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NOTICE OF ENTITLEMENT

We WESTECH INNOVATIONS INC.

of 575 Boulevard Morgan, Baie d'Urfé, QUÉBEC H9X 3T6, CANADA

being the Applicant and Nominated Person, in respect of Application No. 23951/92

state the following:

Philip Hudson Gray is the actual inventor of the invention the subject of the Application.

The inventor made the invention for and on behalf of the applicant and nominated person in the course of his duties as an employee of the applicant.

The applicant and nominated person is entitled to rely on the application listed in the declaration under Article 8 of the PCT.

Convention priority is claimed from the following basic application referred to in the declaration under Article 8 of the PCT:

Basic Applicant	Application Number	Application Date	Country	Country Code
Philip Hudson Gray	742,835	8 August 1991	U.S.A.	US

The basic application referred to in the declaration under Article 8 of the PCT was the first application made in a Convention country in respect of the invention the subject of the Application.

DATED this 7th day of March 1994

WESTECH INNOVATIONS INC.
By their Patent Attorney

GRIFFITH HACK & CO

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SEAT BELT SHOULDER STRAP ADJUSTMENT GUIDE APPARATUS

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(56) Prior Art Documents
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GB 2015321
US 4958416

(57) Claim

1. A seat belt shoulder strap adjustment guide apparatus (1) for redirecting a shoulder strap (2) of a vehicle's seat belt from a standard path, the standard path extending between a lower buckle clasp to an upper vehicle side wall mounting (11) across a torso of an average height adult passenger of the vehicle, to a lowered path extending from the lower buckle clasp (12) across a torso of a reduced height passenger of the vehicle to said passenger's shoulder opposite the buckle clasp (12), the apparatus comprising:

locating fastening means (6) for holding and guiding the shoulder strap (2) coming from the upper side wall mounting (11), said locating fastening means (6) being located in use at a point substantially along the lowered path at a side of the reduced height passenger adjacent said mounting (11) to the lower buckle clasp (12);

lower belt fastening means (7) attachable to a lap strap (3) of the seat belt on a side of the passenger opposite the buckle clasp (12); and

a body member (4) interconnecting the locating fastening means (6) and the lower belt fastening means (7),

.../2

and extending vertically upwardly from said lower belt fastening means (7) to said locating fastening means (6) when said lap strap (3) is fed through said lower belt fastening means (7), such that said locating fastening means (6) are located approximately at a shoulder of said reduced height passenger characterized in that the body (4) is made of a resilient material connected to said locating fastening means (6) and said lower belt fastening means (7), whereby by fastening the apparatus (1) to the seat belt (2, 3), the shoulder strap (2) is redirected from the standard path to the lowered path so that the shoulder belt strap extends from the locating fastening means (6) to the lower buckle clasp (12) across the torso of the reduced height passenger and is held in position in such a way as to prevent being lowered by the reduced height passenger.

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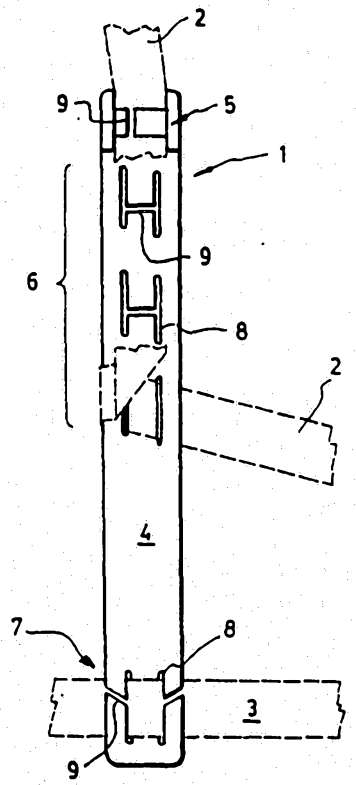
(54) Title: SEAT BELT SHOULDER STRAP ADJUSTMENT GUIDE APPARATUS

(57) Abstract

The apparatus (1) for redirecting a shoulder strap (2) of a vehicle's seat belt from a standard path, the standard path extending between a lower buckle clasp (12) to an upper vehicle sidewall mounting (11) across a torso of an average height adult passenger of the vehicle, to a lowered path extending across a torso of a reduced height passenger of the vehicle, may comprise: an upper shoulder strap feeder fastener (5) for holding and guiding the shoulder strap (2) from the upper sidewall mounting (11) at a point substantially along the standard path at a side of the reduced height passenger adjacent the mounting (11); a middle shoulder strap locating fastener (6) for holding and guiding the shoulder strap (2) from the upper shoulder strap feeder fastener (5) to the lower buckle clasp (12); a lower belt fastener (7) attachable to a lap strap (3) of the seat belt; and a body member (4) interconnecting the upper shoulder strap feeder fastener (5), the middle shoulder strap locating fastener (6) and the lower belt fastener (7). In this way, by fastening the apparatus (1) to the seat belt (2, 3), the shoulder strap (2) is redirected from the standard path to the lowered path so that the shoulder belt strap extends from the middle shoulder strap locating fastener (6) to the lower buckle clasp (12) across the torso of the reduced height passenger. The apparatus (1) is easy to install, operates effectively and can be manufactured inexpensively.



"SEAT BELT SHOULDER STRAP ADJUSTMENT GUIDE APPARATUS"

FIELD OF THE INVENTION

The present invention relates to a seat belt shoulder strap adjustment guide apparatus for redirecting a shoulder strap of a vehicle's seat belt from a standard path, the standard path extending between a lower buckle clasp to an upper vehicle side wall mounting across a torso of an average height adult passenger of the vehicle, to a lowered path extending across a torso of a reduced height passenger of the vehicle. The invention is typically used for making automobile seat belts having shoulder straps usable by reduced height passengers such as children.

BACKGROUND OF THE INVENTION

As car safety progresses, an increased awareness for passenger safety is being perceived with resulting innovations in many areas. One of these innovations is the installation of seat belts having a waist/shoulder strap in the rear seats of new cars in addition to the standard installation in the front seats. Upon first impression, this appears to be a logical safety improvement and for most adults this is the case, however, for passengers of a reduced height, especially children, it is a potential for serious injury.

For children under the height of 95 cm, conventional child seats are used to secure the child safely in a vehicle. However, for children between the height of 95 and 155 cm, a child safety seat is too small and the conventional seat belt is ineffective in safely securing the child in the vehicle. It is known in the prior art to provide a shoulder belt adjuster for the purposes of reducing the height of the shoulder strap anchor point to a height which more suitably fits the reduced height passenger.

In US patent 4,799,737 an auxiliary adjusting device for the shoulder strap of a seat belt is described, the device being mounted to a side wall of the vehicle at a given reduced height and having a yoke for guiding the

shoulder strap through the device. In US patent 4,796,919, a clamp device is disclosed for clamping the diagonal run of the shoulder belt to the vertical run of the shoulder belt to reduce the height of the diagonal run. In US patent 4,938,535, an adjustable shoulder/lap seat belt adaptor is described in which a strap secured at one end to the lap belt is wrapped around and fastened to the shoulder strap while maintaining the shoulder strap at a lowered position in order to accommodate a reduced height passenger. In US patent 4,946,198, a similar adaptor has a safety strap clipped between a shoulder belt fastener and a lap belt fastener. U.S. patent 4,832,367 describes a front mount shoulder belt relocation device having an auxiliary strap extending vertically between and interconnecting the lap belt and a medial portion of the shoulder belt. Published PCT application WO 88/04622 describes a slotted triangular plate for interconnecting the lap belt with the medial portion of the shoulder belt. US patent 4,958,416 describes a side mount seat belt relocator with a detachable adjuster rod interconnecting clips to the shoulder strap and the lap belt.

In the conventional devices, the shoulder belt can be pulled by the child without the device preventing the shoulder belt from being placed by the child under his arms and essentially to a useless position.

Also, in the conventional devices, no device provides an adequate combination of low cost, ease of installation, and efficient operation during normal use and collision.

SUMMARY OF THE INVENTION

According to the invention, there is provided a seat belt shoulder strap adjustment guide apparatus which is easy to install and remove from the seat belt. Also, according to the invention there is provided a seat belt shoulder strap adjustment guide apparatus which prevents the shoulder strap from being pulled down easily out of its selected safest position for the child. The guide apparatus according to the invention is a side mount guide apparatus.

According to the invention, there is provided a seat belt shoulder strap adjustment guide apparatus for

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redirecting a shoulder strap of a vehicle's seat belt from a standard path, the standard path extending between a lower buckle clasp to an upper vehicle side wall mounting across a torso of an average height adult passenger of the vehicle, to a lowered path extending across a torso of a reduced height passenger of the vehicle, the apparatus comprising: shoulder strap locating fastening means for holding and guiding the shoulder strap from the upper side wall mounting at a point substantially along the lowered path at a side of the reduced height passenger adjacent said mounting to the lower buckle clasp; lower belt fastening means attachable to a lap strap of the seat belt; and a plastic body member interconnecting the upper shoulder strap locating fastening means and the lower belt fastening means, whereby by fastening the apparatus to the seat belt, the shoulder strap is redirected from the standard path to the lowered path so that the shoulder strap extends from the shoulder strap locating fastening means to the lower buckle clasp across the torso of the reduced height passenger and is held in position in such a way as to prevent being lowered by the reduced height passenger.

According to the invention, there is also provided a seat belt shoulder strap adjustment guide apparatus for redirecting a shoulder strap of a vehicle's seat belt from a standard path, the standard path extending between a lower buckle clasp to an upper vehicle side wall mounting across a torso of an average height adult passenger of the vehicle, to a lowered path extending across a torso of a reduced height passenger of the vehicle, the apparatus comprising: upper shoulder strap feeder fastening means for holding and guiding the shoulder strap from the upper side wall mounting at a point substantially along the standard path at a side of the reduced height passenger adjacent the mounting; middle shoulder strap locating fastening means for holding and guiding the shoulder strap from the upper shoulder strap feeder fastening means to the

lower buckle clasp; lower belt fastening means attachable to a lap strap of the seat belt; and a body member interconnecting the upper shoulder strap feeder fastening means, the middle shoulder strap locating fastening means and the lower belt fastening means. By fastening the apparatus to the seat belt, the shoulder strap is redirected from the standard path to the lowered path so that the shoulder belt strap extends from the middle shoulder strap locating fastening means to the lower buckle clasp across the torso of the reduced height passenger.

Preferably, the apparatus is made from a substantially flat sheet of plastic material, and wherein all of the fastening means each comprise a pair of T-shaped slots in the plastic sheet, each pair of T-shaped slots having parallel segments of a width sufficient to receive the seat belt and stems extending from each parallel segment, the stems having open ends opposite the parallel segments through which the seat belt can be fed for fastening the seat belt in the pair of T-shaped slots. The shoulder strap extending between the upper shoulder strap feeder fastening means and the middle shoulder strap locating fastening means can be diagonally folded to turn and wrap around a side of the flat sheet proximal the vehicle side wall as the shoulder strap extends between the upper shoulder strap feeder fastening means and the middle shoulder strap locating fastening means. Preferably, the pair of T-shaped slots have stems which join one another, so that the slot is substantially H-shaped. The stems of the T-shaped slots may also open onto opposite sides of the flat sheet of plastic.

Preferably, the pair of parallel T-shaped slots of the upper shoulder strap feeder fastening means have substantially horizontal segments and interconnecting stems thus forming a sideways oriented H-shaped slot; the parallel T-shaped slots of the middle shoulder strap locating fastening means have segments which are substantially vertical and stems which are interconnected

forming an upstanding H-shaped slot, the middle shoulder strap locating fastening means including a plurality of the upstanding H-shaped slots at different heights in the plastic member below the H-shaped slot of the upper shoulder strap feeder fastening means; and the T-shaped slot members of the lower belt fastening means have substantially vertical segments and stems forming an acute angle with respect to the parallel segments, the stems connecting with opposite sides of the flat sheet. By selectively fitting the shoulder strap through one of the H-shaped slots of the middle shoulder strap locating fastening means, a suitable height of the shoulder strap with respect to the reduced height passenger may be selected.

Also, preferably the body member may comprise two parts adjustably interconnected to adjust the distance between the lower belt fastening means and the shoulder strap locating fastening means.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be better understood by way of the following description of preferred embodiments with reference to the appended drawings, in which:

Figure 1 is a front sectional view of a child seated in a vehicle seat and retained by a conventional seat belt provided with the apparatus according to the first preferred embodiment;

Figure 2 is a front view of the apparatus according to the first preferred embodiment showing a portion of the shoulder strap fed therethrough and a portion of the lap strap fed therethrough;

Figure 3 is an enlarged breakaway front view of the upper end of the apparatus according to the first preferred embodiment;

Figure 4 is an end view of the apparatus as shown in Figure 3;

Figure 5 is a front view of the apparatus according to the second preferred embodiment; and

Figure 6 is an exploded perspective view of the apparatus according to the third preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the first preferred embodiment, the seat belt shoulder strap adjustment guide apparatus (1), as shown in Figures 1 and 2, is provided with a plurality of H-shaped slots through which shoulder strap (2) is fed. Horizontally disposed H-shaped slot (5) provides upper shoulder strap feeder fastening means for holding and guiding the shoulder strap (2) from the upper side wall mounting (11). A standard path of shoulder strap (2) is shown in dashed lines in Figure 1, and strap (2) extends from mounting (11) to upper shoulder strap feeder fastening means (5) along substantially the standard path. The strap (2) is then guided through the H-shaped slot of means (5) and continues downwardly towards one of three H-shaped slots (6) forming the middle shoulder strap locating fastening means. Strap (2) is folded 90° so that it turns laterally outwards away from the passenger of reduced height, and the strap (2) is then folded around an outer edge of plastic sheet (4) before passing through middle shoulder strap locating fastening means (6). The lap or waist strap (3) of the seat belt is fastened to the lower belt fastening means (7) which comprises a pair of T-shaped slots having parallel top segments (8) each having a depending stem (9) which is open ended. The H-shaped slots of the upper shoulder strap feeder fastening means (5) and the middle shoulder strap locating fastening means (6) similarly comprise parallel segments (8) with depending stems (9) which are open ended, except in the case of the H-shaped slots, the open ends of the stems (9) are provided by the fact that the stems (9) are interconnected, thus forming the H-shape from 2 joined T-shaped slots.

As is shown in Figure 2, the H-shaped slots of middle shoulder strap locating fastening means (6) have parallel slot segments (8) which are shifted relative to one another in order to receive strap (2) at the appropriate angle when

it lies in its lowered path as shown in Figure 1. The crossing stem (9) of the H-shaped slots (6) is provided lower down for ease of fastening strap (2) to the slot (6) and for greater strength when strap (2) is subjected to force during an accident.

As shown in Figures 3 and 4, upper belt fastening means (5) comprise an H-shaped slot having parallel segments (8) and a cross stem (9). Segments (8) of slot (5) are not angled towards mounting (11) or staggered in order to receive strap (2) at an angle significantly directed towards mounting (11) as if strap (2) were coming from buckle (12), since in the preferred embodiment, the width of plastic sheet (4) is kept to the minimum possible width, and therefore the sides of flat sheet (4) at its upper end are reinforced with ridges (10) into which strap (2) is guided before passing through slot segments (8). As is shown, cross stem (9) is provided on a side of the side wall mounting (11) so that if strap (2) is pulled away towards side wall mounting (11), strap (2) will not become exposed to cross slot (9).

As can be understood, the apparatus (1) attaches to shoulder strap (2) in such a manner that flat sheet (4) will not slide along strap (2) while being securely fastened to waist strap (3) by lower belt fastening means (7). Once the existing shoulder strap (2) is fitted into the slots (8) and (9) of fastening means (5) and (6), making sure that strap (2) is fed through the appropriate slots (6) considering the height of the child seated in the vehicle, waist strap (3) is fit through slots (7) as shown in the figures, and the shoulder strap (2) is securely adjusted to a lowered path without severely affecting standard operation of the seat belt. In the case that the seat belt includes an inertial locking system for the shoulder strap (2), the force of the child's body on strap (2) is transferred to the flat sheet (4) at middle shoulder strap locating fastening means (6), and is then transferred to belt (2) leading to mounting (11) by upper shoulder

strap feeder fastening means (5). The direct uninhibited transfer improves the ability of an inertial shoulder strap locking means to engage, and once engaged, an additional impact absorption is provided to the child, since the flat sheet of plastic material (4) providing the body of the apparatus (1) will flex as the seat belt pulls on it on impact.

According to the second preferred embodiment, the apparatus (1) is constructed without the upper shoulder strap feeder slot or fastening means (5), and although the shoulder strap (2) is then fed to the side wall mounting (11) at a lower angle than the standard path, the feature of the invention that the shoulder strap (2) is held in position along the reduced height path, without the child or reduced height passenger being able to pull down the shoulder strap (2) due to the solid plastic body member (4) is provided. The plastic body (4) also offers a certain flex during an accident which reduces the impact force of the shoulder strap (2) on the passenger.

In the third preferred embodiment, the body (4) of the apparatus (1) comprises a lower half (4a) and an upper half (4b) interconnected by length adjustment means (20) for adjusting the distance between lower belt fastening means (7) and middle shoulder belt fastening means (6). The adjustment means (12) shown comprise a bolt (14) and a pin (16) provided on upper half (4b) which are slidable in a slot (15). A butterfly nut (17) fastens lower half (4a) to upper half (4b). Matching serrated surfaces (18) are provided on halves (4a) and (4b) as shown to prevent longitudinal movement once the nut (17) is fastened to bolt (14).

The third preferred embodiment allows for a more precise adjustment of the distance between means (6) and (7), and once disassembled, the storage volume of the apparatus (1) may be reduced enough for storage in the glove box of the car.

Of course, the adjustment means can comprise a variety

of other mechanisms to adjustably interconnect halves (4a) and (4b) together. For example, laterally disposed tongue and grooves may be used to connect the halves (4a) and (4b) together, or alternatively, upper half (4b) may plug into lower half (4a) either directly or via an extension member of a given length (not shown). It is important, however, that, once means (20) connect the halves (4a) and (4b) together, the body (4) flexes and operates as it normally would for safe operation during an accident.

In the third preferred embodiment, the shape of the H-shaped slots of means (5) and (6) are different and the seat belt (2) is to be fed through the slots of means (5) and (6) differently. The feeder fastening means (5) are no longer provided with ridges (10), and instead the belt (2) is fed from behind to go over slot (9) at which point the belt (2) is folded behind plastic strip (4) and is then fed through slot (6) covering once again the cross stem (9) of slot (6), and then the belt (2) continues towards the latch plate.

The operation of apparatus (1) according to the third preferred embodiment is somewhat different in that during a severe impact, the strap (2) will detach from means (5) and (6) giving additional slack in belt (2) to allow the torso of the reduced height passenger to bend forward. Crash tests have shown that during the initial stages of impact, the torso of the reduced height passenger forces against belt (2) and the head begins to roll forward. Thereafter, as the forces on belt (2) increase, the belt (2) bends the plastic around the slots (5) and (6) in such a way that the belt (2) is pulled out of the slots (5) and (6) leaving the shoulder strap (2) pressed in place on the torso of the reduced height passenger and as the belt (2) is released, extra slack is given while the torso bends forward. However, the belt (2) remains across the torso of the reduced height passenger without creeping up towards the neck or allowing a twisting of the torso. When the body member (4) is no longer attached to the shoulder strap

(2), it falls forward to the side without coming into contact with the passenger during impact.

Of course, the configuration of the invention according to the third preferred embodiment may be incorporated into a one-piece apparatus (1) as shown in Figure 2.

In the first preferred embodiment, the flat sheet of plastic material (4) can measure 6 cm wide x 60 cm long and can be 3 to 6 mm thick. In the second preferred embodiment the sheet can be 50 cm long. The plastic material can be polypropylene, as this material gives maximum strength while allowing the required amount of flexibility. The properties of polypropylene remain constant over a wide temperature range. Ultraviolet protection can be achieved by the addition of known chemicals to the plastic prior to the manufacturing process. Apparatus (1) can be easily manufactured by a simple injection molding process.

It is to be understood that the above description of the preferred embodiment is not intended to limit the scope of the present invention as defined in the appended claims.

CLAIMS

1. A seat belt shoulder strap adjustment guide apparatus (1) for redirecting a shoulder strap (2) of a vehicle's seat belt from a standard path, the standard path extending between a lower buckle clasp to an upper vehicle side wall mounting (11) across a torso of an average height adult passenger of the vehicle, to a lowered path extending from the lower buckle clasp (12) across a torso of a reduced height passenger of the vehicle to said passenger's shoulder opposite the buckle clasp (12), the apparatus comprising:

locating fastening means (6) for holding and guiding the shoulder strap (2) coming from the upper side wall mounting (11), said locating fastening means (6) being located in use at a point substantially along the lowered path at a side of the reduced height passenger adjacent said mounting (11) to the lower buckle clasp (12);

lower belt fastening means (7) attachable to a lap strap (3) of the seat belt on a side of the passenger opposite the buckle clasp (12); and

a body member (4) interconnecting the locating fastening means (6) and the lower belt fastening means (7), and extending vertically upwardly from said lower belt fastening means (7) to said locating fastening means (6) when said lap strap (3) is fed through said lower belt fastening means (7), such that said locating fastening means (6) are located approximately at a shoulder of said reduced height passenger characterized in that the body (4) is made of a resilient material connected to said locating fastening means (6) and said lower belt fastening means (7), whereby by fastening the apparatus (1) to the seat belt (2, 3), the shoulder strap (2) is redirected from the standard path to the lowered path so that the shoulder belt strap extends from the locating fastening means (6) to the lower buckle clasp (12) across the torso of the reduced height passenger and is held in position in such a way as to prevent being lowered by the reduced height passenger.

2. The apparatus as claimed in claim 1, further

comprising feeder fastening means (5) for holding and guiding the shoulder strap (2) from the upper side wall mounting (11), said feeder fastening means (5) being located in use at a point substantially along the standard path at a side of the reduced height passenger adjacent said mounting (11), and characterized in that the body member (4) also interconnects the feeder locating fastening means (5) to the locating feeder fastening means (6) and the lower belt fastening means (7).

3. The apparatus as claimed in claim 1, characterized in that the apparatus (1) is made from a substantially flat sheet of plastic material, and wherein said locating (6) and said lower fastening means (7) each comprise a pair of T-shaped slots (8) in the plastic sheet, each pair of T-shaped slots having parallel segments of a width sufficient to receive the seat belt and stems extending from each parallel segment, the stems (9) having open ends opposite the parallel segments through which the seat belt can be fed for fastening the seat belt in said pair of T-shaped slots.

4. The apparatus as claimed in claim 2, characterized in that the apparatus (1) is made from a substantially flat sheet of plastic material, and wherein said feeder (5), said locating (6), and said lower fastening means (7) each comprise a pair of T-shaped slots (8) in the plastic sheet, each pair of T-shaped slots having parallel segments of a width sufficient to receive the seat belt and stems extending from each parallel segment, the stems (9) having open ends opposite the parallel segments through which the seat belt can be fed for fastening the seat belt in said pair of T-shaped slots, whereby the shoulder strap (2) extending between the feeder fastening means (5) and the locating fastening means (6) can be diagonally folded to turn and wrap around a side of the flat sheet proximal said vehicle side wall as the shoulder strap (2) extends between the feeder fastening means (5) and the locating fastening means (6).

5. The apparatus as claimed in claim 3 or 4, characterized in that said pair of T-shaped slots have stems (9) which join one another, whereby said slots form substantially an H-shaped slot (8).

6. The apparatus as claimed in claim 3 or 4, characterized in that said stems (9) of said T-shaped slots open onto opposite sides of the flat sheet (8).

7. The apparatus as claimed in claim 1, 2, 3 or 4, characterized in that said body member (4) comprises a lower part (4a) and an upper part (4b), said lower part (4a) provided with said lower belt fastening means (7), and said upper part including said locating fastening means (6), and in that said upper part (4b) is connected to said lower part (4a) by means of adjustment means (20).

8. The apparatus as claimed in claim 7, characterized in that the adjustment means (20) comprise a bolt (14) and a pin (16) provided on said upper part (4b) which are slidable in a slot (15) provided in lower part (4a), said upper part (4b) and said lower part (4a) being provided with matching serrated surfaces (18) to prevent longitudinal movement once a nut (17) is fastened on bolt (14).

9. The apparatus as claimed in claim 3 or 4, characterized in that:

the parallel T-shaped slots (8) of the locating fastening means (6) have segments which are substantially vertical and stems (9) which are interconnected forming an upstanding H-shaped slot, the locating fastening means (6) including a plurality of the upstanding H-shaped slots at different heights in the plastic member; and

the T-shaped slot members of the lower belt fastening means (7) have substantially vertical segments (8) and stems (9) forming an acute angle with respect to the parallel segments (8), the stems (9) connecting with opposite sides of the flat sheet (4), whereby by

selectively fitting the shoulder strap through one of the H-shaped slots of the locating fastening means (6), a suitable height of the shoulder strap (2) with respect to the reduced height passenger may be selected.

10. The apparatus as claimed in claim 4, characterized in that the pair of parallel T-shaped slots (8) of the feeder fastening means (5) have substantially horizontal segments and interconnecting stems (9), thus forming a sideways oriented H-shaped slot.

11. Apparatus as claimed in claim 9, characterized in that the plurality of upstanding H-shaped slots (8) have staggered segments for receiving diagonally the shoulder strap (2) at an average angle of the shoulder strap when in said lowered path.

12. Apparatus as claimed in claim 11, characterized in that the plurality of H-shaped slots (8) are three in number.

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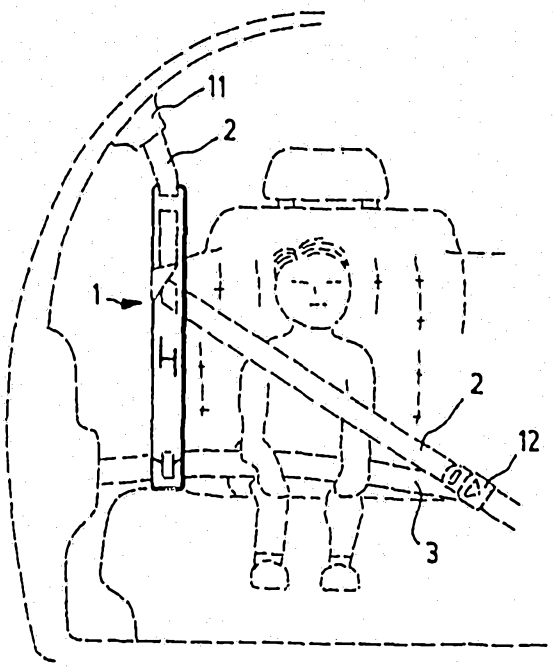

FIG. 1

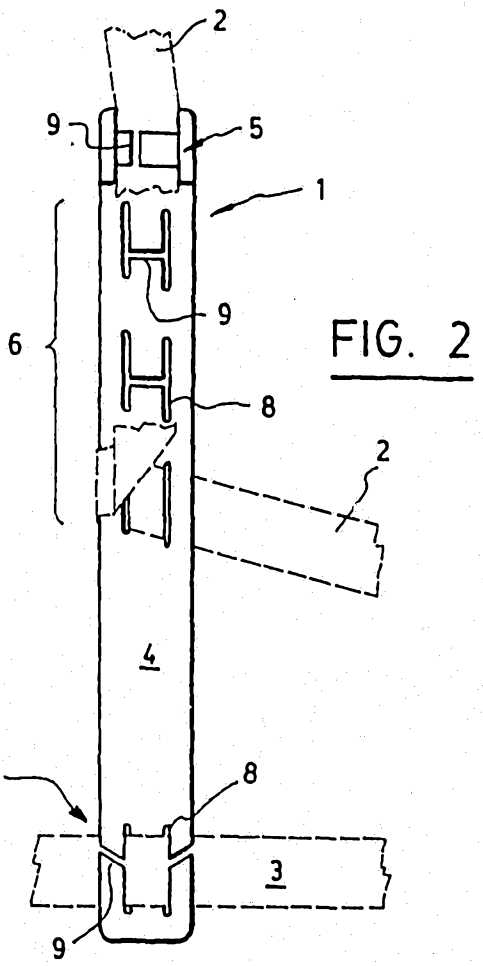

FIG. 2

FIG. 3

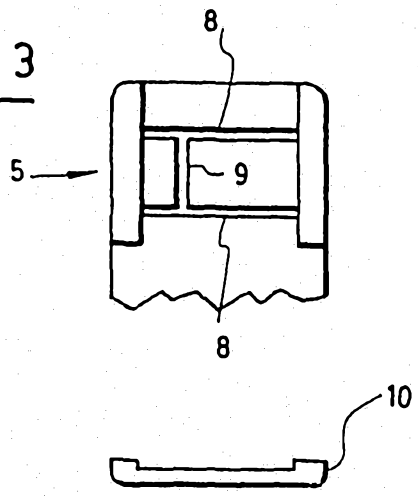

FIG. 4

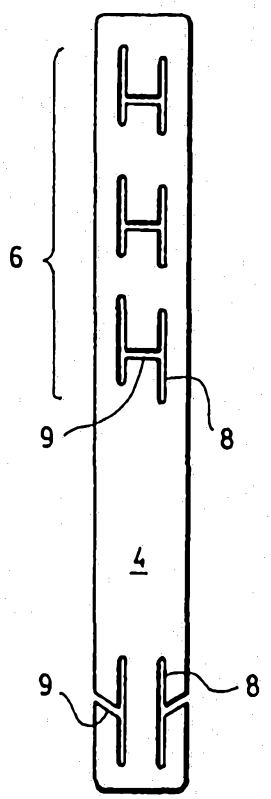

FIG. 5

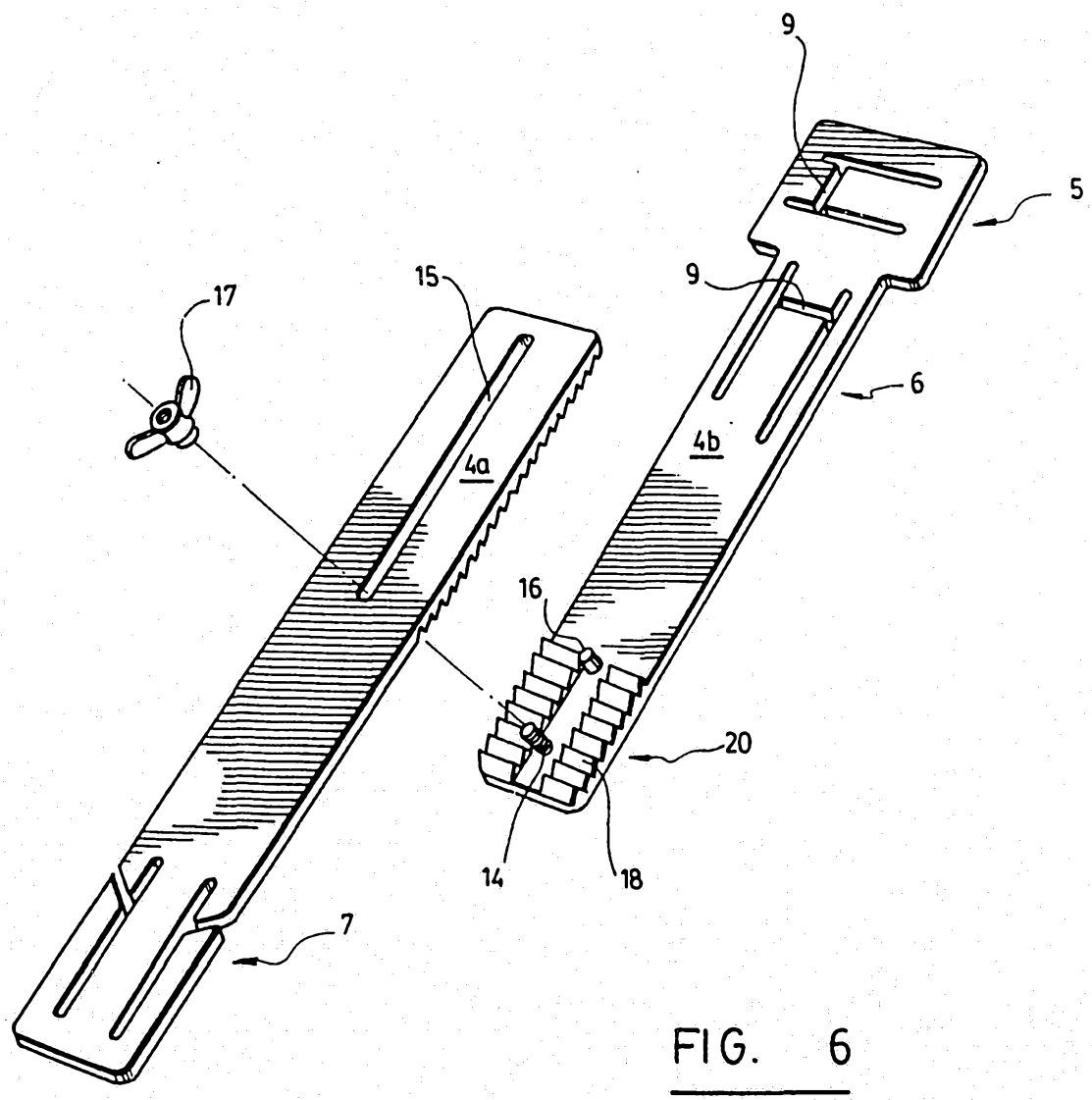

FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No PCT/CA 92/00334

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 B60R22/30

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	B60R

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
Y	GB,A,2 015 321 (KANGOL MAGNET LIMITED) 12 September 1979 see abstract; figures 1,2,11,12	1
A	---	5,10,11
Y	AU,B,489 040 (JAMES ALAN BOULTBEE) 11 November 1976 see the whole document	1
A	---	5
A	US,A,4 958 416 (FRISHLING) 25 September 1990 see column 3, line 10 - column 6; figures	1,2,5, 10,11,17

° Special categories of cited documents :[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"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.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
27 OCTOBER 1992	09. 11. 92
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	DUBOIS B.F.J.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. CA 9200334 SA 62890

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A-2015321	12-09-79	AU-B- 526660	27-01-83
		AU-A- 4450279	30-08-79
		BE-A- 874368	18-06-79
		CA-A- 1142492	08-03-83
		DE-A- 2906988	30-08-79
		FR-A,B 2417989	21-09-79
		JP-A- 54162328	22-12-79
		NL-A- 7901402	24-08-79
		SE-A- 7901575	23-08-79
		US-A- 4236755	02-12-80
AU-B-489040	11-11-76	None	
US-A-4958416	25-09-90	None	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. CA 9200334 SA 62890

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		SE-A- 7901575	23-08-79
		US-A- 4236755	02-12-80
AU-B-489040	11-11-76	None	
US-A-4958416	25-09-90	None	