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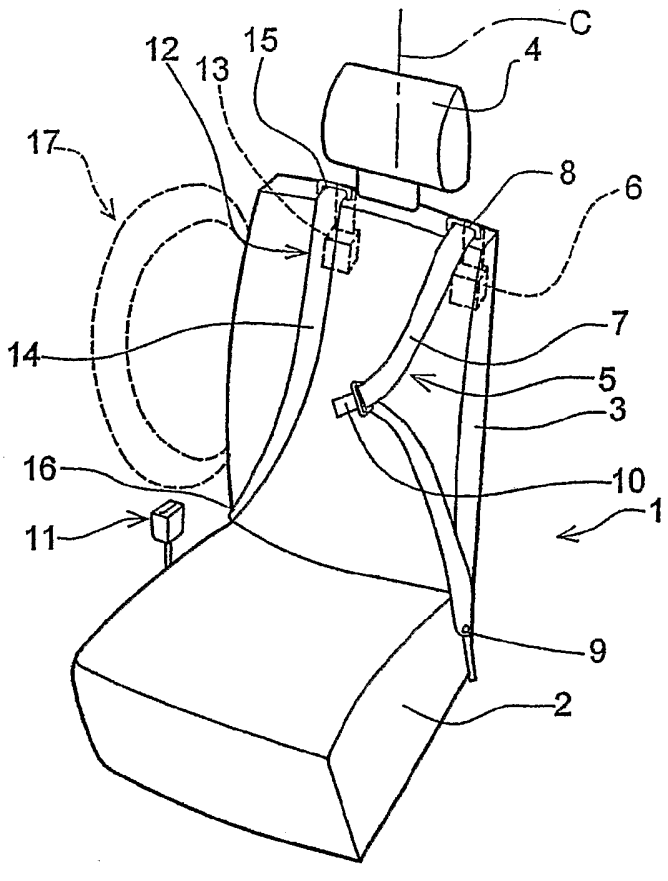
(54) Title: A SEAT BELT ARRANGEMENT



(57) Abstract: A seat belt arrangement incorporates a three-point seat belt (5), part of which passes through a shoulder guide (8) provided on one side of the centreline of the seat. The seat belt arrangement incorporates an additional two-point seat belt (12) which passes through a shoulder guide on the other side of the centreline of the seat. The shoulder guide (15) of the two-point seat belt (12) is much closer to the centreline C of the seat than is the shoulder guide (8) of the three-point seat belt (7).

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"A SEAT BELT ARRANGEMENT"

THE PRESENT INVENTION relates to a seat belt arrangement, and more particularly relates to a seat belt arrangement to provide protection for an occupant of a seat in a vehicle in the event that an accident should occur.

Seats belts have now been in use for many years in vehicles to restrain seat occupants in the event that an accident should occur. A typical seat belt, which provides a good restraining characteristic in connection with frontal impacts, is the so-called three-point seat belt. A typical three-point seat belt has a retractor which may be mounted on the vehicle or which may be mounted on the seat. A seat belt is wound on a spring-biased spool within the retractor. The seat belt passes from the retractor to a guide, which is located above the shoulder of the seat occupant which is the shoulder closest to the side of the vehicle. The guide may be mounted on a pillar of the vehicle or may be integrally formed in the seat, depending upon the position of the retractor.

The seat belt initially extends from the guide to an anchorage which is provided substantially at floor level, still on the same side of the seat. A tongue is slideably mounted on the belt and the tongue can be engaged with a buckle, the buckle being provided on the other side of the seat.

When the tongue is inserted in the buckle the three-point belt forms a lap strap extending from the anchored end of the belt to the buckle and diagonal portion which extends from the buckle to the guide mounted adjacent the shoulder of the vehicle occupant.

It has now been found that when a seat occupant is utilising a three-point belt of this type, while good protection is provided in frontal impacts and some side impacts, there is a risk of injury occurring if the vehicle is involved in a

so-called "far side" impact. In such an impact, a further vehicle, such as vehicle emerging from a side turning, impacts with the side of the vehicle which is furthest away from the seat occupant. The body of the vehicle is thus accelerated in such a way that the upper torso of the seat occupant, which tends to remain stationary as a consequence of inertia, becomes withdrawn from the part of the three-point belt which extends over the shoulder of the seat occupant. The seat belt thus effectively becomes disengaged from the upper torso of the seat occupant, and as a consequence injuries can arise. It has also been found that a seat occupant may become disengaged from a conventional three-point seat belt during a roll-over situation.

In order to enhance the level of safety provided by the seat belt arrangement it has been proposed to incorporate, into the seat belt arrangement, an additional seat belt which will engage the other shoulder of the seat occupant. Thus, with such an additional belt, both shoulders of the seat occupant are engaged and the risk of injury occurring in a side impact or roll-over may be reduced.

The present invention seeks to provide an improved safety belt arrangement.

According to this invention there is provided a seat belt arrangement in combination with a vehicle seat which has a squab and a backrest, the seat belt arrangement incorporating a three-point seat belt and a two-point seat belt, the three-point seat belt having a retractor on which seat belt is wound, the belt from the retractor passing through a shoulder guide located to one side of the centreline of the backrest of the seat, the belt being anchored on that side of the seat and having a tongue thereon for engagement with a buckle on the other side of the seat, the two-point seat belt extending through a shoulder guide provided on the said other side of the seat and extending to an anchorage on the said other side of the seat, the shoulder guide for the

two-point seat belt being located closer to the centre- line of the seat than the shoulder guide for the three-point seat belt.

Preferably the shoulder guide for the two-point seat belt is spaced from the centreline of the seat by a distance of between 5 cm and 10 cm.

In one embodiment the retractor and shoulder guide for the three-point seat belt are mounted on a vehicle in which the seat is provided.

In another embodiment the retractor and the shoulder guide for the three-point seat belt are mounted on the seat.

Conveniently the end of the two-point seat belt on the said other side of the seat is fixed permanently to an anchorage.

Preferably the end of the two-point seat belt is provided with a tongue to engage a buckle provided on the said other side of the seat.

Conveniently a single buckle is provided to receive the tongue of the three-point seat belt and the tongue of the two-point seat belt.

Advantageously the buckle is provided with a single release button actuable to release both tongues.

Preferably the buckle presents two slots, each slot being configured to receive only a respective tongue of the three-point or two-point seat belt, the buckle being such that the tongue for the three-point seat belt must be inserted into and retained by the buckle before the tongue for the two-point seat belt can be inserted into and retained by the buckle.

Conveniently the two-point seat belt is associated with a force limiter having a minimum force limiting level of 1kN and a maximum force limiting effect of 3kN.

Advantageously at least one of the seat belts is provided with a pretensioning arrangement.

Preferably there is a supplementary side restraint provided on the said other side of the seat.

Conveniently the supplementary restraint is in the form of an inflatable air-bag initially stored within the backrest of the seat.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic perspective view of a vehicle seat illustrating one form of seat belt arrangement in accordance with the present invention;

FIGURE 2 is a view corresponding to Figure 1 illustrating a modified embodiment of the invention;

FIGURE 3 is a view corresponding to Figure 2 illustrating a further modified embodiment of the invention; and

FIGURE 4 is an enlarged view of a buckle used in the embodiment of Figure 3.

Referring initially to Figure 1, a vehicle seat 1 is illustrated, the vehicle seat having a squab 2 and a backrest 3. The backrest 3 carries a headrest 4. The

seat is provided with an integral three-point seat belt 5. The three-point safety belt 5 incorporates a retractor 6 which is located towards the top of the backrest of the seat, within the interior of the backrest. The retractor 6 incorporates a spool. Wound on the spool of the retractor 6 is a webbing belt 7. The belt 7 emerges from the retractor and passes through a shoulder guide 8 which is provided at the top of the backrest, a substantial distance, measured horizontally, from the centreline C of the backrest. The distance from the centreline C to the guide is typically in excess of 12 cm. The belt 7 extends from the guide 8 to an anchorage 9 provided at the side of the seat below the guide 8. The anchorage 9 may secure the end of the belt 7 to the seat or to the floor of a vehicle in which the seat is mounted.

A tongue 10 is slidably mounted on the belt 7, the tongue 10 being configured to co-operate with a buckle 11 which is provided at the other side of the seat. The buckle 11 may be secured to the seat or to the floor.

In an initial condition of the seat belt 5, a substantial length of the belt 7 is wound onto the spool of the retractor 6, and the belt 7 extends directly from the guide 8 to the anchorage 9, with the tongue 10 being slideable on the belt. When the belt is to be used the tongue 10 is grasped and is pulled across the lap of the seat occupant and is engaged in the buckle 11. The seat belt 5 then forms a conventional three-point seat belt 5, with a lap strap and a diagonal portion. The upper end of the diagonal portion is held in position on the shoulder of the seat occupant by the shoulder guide 8.

The vehicle seat 1 is provided with an additional two-point seat belt 12. The two-point seat belt 12 incorporates a retractor 13 which is embedded within the upper part of the backrest 3 of the seat 1. A webbing belt 14 is wound on the spool of the retractor 13, and the belt 14, after emerging from the retractor 13, passes through a shoulder guide 15 provided at the upper part of the backrest of the seat. The guide 15 is closer to the centreline C than the guide 8 of the 3-point seat belt 5, but on the opposite side of the centreline.

The distance between the guide 15 and the centreline C, measured horizontally, is between 5 and 10 cm. The guide 15 is thus located very much towards the centre of the seat, immediately adjacent the headrest 4. The belt 14 extends from the guide 15 to an anchorage 16 provided at the side of the seat in the region of a buckle 11. The anchorage 16 may be on the seat or on the floor. The end of the seat belt 14 is permanently fixed to the anchorage 16.

It is to be appreciated that a seat occupant may choose to use the two-point seat belt 12 in addition to the previously described three-point seat belt 5. If the two-point seat belt 12 is to be utilised the seat occupant will, initially, pull a length of the belt 14 from the retractor 13 through the guide 15, and slide one arm between the seat 14 and the backrest 3 of the seat 1, thus applying the belt 14 in a manner similar to that in which a strap of a rucksack is applied to a shoulder. The shoulder guide 15 holds the upper end of the belt 14 in position on the shoulder of the seat occupant.

Once the two-point seat belt 12 has been engaged with a shoulder in this way the three-point seat belt 5 can be utilised in the conventional manner.

Because only a relatively small length of belt 14 has to be paid out from the retractor 13 the retractor 13 may be much smaller than the retractor 6. The end of the two-point seat belt 12 remote from the retractor is permanently secured to the anchorage 16, and so it is not necessary for the seat occupant to use a buckle for the two-point seat belt 12. The two-point belt 12 is thus not an inconvenience for the seat occupant, even when the belt is not in use.

It is preferred for the seat 1 to have an additional "in-board" side restraint in the form of an inflatable air-bag 17 which is stored within the side part of the backrest of the seat. The air-bag 17 is provided on the same side of the set as the two-point seat-belt 12.

In the event of a side impact, such as a "far side" impact, the air-bag 17 will inflate and extend forwardly from the side of the backrest, thus being located adjacent the side of the upper torso of the seat occupant, to help prevent the torso moving laterally relative to the seat back. The presence of the air-bag 17, in conjunction with the two-point seat belt 12, will help minimise any risk that the seat occupant will become disengaged from the seat belt arrangement. In a far-side side impact the two-point seat belt 12 and the air-bag 17 will each tend to impart an acceleration to the upper torso of the seat occupant which is closely related to the acceleration imparted to the actual seat as a consequence of the side impact.

In a roll-over situation, the seat occupant wearing both the two-point seat belt 12 and the three-point seat belt 7 will have a much lower probability of receiving injuries than a corresponding seat occupant wearing only the three-point seat belt 7.

The three-point seat belt 7 may, as is conventional, be provided with an energy absorber or force limiter. The energy absorber or force limiter may be incorporated within the anchorage 9 or within the retractor 6, or within the buckle 11. The anchorage 9 and/or the retractor 6 and/or the buckle 11 may, if desired, be provided with a pretensioner.

Similarly, the two-point seat belt 12 may be provided with a force limiter. The force limiter may be incorporated within the retractor 13 or within the anchorage 16. It is envisaged, however, that the force limiter of the secondary seat belt will have a lower force limiting level than the force limiting level found in a conventional three-point seat belt, and the force limiting level may have a minimum value of 1kN and a maximum value 3kN. Again the two-point seat belt 12 may be provided with a pretensioner and the pretensioner may be incorporated within the retractor 13 or within the anchorage 16.

Figure 2 illustrates a modified embodiment of the invention in which like parts are identified by like references. Here, it is to be noted, that the three-point seat belt 5, instead of being integrated into the seat, is a three-point seat belt of the type in which the retractor 6 is floor mounted adjacent the side of the seat 1, and the shoulder guide 8 is a pillar loop guide which is mounted on a pillar of the vehicle such as, for a front seat occupant, the "B" pillar. It is to be understood that three-point seat belts which are integrated with a seat, as shown in Figure 1 and three-point seat belts which are partly mounted to the vehicle, as shown in Figure 2, are both already in use. The present invention relates specifically to the additional two-point seat belt 12, and the two-point seat belt 12 can be used with either of the prior proposed general types of three-point seat belts.

It is to be noted that in both Figure 1 and Figure 2 the guide 8 for the three-point seat belt 7 is located much further, in a horizontal sense, from the centreline of the backrest 3 of the seat than is the guide 15. The reason for this is that the part of the three-point seat belt that is passing through the guide 8 is intended to extend, in use, over the shoulder and substantially diagonally across the torso of the seat occupant to the buckle 11, which is located on the other side of the seat. If the guide 15 for the secondary seat belt 12 were to be located in a position corresponding to the position of the guide 8, the two-point seat belt 12 would extend substantially vertically adjacent the side of the seat, and would not, in an accident situation, firmly engage the shoulder of a seat occupant wearing the two-point seat belt. As a consequence of the guide 15 being located towards the centreline of the vehicle seat, the two-point seat belt 12 does extend at an appropriate angle across the upper torso of the seat occupant, when the two-point belt is in use, to provide a desired restraining effect.

Figures 3 and 4 illustrate a further embodiment of the invention. In this embodiment of the invention a conventional three-point seat belt 7 is

provided. The illustrated conventional three-point seat belt is three-point seat belt in which the retractor 6 is floor mounted and the guide 8 is a pillar loop guide mounted on a post of the vehicle, but it is to be understood that the three-point seat belt could equally be a three-point seat belt integrated into the seat as shown in Figure 1.

In the embodiment of Figure 3, the two-point seat belt does not have one end connected to an anchorage 16, but instead is provided, at its end, with a tongue 18.

In such an embodiment the retractor 13 would be somewhat larger than the retractor of the embodiment described above with reference to Figures 1 and 2 and, when the seat belt is not in use, the seat belt may be fully retracted so that the seat belt is not uncomfortable to a person who has chosen to use only the three-point seat belt 5.

In the embodiment of Figure 3 a modified buckle 11A is provided, the buckle 11A being illustrated more clearly in Figure 4. The buckle 11A includes a housing 19, the housing 19 defining two entry slots 20,21 to receive, respectively, the tongue 10 provided on the three-point seat belt 5 and the tongue 17 provided on the two-point seat belt 12.

The buckle 11A and the tongues 10,17 of the two seat belts are so configured that the tongue 10 can only be inserted into and retained by the buckle if the tongue 10 is inserted into the slot 20 and so that the tongue 17 can only be inserted into and retained by the buckle if it is inserted into the slot 21. The tongues and the corresponding slots may be provided with corresponding key ways or may have different dimensions of widths and thickness to enable this effect to be achieved. It is preferred, also, for the buckle to be such that the tongue 17 may only be inserted into the slot 21 in one particular orientation, in order to minimise the risk of an undesirable "twist" appearing within the two-point seat belt 12.

Preferably the buckle also has a mechanical interconnection between the internal retaining mechanism which retains the tongue 10 on the three-point seat belt 5 and the retaining mechanism which retains the tongue 17 on a two-point seat belt 12 which ensures that the two-point seat belt 12 cannot be retained unless the three-point seat belt 5 has already been buckled up. In other words, it is essential in use of the buckle, for the tongue 10 to be inserted into the slot 20 and retained by the buckle 11A before the tongue 17 is inserted into the slot 21 to be retained by the buckle 11A.

The buckle 18 is provided with a single push button 22 which may be pushed to release both of the tongues once the tongues have been inserted into the buckle, or only one tongue should the seat occupant choose to use only the three-point safety belt.

When used in this Specification and Claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

Claims

1. A seat belt arrangement, in combination with a vehicle seat which has a squab and a backrest, the seat belt arrangement incorporating a three-point seat belt and a two-point safety belt, the three-point seat belt having a retractor on which seat belt is wound, the belt from the retractor passing through a shoulder guide located to one side of the centreline of the backrest of the seat, the belt being anchored on that side of the seat and having a tongue thereon for engagement with a buckle on the other side of the seat, the two-point seat belt extending through a shoulder guide provided on the said other side of the seat and extending to an anchorage on the said other side of the seat, the shoulder guide for the two-point seat belt being located closer to the centre- line of the seat than the shoulder guide for the three-point seat belt.

2. A seat belt arrangement according to Claim 1 wherein the shoulder guide for the two-point seat belt is spaced from the centreline of the seat by a distance of between 5 cm and 10 cm.

3. A seat belt arrangement according to Claim 1 of 2 wherein the retractor and shoulder guide for the three-point seat belt are mounted on a vehicle in which the seat is provided.

4. A seat belt arrangement according to Claim 1 or 2 wherein the retractor and the shoulder guide for the three-point seat belt are mounted on the seat.

5. A seat belt arrangement according to any one of the preceding Claims wherein the end of the two-point seat belt on the said other side of the seat is fixed permanently to an anchorage.

6. A seat belt arrangement according to any of Claims 1 to 4 wherein the end of the two-point seat belt is provided with a tongue to engage a buckle provided on the said other side of the seat.

7. A seat belt arrangement according to Claim 6 wherein a single buckle is provided to receive the tongue of the three-point seat belt and the tongue of the two-point seat belt.

8. A seat belt arrangement according to Claim 7 wherein the buckle is provided with a single release button actuable to release both tongues.

9. A seat belt arrangement according to Claim 7 and Claim 8 wherein the buckle presents two slots, each slot being configured to receive only a respective tongue of the three-point or two-point seat belt, the buckle being such that the tongue for the three-point seat belt must be inserted into and retained by the buckle before the tongue for the two-point seat belt can be inserted into and retained by the buckle.

10. A seat belt arrangement according to any one of the preceding Claims wherein the two-point seat belt is associated with a force limiter having a minimum force limiting level of 1kN and a maximum force limiting effect of 3kN.

11. A seat belt arrangement according to any one of the preceding Claims wherein at least one of the seat belts is provided with a pretensioning arrangement.

12. A seat belt arrangement according to any one of the preceding Claims wherein there is a supplementary side restraint provided on the said other side of the seat.

13. A seat belt arrangement according to Claim 12 wherein the supplementary restraint is in the form of an inflatable air-bag initially stored within the backrest of the seat.

14. A seat belt arrangement, in combination with a vehicle seat which has a squab and a backrest, the seat belt arrangement incorporating a three-point seat belt and a two-point safety belt, the three-point seat belt having a retractor on which seat belt is wound, the belt from the retractor passing through a shoulder guide located to one side of the centreline of the backrest of the seat, the belt being anchored on that side of the seat and having a tongue thereon for engagement with a buckle on the other side of the seat, the two-point seat belt extending through a shoulder guide provided on the said other side of the seat, the end of the two-point seat belt being provided with a tongue to engage a buckle provided on the said other side of the seat, the shoulder guide for the two-point seat belt being located closer to the centre- line of the seat than the shoulder guide for the three-point seat belt, a single buckle being provided to receive the tongue of the three-point seat belt and the tongue of the two-point seat belt, with the buckle being provided with a single release button actuable to release both tongues, the buckle presenting two slots, each slot being configured to receive only a respective tongue of the three-point or two-point seat belt, the buckle being such that the tongue for the three-point seat belt must be inserted into and retained by the buckle before the tongue for the two-point seat belt can be inserted into and retained by the buckle.

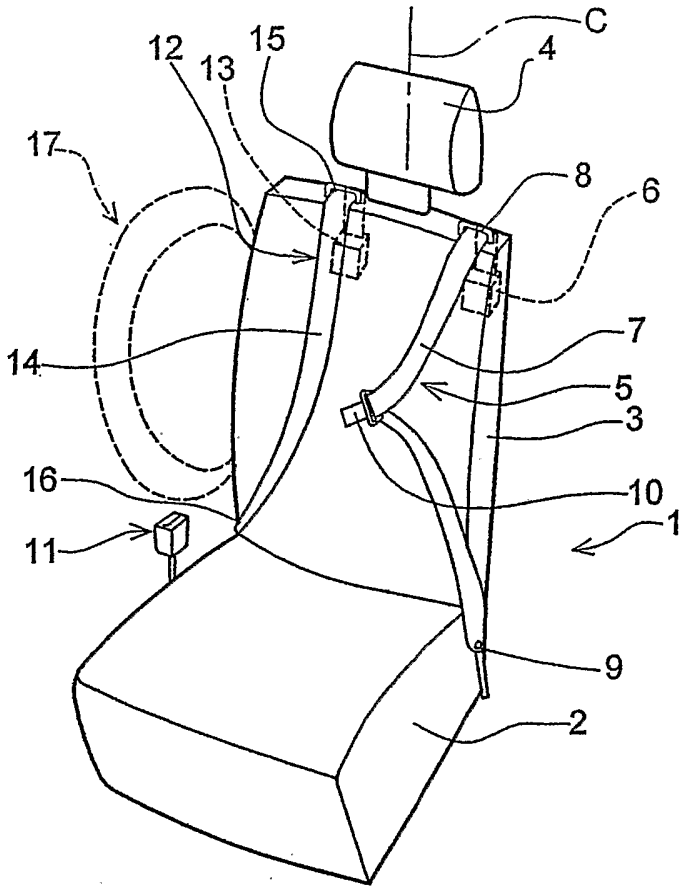


FIG 1

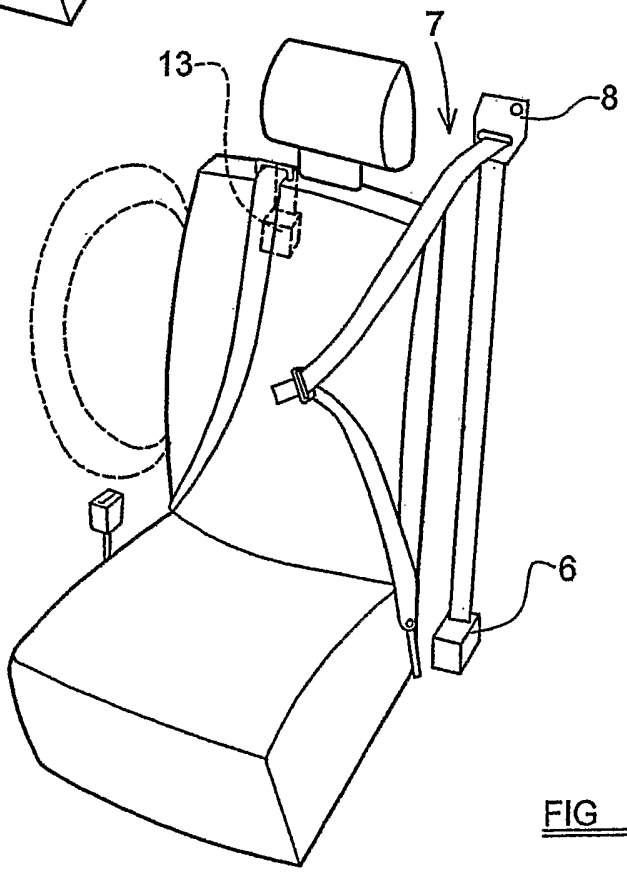
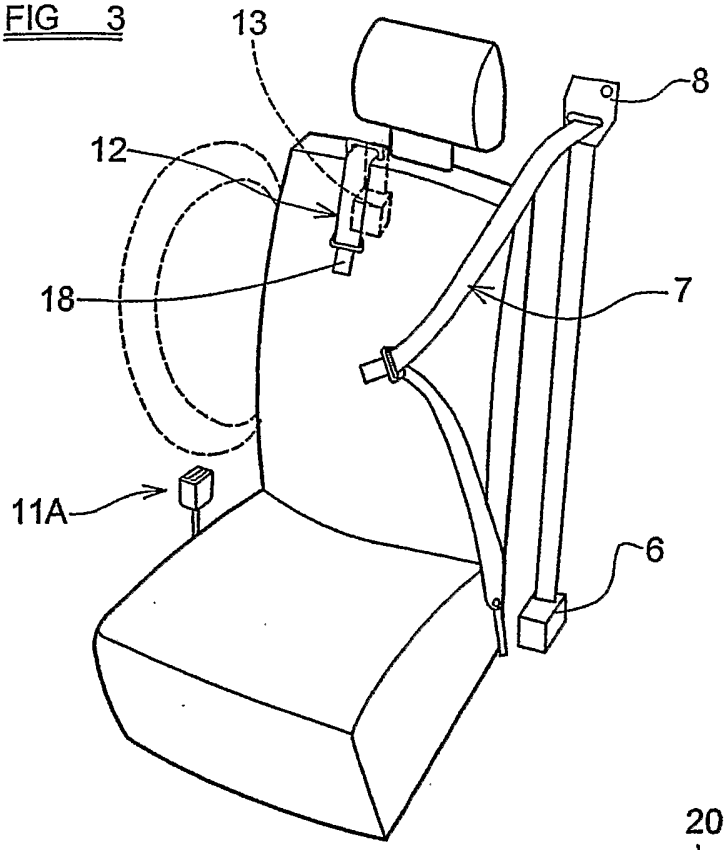


FIG 2

FIG 3



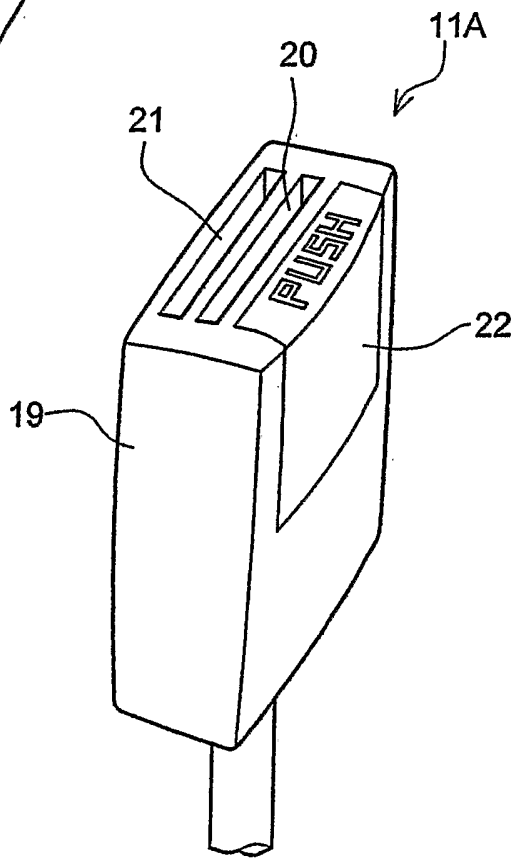


FIG 4