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(71) Applicant: LAZZERINI SOCIETA' A RESPONSABILITA' LIMITATA [IT/IT]; 21, Viale Giannino Pieralisi, I-60030 Monsano (an) (IT).

(72) Inventor: CARBONE, Innocenzo Salvatore; 10, Via Mura Occidentali, I-60035 Jesi (an) (IT).

(74) Agent: BALDI, Claudio; 13, Viale Cavallotti, I-60035 Jesi (an) (IT).

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- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
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[Continued on next page]

(54) Title: A VEHICLE SEAT PROVIDED WITH COMPACT FAST-INSTALLING SAFETY BELT SYSTEM.

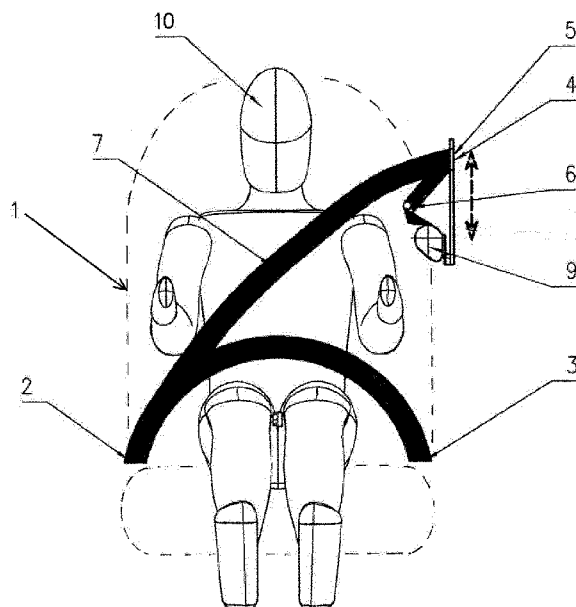


FIG. 2

(57) Abstract: The present invention relates to a vehicle seat provided with safety belt system characterized by compact size and rapid installation, which can be preassembled and installed simultaneously with the framework of the seat-back.



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Description

A vehicle seat provided with compact fast-installing safety belt system.

The present patent application for industrial invention relates to a vehicle seat provided with compact fast-installing safety belt system.

The seat of the invention has been designed to overcome the drawbacks of the safety belt systems with self-adjustable height of the prior art that are embedded in the back of the seat.

More precisely, these seats have been designed to avoid positioning the recoil and restraint system of the safety belt in an external fixed framework, as it normally occurs in the majority of vehicles in which the entire system is anchored to the vehicle framework.

In particular, said seats have been particularly designed for coaches or buses in which seats are mounted in multiple rows and are not always provided with a fixed wall adapted to house the recoil and/or restraint systems of the safety belts.

Therefore the present invention falls within the sector of seats that embed guiding systems for seat belts with self-adjustable height in the back of the seat, which are able to adjust to the occupant's body size, and especially, height.

In fact, the guiding system for safety belts according to the invention is of three-point type (e.g. traditional system of car vehicles on the market), it being provided with two lower anchor points located on the two sides of the seat, and with a third deflection point located at the height of the occupant's shoulder.

Said third deflection point must be provided with a height adjustment device adapted to redirect the seat belt from one of the lower anchor points to the recoil and restraint device.

The description of the prior art continues with reference to the EP1731385 patent registered on 03.03.2006 by FUNDACION INST TECHNO

PARA SEG [ES] and claiming the priority of the Spanish patent application ES200400618 filed on 12.03.2004.

The prior art is described with reference to Fig. 1, which is a schematic view of a guiding system for safety belts as described and claimed in the
5 EP1731385 patent.

With reference to Fig. 1, the guiding system for safety belts comprises two lower anchor points (2 and 3), located on the two sides of a seat (1) and a deflection point (4) located at the height of the occupant's shoulder; said deflection point (4) is provided with a height adjustment device (5) adapted to
10 redirect the belt web (7) from one of said lower anchor points (2 or 3) to a recoil and restraint device (9) that keeps the belt web (7) tight in normal conditions.

Said belt web (7) is diagonally positioned across the occupant's chest between the deflection point (4) and one of the lower anchor points (2 or 3)
15 and is transversally positioned onto the lower part of the occupant's body between the lower anchor points (2 or 3).

The height adjustment device (5) of the deflection point (4) comprises sliding means (8) that are fixed to the vehicle bodyworks or to the relevant side of the vehicle seat and allow for freely positioning of the belt web (7)
20 diagonally across the occupant's chest.

The innovative characteristic of said device was the provision of a second deflection point (6) fixed and arranged behind the vehicle occupant (10).

Moreover, means (8) are provided to allow freely displacement of the
25 deflection point (4) of the safety belt web (7), redirecting the belt web (7) from a variable height that is automatically adjustable to the occupant's needs to the opposite side of the seat and to the second deflection point (6) wherefrom the belt web (7) is redirected to the supply and restraint device (9).

The first drawback of the system disclosed and claimed in the
30 EP1731385 patent refers to the length of the belt web (7).

Being the recoil and restraint device (9) located in the lower part of the seat (1) – on the opposite side with respect to the deflection point (4) - said

belt web is provided with a substantially vertical section (Y) going from the recoil and restraint device (9) to the deflection point (6) and a second substantially horizontal section (X) going from the deflection point (6) to the height adjustment device (5) of the deflection point (4).

5 Said first (Y) and second section (X) of the belt affect the total length of the belt web (7) and the size of the recoil and restraint device (9).

It must be noted that the cost of the entire system also depends on the total length of the belt web and on the dimensions of the recoil and restraint device (9).

10 Moreover, safety belts with insufficient length may be inappropriate for tall or heavily-built passengers.

The second drawback consists in the fact that, being said recoil and restraint device (9) located in the lower part of the seat-back and precisely on the seat, the total thickness of the seat-back is increased in a prominent point.

15 In fact, when the volume of the lower part of the seat-back increases, the distance between the front seat and the back seat must be modified in order to maintain the level of comfort unchanged for the passenger sitting on the back seat.

More precisely, said level of comfort depends on the distance between
20 the seat of the back seat and the back side of the seat- back of the front seat, given the fact that the leg position of the passenger sitting on the back seat exclusively depends on said distance.

The EP 0 215 220 patent discloses a safety belt system comprising:

25 - a first deflection point provided with height adjustment device, both being located on the side of the seat, in correspondence of the occupant's left shoulder;

- a recoil device located behind the seat, in correspondence of the occupant's left shoulder; and

30 - a second deflection point located behind the seat, in correspondence of the occupant's left shoulder, between the recoil device and the first deflection point.

Therefore the first deflection point, the height adjustment device, the second deflection point and the recoil device are all located on the same side with respect to the occupant.

5 However the second deflection point consists in a "C"-shaped curved plate and the recoil axis of the recoil device is parallel to the plane of the seat-back. The structure and arrangement of the second deflection point and recoil device result in the additional extension of the belt and a high sliding friction, with the possibility that, when recoiling the belt, the belt section between the second deflection point and the recoil device may get twisted and blocked,
10 thus jeopardizing belt operation and consequently passenger's safety.

The purpose of the present invention is to devise a seat that embeds a guiding system for safety belts with automatic height adjustment, which is exempt from the aforementioned drawbacks.

15 An additional purpose of the present invention is to disclose a seat provided with a safety belt system with automatic height adjustment that, apart from meeting the aforesaid purpose, does not comprise the sliding means of the prior art consisting in a slide mounted on tracks.

In addition to reducing the total weight of the seat, the elimination of said sliding means results in a series of advantages in terms of costs, both in
20 terms of purchasing and maintenance costs. Attention must be drawn on the fact that the correct automatic height adjustment of the safety belt depends on the operation of said sliding means.

Moreover, it must be noted that said sliding means need lubrication and that, in case of wear, the passenger must move them indirectly and
25 manually (either upwards or downwards) actuating on the safety belt, in view of the fact that the sliding means are located inside the seat for evident aesthetic reasons.

The peculiarity of the seat of the invention is that the safety belt system is provided with recoil and restraint device, first deflection point, second
30 deflection point and height adjustment device on the same side of the seat-back.

Therefore these parts are all arranged on the side of the seat-back, thus remedying all aforesaid drawbacks.

As shown in the description below, the height adjustment device is composed of a curved vertical rod that comprises means for fixing to the framework of the seat-back, said fixing means also comprising all parts of the safety belt system, thus providing a compact device characterized by fast installation.

In fact, all parts of the system can be pre-assembled and installed simultaneously by screwing said curved vertical rod onto the framework of the seat-back.

Moreover, the safety belt system of the invention comprises a second deflection point with axis orthogonal to the plane of the seat-back and a recoil device with recoil axis orthogonal to the plane of the seat-back. The structure and arrangement of the second deflection point and recoil device allow for reducing the length of the belt as much as possible, thus minimizing the sliding friction of the belt and preventing the belt from getting twisted and blocked, jeopardizing the passenger's safety.

For explanatory purposes the description of the seat according to the invention continues with reference to the attached drawings, which only have an illustrative, not limiting value, wherein:

- Fig. 1 is a schematic view of a safety belt system according to the prior art;
- Fig. 2 is a schematic front view of a passenger sitting on the seat of the invention with safety belt fastened;
- Figs. 3 and 4 are two axonometric views of the seat of the invention with safety belt in operating condition in two different positions, the first one adapted to be fastened around a short passenger, and the second one around a tall passenger.
- Figs. 3A and 4A are two enlarged views of Figs. 3 and 4, respectively, which show the safety belt (7) and the height adjustment device (5); and

- Fig. 5 is a schematic side view that shows the location of the automatic height adjustment device.

Referring to Fig. 2, the seat of the invention comprises a safety belt system comprising:

- 5 - a safety belt (7) diagonally located across the chest of the passenger (10);
- a recoil and restraint device (9);
- two lower anchor points (2 and 3) located on the two sides of a seat (1);
- 10 - a first deflection point (4) for the belt (7) located at the shoulder height of the passenger (10);
- a second deflection point (6) fixed and located behind the back of the passenger (10).
- a height adjustment device (5) adapted to redirect the safety belt (7)
- 15 from one of the lower anchor points (2 or 3) to said recoil and restraint device (9).

The recoil and restraint device (9) supplies the safety belt (7) and keeps it tight in normal conditions.

The safety belt (7) is diagonally positioned across the chest of the

20 passenger (10) between the first deflection point (4) and one of the lower anchor points (2 or 3) and is transversally located onto the lower part of the passenger's body between the lower anchor points (2 or 3).

Referring now to Figs. 3, 3A, 4, and 4A, the recoil and restraint device (9) is located in the seat-back on the same side as the height adjustment

25 device (5).

Said recoil and restraint device (9) is provided with recoil axis substantially perpendicular to the seat-back. Therefore, when the seat-back is arranged on a substantially vertical plane, the axis of the recoil and restraint device (9) is a horizontal axis.

30 The second deflection point (6) is located above the recoil and restraint device (9). The second deflection point (6) comprises a rod with sliding reel. The axis of the rod is the axis of rotation of the reel. The axis of the rod of the

second deflection point (6) is perpendicular to the plane of the seat-back. Therefore, when the seat-back is arranged on a substantially vertical plane, the axis of the recoil and restraint device (9) is a horizontal axis.

The belt (7) slides on said reel, coming out of the recoil and restraint
5 device (9), and is redirected to the height adjustment device (5). Therefore the second deflection point (6) is located on the same side of the seat-back wherein the recoil and restraint device (9), the height adjustment device (5) and the first deflection point (4) are arranged.

The height adjustment device (5) comprises a curved vertical rod with
10 concavity facing towards the back of the seat. The rod of the height adjustment device is fixed to the seat framework with fixing means, such as screws and bolts, located at the two lower and upper ends of the rod of the height adjustment device.

The safety belt (7) coming out of the reel of the horizontal rod of the
15 second deflection point (6) is partially recoiled around said curved vertical rod of the height adjustment device (5), thus originating the first deflection point (4), which is displaced freely, redirecting the belt (7) from a variable height that is automatically adjusted to the passenger's needs.

Referring to Fig. 5, said vertical rod of the height adjustment device (5)
20 has length of approximately 200 mm and radius of curvature of $400\text{mm} \pm 20\text{mm}$.

Fig. 5 shows that the lower point of said vertical rod of the height
adjustment device (5) is located at height (h1) of approximately 450 mm from
the base of the seat-back (with reference to the front side where the
25 passenger rests his/her back), whereas the upper point of said vertical rod of the height adjustment device (5) is located at height (h2) of approximately 650 mm from the base of the seat-back.

Instead, the center of said radius of curvature is located at height HR
of $630\text{mm} \pm 20\text{mm}$ from the base of the seat-back.

Claims

- 1) A vehicle seat provided with safety belt system comprising:
- a safety belt (7) adapted to be diagonally located across the chest of the passenger (10);
 - a recoil and restraint device (9) that supplies the safety belt (7) and
5 keeps it tight in normal conditions; said recoil and restraint device (9) being arranged on one side of the seat-back;
 - two lower anchor points (2 and 3) located on the two sides of a seat (1);
 - a first deflection point (4) for the belt (7) located at the shoulder height
10 of the passenger (10);
 - a height adjustment device (5) adapted to redirect the safety belt (7) from one of the lower anchor points (2 or 3) to said recoil and restraint device (9); said height adjustment device (5) being located on the same side as the recoil and restraint device (9);
 - 15 - a second deflection point (6) fixed and located behind the seat-back, which is interposed between the first deflection point (4) and the height adjustment device (5),
wherein said recoil and restraint device (9), said first deflection point (4), said second deflection point (6) and said height adjustment device (5) are
20 all located on the same side of the seat-back,
characterized in that
said second deflection point (6) consists in a rod with sliding reel having perpendicular axis to the plane of the seat-back; and
said recoil and restraint device (9) is provided with recoil axis
25 substantially perpendicular to the plane of the seat-back.
- 2) The vehicle seat of the preceding claim, wherein the height adjustment device (5) consists in a curved vertical rod with concavity facing towards the back of the seat.
- 3) The vehicle seat of the preceding claim, wherein said curved vertical
30 rod of the height adjustment device (5) comprises fixing means for fixing to

the framework of the seat-back, which are arranged at the upper end and lower end of the curved vertical rod.

4) The vehicle seat of one of the preceding claims, wherein the recoil and restraint device (9) is arranged in lower position with respect to the
5 second deflection point (6).

5) The vehicle seat of one of claims 2 to 4, wherein said curved vertical rod of the height adjustment device (5) has length of approximately 200mm and radius of curvature of $400\text{mm} \pm 20\text{mm}$.

6) The vehicle seat of one of claims 2 to 5, wherein said curved vertical
10 rod of the height adjustment device (5) is provided with lower point at height (h1) of approximately 450 mm from the base of the seat-back, with reference to the front side where the passenger's back is rested, and higher point at height (h2) of approximately 650 mm with respect to the base of the seat-back.

7) The vehicle seat of one of claims 2 to 6, wherein the center of said
15 radius of curvature of said curved vertical rod of the height adjustment device (5) is located at height HR of $630\text{mm} \pm 20\text{mm}$ from the base of the seat-back.

8) The vehicle seat of one of claims 3 to 7, wherein said recoil and
20 restraint device (9) is fixed to the curved vertical rod of the height adjustment device (5) in correspondence of the lower end of the curved vertical rod.

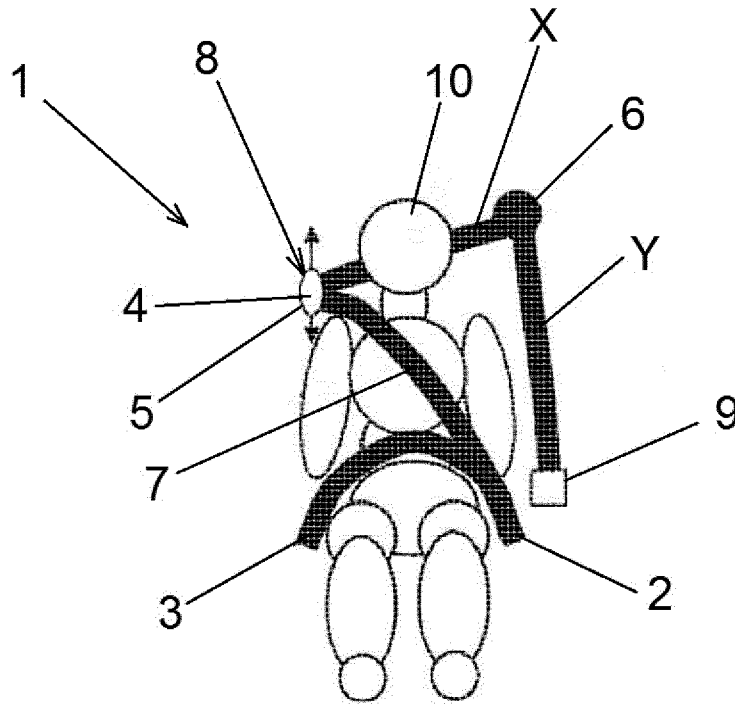


FIG. 1
PRIOR ART

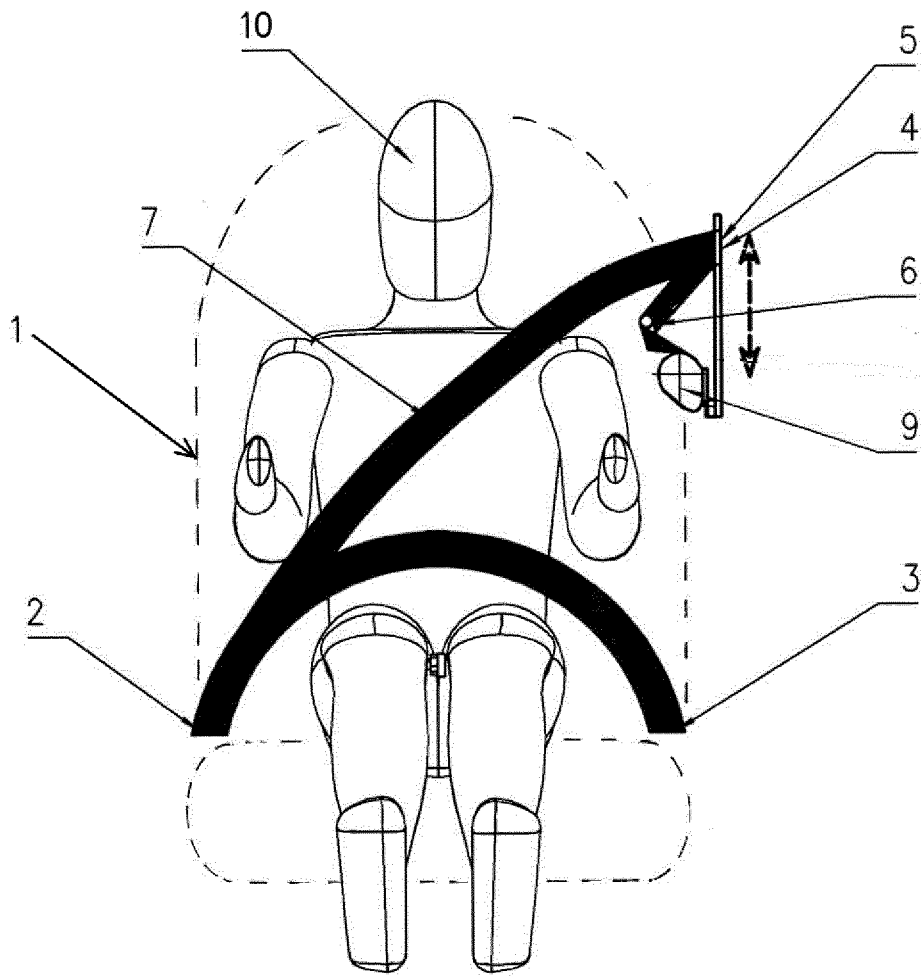


FIG. 2

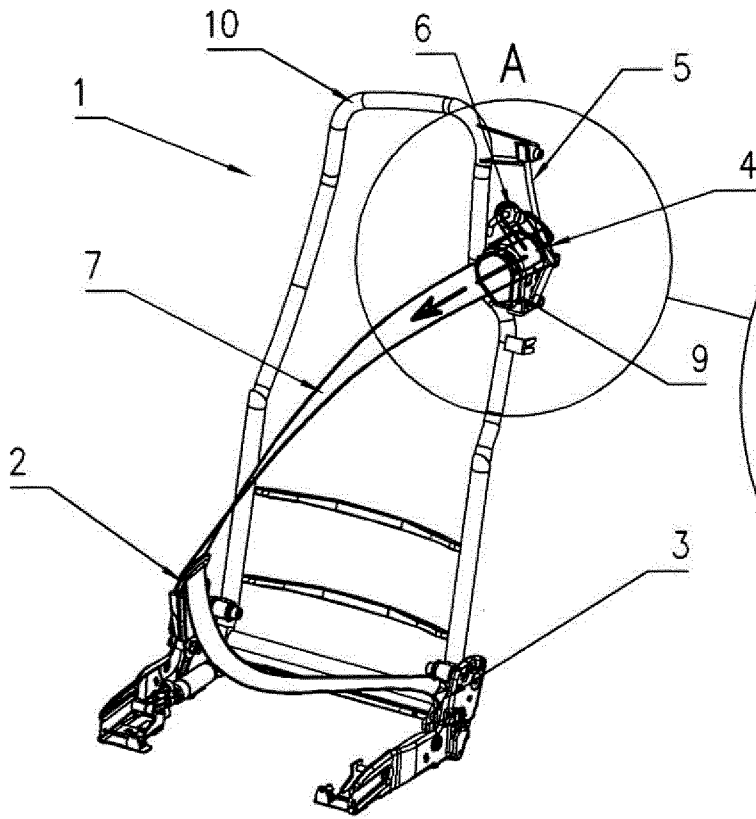


FIG. 3

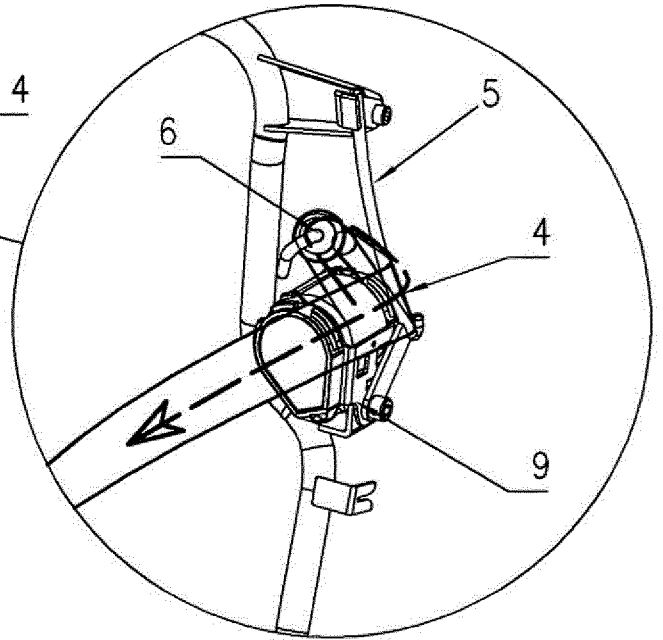


FIG. 3A

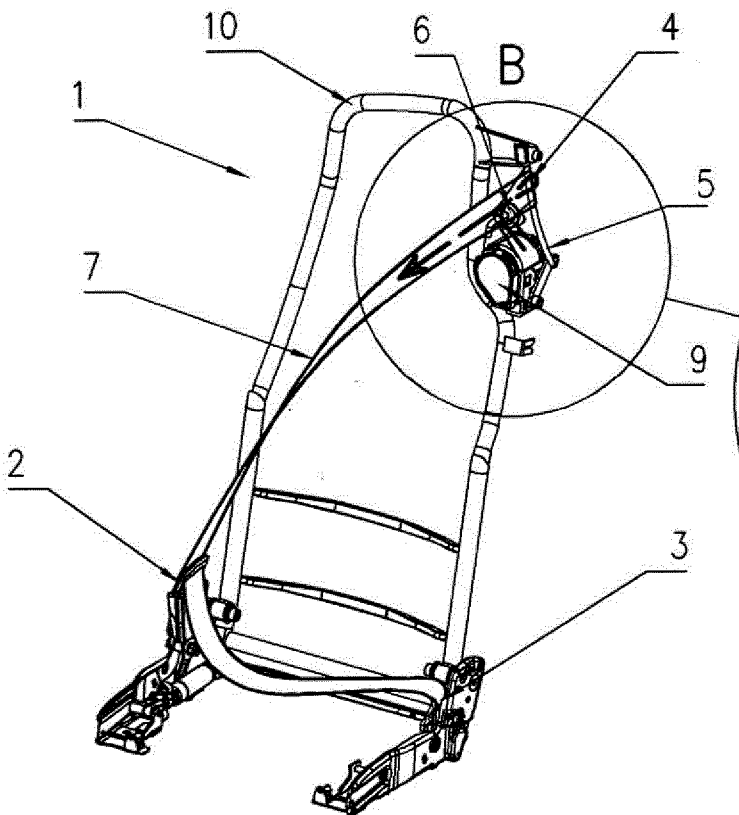


FIG. 4

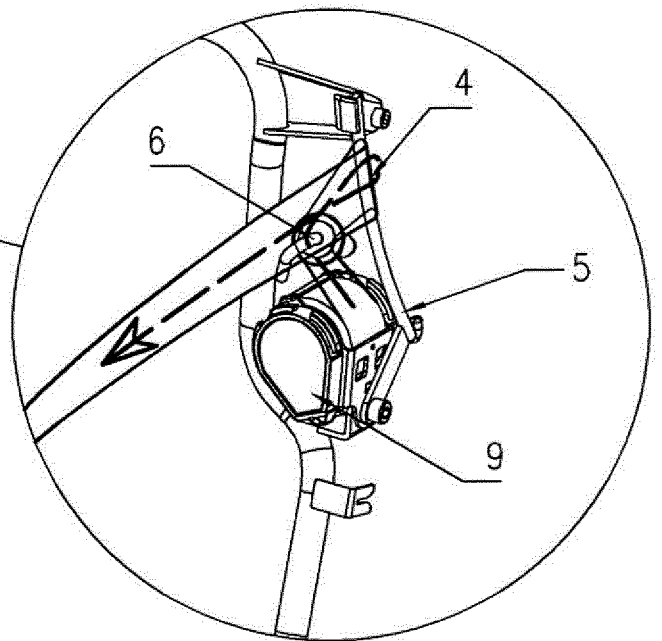


FIG. 4A

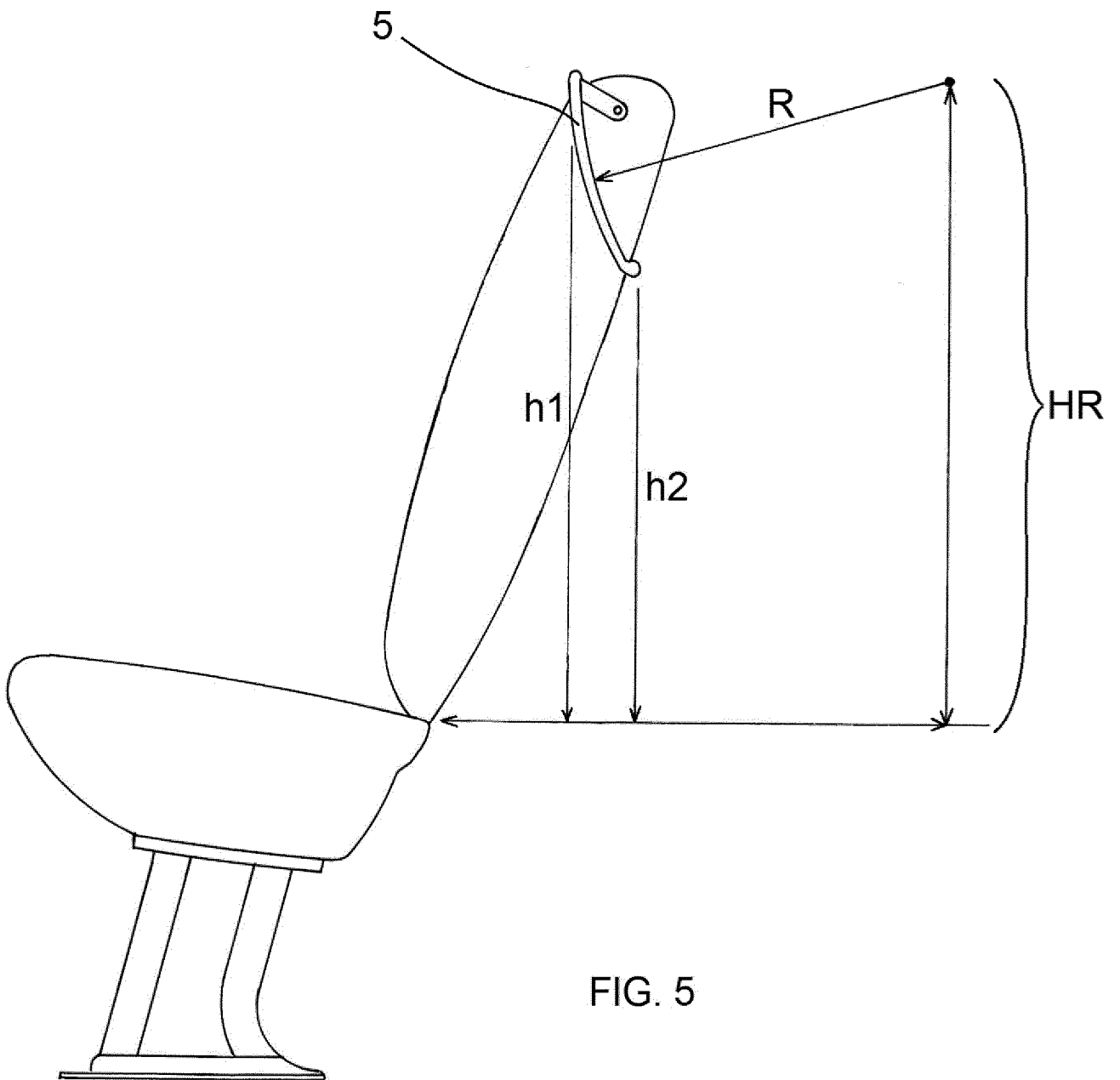


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/055577

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60R22/20 B60R22/26 B60N2/68
ADD.
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)
B60R B60N
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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 215 220 A1 (PORSCHE AG [DE]) 25 March 1987 (1987-03-25) cited in the application column 2, line 33 - column 4, line 37; figures	1
A	EP 0 374 893 A2 (AUTOLIV KOLB GMBH & CO KG [DE]) 27 June 1990 (1990-06-27) column 3, line 50 - column 5, line 51; figures	1
A	US 6 585 325 B1 (PAL CHINMOY [JP]) 1 July 2003 (2003-07-01) column 3, line 22 - column 6, line 23; figures	1
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer David, Pascal

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/055577

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 258 591 A2 (FAINSA SA [ES]) 8 December 2010 (2010-12-08) paragraph [0024] - paragraph [0036]; figures -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2013/055577

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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