 16 comprises a heel 17 which is pre-tensioned by a spring in the track 12 and which can pivot about an axis 18. The pivotable heel 17 is connected via the axis 18 to a handle 19. By turning the handle 19 clockwise, as is shown in Fig. 5, the heel 17 will overcome the spring force and pivot counterclockwise to a position in which the heel 17 extends substantially parallel to the bottom surface 20 of the track 12. In this position, the slide piece 15 is allowed to pass the heel 17, so that the net 5 can be moved to the pushed-open position. When the nets 5 are moved from the pushed-open position to the pushed-closed position, the slide piece 15 will press the heel 17 down so that the spring force is overcome. When the slide piece 15 reaches a stop element 21 arranged in the track 12, the slide piece 15 has moved past the heel 17, which is then pushed up by the spring force so that the slide piece 15 is fixed between the stop element 21 and the heel 17. The stop element 21 is preferably arranged at a location in the track 12 of the rail 11 which corresponds to the mid-point of the length of the track 12. The stop element 21 thus constitutes an end-position for both nets 5. Instead of a spring, the handle 19 can be provided with a counterweight 22 which ensures that the handle 19 and thus the heel 17 tend towards a starting position which corresponds to the locked position shown in Fig. 5.
Alternatively, the locking mechanism 16 can be replaced by a conventional seatbelt lock. The connection between the belts 4 and the slide pieces 15 can also consist of a conventional seatbelt lock, which would make it easier to remove the nets 5 in an emergency situation.

Fig. 6 shows a tensioning arrangement 23 which is connected to the net 5, which tensioning arrangement 23 is designed to stretch and tension the net 5 if the vehicle is exposed to violent impacts. The tensioning device 23 comprises a gas generator 24 and a pre-tensioning element 25. The tensioning arrangement 23 is connected to the rail 11, so that the rail 11 comes to rotate about its longitudinal axis 26 if the vehicle is exposed to a violent impact, for example if the vehicle is in a collision or rolls over. The nets 5 are then tensioned so that the space under the nets 5 decreases. This means that the person lying in the bed 2 is prevented from being thrown about in the bed 2, for example in a collision. The tensioning arrangement 23 can be connected to a sensor 27 which detects impacts of the vehicle.

In order to further limit the size of the space in the event of a collision, the bed 2 can be provided with first and second bases 28, 29, as are shown in a third illustrative embodiment of the invention in Fig. 7. The bases 28, 29 are coupled together via a hinge 30 so that they can rotate relative to each other about an axis extending through the hinge 30 and extending substantially parallel to the longitudinal side 6 of the bed 2. The nets 5 are connected to the first base 28, so that the first base 28 rotates about the hinge 30 when the tensioning arrangement 23 stretches and tensions the nets 5. To allow the first base 28 to rotate about the hinge 30, a mattress 36 arranged on the bed 2 must be sufficiently soft and yielding to be compressed in the area of the hinge 30. Alternatively, the hinge 30 can be arranged on the top of the bed 2, as is shown according to a fourth illustrative embodiment in Fig. 8. According to this fourth illustrative embodiment, the hinge 30 can consist of a piece of fabric 37 or the like which connects two parts of the mattress 36 of the bed 2. According to the third and fourth illustrative embodiments, the
tensioning arrangement 23 preferably cooperates with the rail 11 and the nets 5, as has been described in relation to Fig. 6.

Fig. 9 shows how the tensioning arrangement 23 cooperates with a safety arrangement 1 according to a fifth illustrative embodiment of the invention. According to this illustrative embodiment, the rail 11 is provided with a gear wheel 31 which is designed to cooperate with a gear rack 32. If the vehicle is exposed to a violent impact, the tensioning arrangement 23 will pull the rail 11 and with it the gear wheel 31 along the gear rack 32. The rail 11 is thus simultaneously rotated and moved in a direction towards the floor 33 of the vehicle cab 3, so that the nets 5 are tensioned.

Instead of placing one or more tensioning arrangements 23 at the point where the nets 5 are attached to the bed 2, a tensioning arrangement 23 can be placed at the attachment point 7 of the respective net 5 on the wall 8 of the vehicle cab 3.

Fig. 10 shows a sixth illustrative embodiment of the invention, where the belts 4 of the net 5 are inflatable. The fact that the belts 4 are inflatable is here understood to mean that the belts 4 themselves can be inflated or that an element (not shown) on the belts 4 can be inflated. However, a combination of these is also possible. Fig. 10 shows how the belts of the net 5 have been inflated in the event of a violent impact, so that airbags 34 have been formed. The space which is delimited by the bed 2, the walls 8, 14 of the vehicle cab 3 and the nets 5 has become smaller, which means that there is less possibility of the person lying in the bed 2 being thrown around in the limited space. The inflated belts 4 have also contributed to the person being caught gently by the net 5 during the violent impact.

At least one inflating means such as a gas generator 24 is connected to the belts 4 which are to be inflated. It is preferable for a number of belts 4 to be inflatable, for which reason it is expedient to arrange a gas generator 24 at
the attachment point 7 of each net 5 to the wall 8 of the vehicle cab 3. The
gas generator 24 can also be arranged on or in the respective belt 4. The
gas generator 24 is coupled to a sensor 27 which detects impacts of the
vehicle and which emits a signal to inflate one or more of the belts 4 of the
net if the vehicle is exposed to a violent impact, for example in a collision.
The position of the sensor 27 is shown diagrammatically in Fig. 10. Instead
of or as a means of complementing the gas generator 24, a powder gas
charge or the like can be used for inflating the belts 4.

A flexible element 35 can be arranged between the belts 4, which flexible
element 35 covers substantially the whole of the net 5. In Fig. 10, for
purposes of clarity, only one pair of the openings formed between the belts 4
has been provided with a flexible element 35. The flexible element 35 is
preferably made of a woven material with a dark colour in order thereby to
damp the light in the space under the nets 5.

Fig. 11 shows a seventh illustrative embodiment of the present invention,
where each belt 4 of the net 5 is provided with a shock-absorbing element
38, such as padded cushions, which are placed in a row along the
longitudinal side 6 of the bed 2. The elements 38 are preferably connected to
each other via a flexible woven material 39 or the like, so that the elements
38 can be turned and folded against each other along the woven material 39
when the nets 5 are to be moved to the pushed-open position. Each belt 4
and element 38 thus comes to be turned approximately 90°. To make this
pivoting easier, a pivotable coupling (not shown) can be arranged between
each belt 4 and slide piece 15.

Fig. 12 shows an eighth embodiment of the invention, where the rail 11 is
divided into two sections 40, 41 whose combined length substantially
corresponds to the length of the longitudinal side 6 of the bed 2. One net 5
can then be displaced in one section 40 and the other net 5 can be displaced
in the other section 41. The two sections 40, 41 can be articulated on the
side walls 14 of the vehicle cab 3 and can be folded up towards these when
the nets 5 are pushed open. This simplifies the folding away or removal of
the bed 2. The two sections 40, 41 can each have a length which is longer
than half the longitudinal side 6 of the bed 2. This provides an overlap of the
nets 5 by virtue of the two nets 5 overlapping when they are in a pushed-
closed position. The bed 2 can also be divided transverse to its longitudinal
direction, so that one part is folded up towards the wall at the same time as
the other part is folded down. A table (not shown) can be arranged under the
folded-away part, in which case the lowered bed part will constitute a seat.
According to the last-mentioned embodiment, each section 40, 41 of the rail
11 can be securely connected to the respective part of the bed 2. In order to
be able to fold up one half of the bed 2, a catch (not shown) between the
rails 11 has to be released. When this part is subsequently lowered, the
sections 40, 41 are automatically coupled together.

Fig. 13 shows a ninth illustrative embodiment of the invention. According to
this illustrative embodiment, an upper bunk 42 is arranged above the bed 2,
which then comes to constitute a lower bunk. The nets can be pushed along
the longitudinal side 6 of the upper bunk 42 and lower bunk 2 in order for a
person to be able to get in and out of the lower bunk 2. If the upper bunk 42
is to be able to be folded away, the attachment of the upper end of the nets 5
is moved to the wall 8, as is shown in Fig. 1.
Patent Claims

1. Safety arrangement for a bed (2) in a vehicle, comprising at least one device (5) which catches a person lying in the bed (2) and which can be arranged at least partially around the bed (2), characterized in that the catching device (5) is arranged so that it can be pushed partially along a longitudinal side (6) of the bed (2) in order, in a pushed-closed position, to give protection to the person lying in the bed (2) and, in a pushed-open position, to allow the person to get in and out of the bed (2).

2. Safety arrangement according to Claim 1, characterized in that the catching device (5) is connected to a vehicle cab (3) surrounding the bed (2).

3. Safety arrangement according to Claim 1 or 2, characterized in that the catching device (5) is connected to an upper bunk (42) located above the bed.

4. Safety arrangement according to Claim 1 or 2, characterized in that the catching device (5) can be arranged at least partially over the bed (2).

5. Safety arrangement according to any of the preceding claims, characterized in that the catching device (5) can be pushed in a rail (11) which is arranged on the longitudinal side (6) of the bed (2) and which can be divided into two sections (40, 41).

6. Safety arrangement according to any of the preceding claims, characterized in that at least one means (24) for inflation, such as a gas generator or a powder gas charge, is connected to the catching
device (5), which means (24) is coupled to a sensor (27) which detects impacts of the vehicle and which emits a signal to inflate the catching device (5) if the vehicle is exposed to a violent impact.

7. Safety arrangement according to any of the preceding claims, characterized in that a tensioning arrangement (23) is connected to the catching device (5), which tensioning arrangement is designed to stretch and tension the catching device (5) if the vehicle is exposed to violent impacts.

8. Safety arrangement according to Claim 7, characterized in that the bed (2) comprises first and second bases (28, 29) which are coupled together via a hinge (30), and in that the catching device (5) is connected to the first base (28), so that the first base (28) pivots about the hinge (30) when the tensioning device (23) stretches and tensions the catching device (5).

9. Safety arrangement according to any of the preceding claims, characterized in that the catching device (5) comprises a net (5) made up of belts (4).

10. Safety arrangement according to Claim 9, characterized in that two nets (5) are arranged alongside each other and can be pushed along the longitudinal side (6) of the bed (2) in such a way that, in a pushed-closed position, they together present a width which corresponds substantially to the length of the longitudinal side (6) of the bed (2).

11. Safety arrangement according to any of Claims 9-10, characterized in that at least one of the belts (4) comprises a stiffening element (9) which supports at least one portion (10) of the net (5).
12. Safety arrangement according to any of Claims 9-11, characterized in that at least one of the belts (4) can be inflated.

13. Safety arrangement according to any of Claims 9-12, characterized in that a flexible element (35) is arranged between the belts (4), which flexible element (35) covers substantially the whole of the net (5).

14. Safety arrangement according to any of Claims 9-13, characterized in that shock-absorbing elements (38) are arranged on the net (5).
### INTERNATIONAL SEARCH REPORT

**International application No.**

PCT/SE 01/01663

#### A. CLASSIFICATION OF SUBJECT MATTER

**IPC7:** B60R 21/06, B60R 21/22

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)

**IPC7:** B60R, B60P, B62D

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

SE, DK, FI, NO classes as above

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

#### EPO-INTERNAL, WPI DATA

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 4043582 A (LYTER), 23 August 1977 (23.08.77)</td>
<td>1,2,4,5</td>
</tr>
<tr>
<td>Y</td>
<td>--</td>
<td>3,6,7,9-14</td>
</tr>
<tr>
<td>Y</td>
<td>WO 0037285 A1 (VOLVO LASTVAGNAR AB), 29 June 2000 (29.06.00)</td>
<td>3,6,7,9-14</td>
</tr>
<tr>
<td>A</td>
<td>US 5690355 A (KLEINBERG), 25 November 1997 (25.11.97)</td>
<td>1,3,6,13,14</td>
</tr>
<tr>
<td>A</td>
<td>US 5536042 A (WILLIAMS ET AL), 16 July 1996 (16.07.96)</td>
<td>1,2,9,11,13</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>*</th>
<th>Special categories of cited documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A&quot;</td>
<td>document defining the general state of the art which is not considered to be of particular relevance</td>
</tr>
<tr>
<td>&quot;E&quot;</td>
<td>earlier application or patent but published on or after the international filing date</td>
</tr>
<tr>
<td>&quot;L&quot;</td>
<td>publication date of another citation or other special reason (as specified)</td>
</tr>
<tr>
<td>&quot;O&quot;</td>
<td>document referring to an oral disclosure, use, exhibition or other means</td>
</tr>
<tr>
<td>&quot;P&quot;</td>
<td>document published prior to the international filing date but later than the priority date claimed</td>
</tr>
</tbody>
</table>

| "X" | 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 |
| "Y" | 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 |
| "&" | document member of the same patent family |

Date of the actual completion of the international search: 8 November 2001

Date of mailing of the international search report: 13-11-2001

Name and mailing address of the ISA/Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer: Hans Nordström / JA A
Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 3695698 A (TRUMP), 3 October 1972 (03.10.72)</td>
<td>1, 2, 9</td>
</tr>
</tbody>
</table>
## INTERNATIONAL SEARCH REPORT

<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 4043582 A</td>
<td>23/08/77</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>WO 0037285 A1</td>
<td>29/06/00</td>
<td>SE 513394 C</td>
<td>04/09/00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE 9804507 A</td>
<td>23/06/00</td>
</tr>
<tr>
<td>US 5690355 A</td>
<td>25/11/97</td>
<td>US 5876059 A</td>
<td>02/03/99</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 9825800 A</td>
<td>18/06/98</td>
</tr>
<tr>
<td>US 5536042 A</td>
<td>16/07/96</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>US 3695698 A</td>
<td>03/10/72</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>